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Managing the real estate development process for healthcare

a system dynamics model for the development of strategic real estate for healthcare

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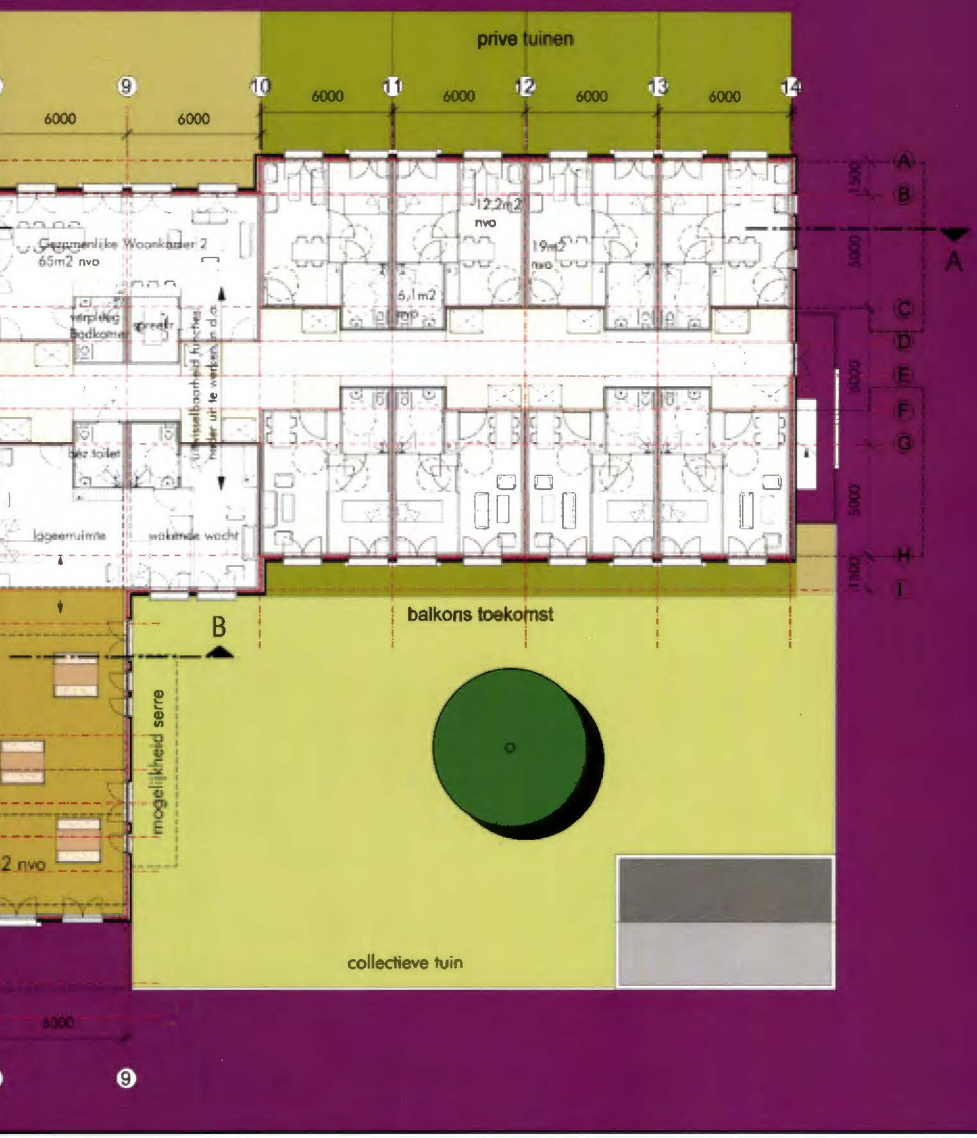

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Manon Bodenstaff

Construction Management and Engineering

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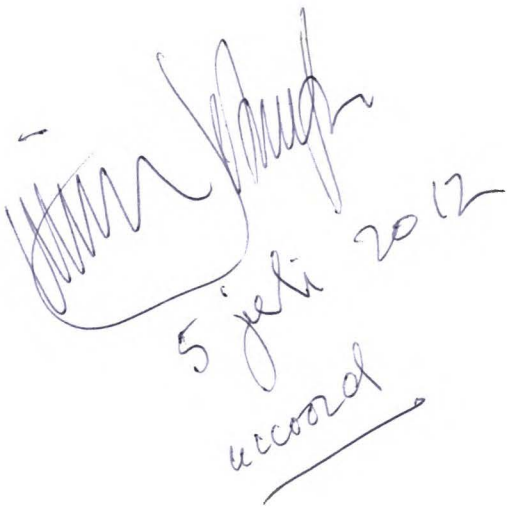
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Managing the real estate development process for healthcare

A system dynamics model for the development of strategic real estate for healthcare

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Eindhoven, July 5th 2012

PREFACE

This report contains my graduation research with the title 'Managing the real estate development process for healthcare'. With this report I will end six years of studying at the Eindhoven University of Technology. I can say, with full conviction that these six years have been fantastic.

A topic for my graduation thesis was easy to find from my own interest, namely healthcare real estate. During the process of choosing a study I considered the study Architecture and the study Medicine, finally the choice fell on Architecture. Because of this, my graduation was a great opportunity to combine these two areas of interest. After finding a topic the quest for an internship at a company was started. draaijer+partners gave me the opportunity to perform my research at their company, they provided me their knowledge and contacts to make my final project to a success. I hope that the model that is created will be a useful tool for draaijer+partners and can assist healthcare organisations even more during the development process of their real estate.

The last 6 months a number of people helped me with the execution of my research. Without their guidance, assistance and support it would not have been possible to come to where I am now. At first I would like to thank my mentors at draaijper+partners, Johan Thijssen en Leo Wolters who often helped me by giving some critical comments or brought me into contact with the right persons, and also Jan-Joost Mestebeld who was the first person I spoke with and brought me in contact with the company. Next to this I would to thank like all the other employees of draaijer+partners who took some time for me to discuss the process of my project and gave me very useful tips. For helping me with filling in my questionnaire I would like to thank the employees of Philadelphia, and in particular Anne Kok for providing me the right contacts. Finally, I would like to thank my supervisors, Erik Blokhuis and Wim Schaefer, from the Eindhoven University of Technology, for the guidance during the past months. These meetings often helped me to keep positive when I was feeling unsure about my results.

Of course I would also want to thank my parents who have given me the opportunity to go to the university and who have supported me during the years. Next to this I want to thank my boyfriend Robert and my friends for the necessary study evasive activities during my graduation period.

I hope you will enjoy reading this report and it might prove to be a bit long to start of straight away, hence the summary can be found at page 126 of this report.

Eindhoven, July 2nd, 2012

Manon Bodenstaff

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List of abbreviations

AHP	Analytical Hierarchy Process
AWBZ	Algemene Wet Bijzondere Ziektekosten
CBS	Centraal Bureau voor de Statistiek
CIZ	Centrum Indicatiestelling Zorg
CREM	Corporate Real Estate Management
IPCC	Intergovernmental Panel on Climate Change
LCC	Life Cycle Costs
NHC	Normatieve Huisvestingscomponent
NIVEL	Dutch Institute for Research in Public Health
NPV	Net present Value
NZa	Nederlandse Zorgautoriteit
RIVM	Rijksinstituut voor Volksgezondheid en Milieu
RO	Real options
SCP	Sociaal en Cultureel Planbureau
SD	System Dynamics
VeVeRa-iii	Ramingen Verpleging en Verzorging III
Wmo	Wet Maatschappelijke ondersteuning
Zvw	Ziektekostenverzekeringswet
ZZP	Zorg Zwaarte Pakket

1 Background, context and motives

1.1 Background and context

The coming year's new financing measures of the government, and the dynamics in the population causes great changes in the demand for healthcare real estate. In a response to this, the way healthcare real estate will be developed will be changing. This means that the healthcare real estate development process needs to be analysed thoroughly. It is important that the opportunities for the future will be identified so that an adequate response can be given to this.

The recent introduction of the "ZZP" (Zorg Zwaarte Pakketten) funding has ensured that institutions have to earn financial compensations by the number of patients that are being treated. This means that at the moment that there is a bed empty, there will not be given a compensation. Also the financial compensation that is given by the government for developing and maintaining (new) real estate for healthcare organizations, the NHC (Normatieve Huisvestingscomponent), will be linked to the ZZPs. The compensation for the housing of the organization is then linked to the kind of care that is given. This means that the organization is responsible for the financing of its own property, and when a bed is empty they don't receive a financial compensation for their real estate. Therefore it is important that the scale of the care is accurately calculated so that the size and capacity are optimally aligned to each other.

With the introduction of the ZZP and the NHC it is very important for healthcare organizations to set up a business case to see if the development of real estate is financial feasible. A very important element in a business case is the operating costs. These costs depend on the care that is given and the amount of square meters real estate. This means that it is important that a functional and flexible building is created. When the demand for care will change it will be necessary to adapt the real estate to this so that the organization can perform on its best.

1.2 Problem analysis and research question

Since the healthcare organizations have become responsible for their own budget for real estate, their financial situation has become uncertain. Because the development of real estate is not the core business of a healthcare organization it will be useful to approach an extern party to help them with setting up a feasible plan and creating a proper business case. Still the whole situation is quite unsure because it depends on many unstable factors. To align the supply and demand in a funded way it is important to get a grip on all those unstable factors. That's why the following research question is designed so that these factors can be found and dealt with in a considered way.

How can a healthcare organization manage its real estate in such a way that the dynamic influences have a minimal effect on the functioning of an organization, and can be controlled so that the financial balance of a healthcare organization can absorb these changes?

1.2.1 Sub questions

To gain traction on the research subject, the research question is divided into sub questions. This makes the research more tangible and easier to understand. Also the objectives are identified in this way. The first question is about the demand for care. How will this develop in the upcoming years and which kind of care will change the most? Which population developments have an influence on the demand for care?

1. *How will the demand for care develop the upcoming years?*

The second question is about the whole financial picture for a healthcare organization in relation to its real estate. Which variables have an influence on the kind of compensation that is given? Also the expenses for an organization are important because all the compensations are connected and depending on each other.

2. *What are the main elements in the financial balance of a healthcare organization in relation to its real estate?*

The third question focuses on the real estate for healthcare itself. Which elements are compulsory in developing real estate for healthcare? It is also important in this part to investigate how the real estate is made flexible so it can be adjusted to the changing demands.

3. *Which elements are compulsory in developing healthcare real estate and how can it be made flexible?*

The last question is about how a healthcare organization can incorporate their real estate in their management. It is important that a real estate strategy is developed so that based on this, decisions can be made in the future regarding to their property. How to set up such a strategy and which elements play a role in this process?

4. *How to incorporate real estate in the management of a healthcare organization?*

Many of the components of the research can be answered subjectively. It is important to the research that it is performed objectively. To ensure that this actually happens a number of criteria can be set, so that a clear and objective framework is used.

1.3 Boundary

This research is performed within a limited time period. This means that certain details in the report are not optimally investigated and can be based on assumptions. Nevertheless the outcome is still useable and is representing a real world case.

The focus in this research is solely on the care sector. The regulations for the cure sector differ from that from the care sector so that it is not directly useable for this sector. The model that will be created is adapted on the special care for people with a mental disability. With some minor changes it can also be used for other kinds of care.

1.4 Objectives and expected result

The expected result is a model that can simulate the demand for care and can make a decision how to react on this. Based on different scenarios the model will calculate the amount of people that need care and based on this an healthcare organization can see if they can meet this demand and how. When for a certain amount of time an healthcare organization don't meet de demand for care then it is important that something needs to change. This can be done by changes in real estate. When there is too much space for example it need to be transformed so that the unused space will be used again.

The purpose of the model is to create a financial plan on which healthcare organizations can base their real estate decisions. By adjusting the real estate on the demand for care, money can be saved and risks can be avoided. Although this model is created for Philadelphia, it should be applicable for different kind of situations. At the end, based on the outcomes of the model, recommendations will be given for further research. Also recommendations for healthcare organizations, real estate owners and consultancy companies will be given. Then after all of this a conclusion will be written about this research.

1.5 Outline final report

The final report follows the structure of the research design. First a short explanation will be given in context of the research. Then after this introduction the contextual orientation is split up in four different parts. These parts are connected to the sub questions so that a logical sequence in the report will help to clarify the whole research.

The four control frameworks that can be used as a foundation for decision-making in the development for healthcare real estate will also be the red thread through the report. These control frameworks can be seen in Table 1-1 and will be connected into a model which will be developed in the context of this research.

Framework	Healthcare
Market	Demand for Care
Finance	Income and expenses
Functionality and Flexibility	Strategic and flexible real estate
Organization	Strategic real estate strategy

Table 1-1 Frameworks for the research

At the end a conclusion is given and the crucial information for the model is summed up. Also the research methods will be explained in detail so that this information can be used during the model phase.

The results part of the report starts with a short introduction of the context of the model. This model is created for a healthcare organization and this organization will be introduced. Then after this there is a chapter for the model. Here all the steps in the model development process that were taken are discussed.

At the end of the report the conclusions are given based on the outcome of the model. Also some recommendations for further research can be found here. All the previous parts together will form the complete research report. The outline of the report can be seen in Table 1-2.

	Chapter	Title
Introduction	1	Background, context and motives
	2	Research design
Contextual orientation	3	Demand for care
	4	Income
	5	Expenses
	6	Organization
	7	Strategic Real Estate
Results	8	The model
	9	Results
	10	The business case
Conclusions	11	Conclusions
	12	Recommendations
	13	References
	14	Appendix

Table 1-2 Outline final report

2 Research design

The research is built up from four phases, the contextual orientation, model development, results and the conclusions and recommendations as can be seen in Figure 2-1.

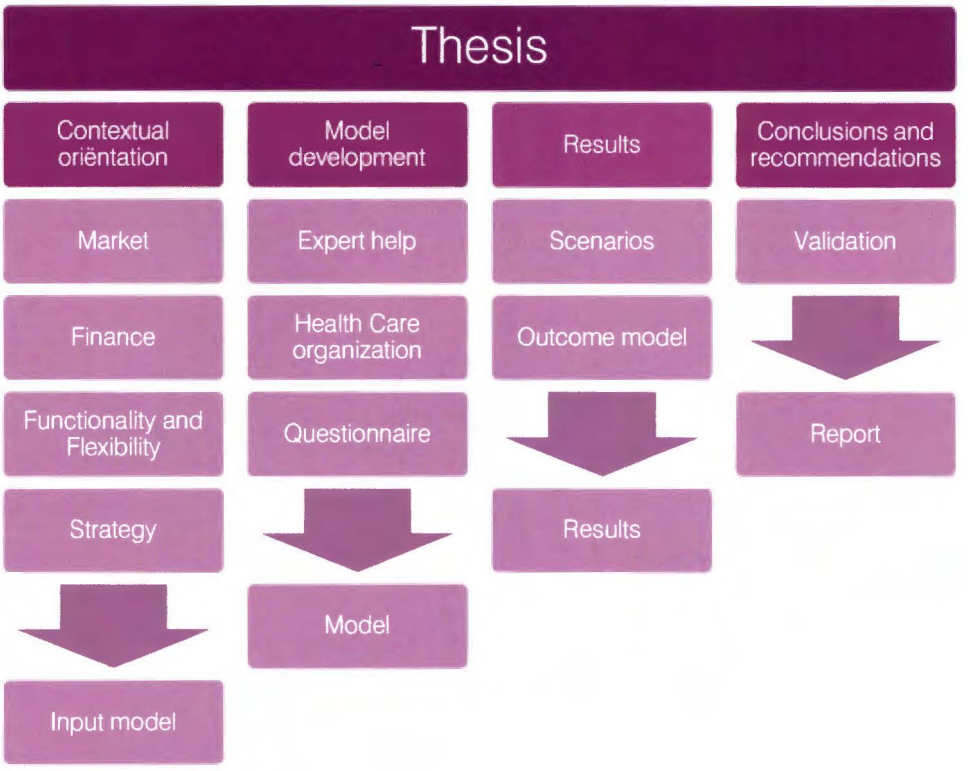


Figure 2-1 Research design

1. During the contextual orientation a literature study is performed. This literature study is built up from four chapters which are based on the control frameworks that are used during an advisory process performed by draaijer+partners. Also during this phase meetings will be held with some experts. The knowledge gained in this phase can be used as input for the model that will be created in the subsequent phase.
2. In the second phase the model will be created. This model will be developed with the help of several experts from draaijer+partners. Also a healthcare organization will be asked to fill in a questionnaire. The information that is gathered from this questionnaire can be used as an input for the model.
3. When the model is finished it need to be tested if it works in the correct way. Based on several scenarios the model will be used to develop the results. Based on these results the conclusions and recommendations in de next phase can be developed.
4. In the last phase all the results and conclusions from the literature study will be connected to each other so that some recommendations can be given for further research. Also the whole report will be completed.

2.1 Research methodology

When a scientific research is being performed it is necessary to make a decision in which research methods can help to achieve the set goals. Most of the time more than on research method is needed so that all the information that is found can be analysed and translated into conclusions and recommendations. In this research three different research methods are used. First the analytical hierarchy process is used to setting up a questionnaire. The second method is the system dynamics method to model the whole development process around healthcare real estate. Then with the help of the scenarios method the system dynamics model can be run a few times to find the desirable end result. To get a better understanding of these methods before the real research is performed, a short explanation is given of each of the methods. The knowledge gained in this chapter is used to perform the research and to design the model. This can be found in part III that will start after this chapter.

2.2 Scenario's

When the operating costs are calculated for the life time of a building it is necessary to use scenarios. In these scenarios possible future states of demographic patterns, social and life style factors, economic conditions, natural resources, ecosystem, political and regulatory forces, technological forces, and international conditions are examined. Not every possibility is equal likely to happen but every option is taken into account. The Intergovernmental Panel on Climate Change (IPCC) uses the following definition:

(IPCC, 2008):
"A scenario is a coherent, internally consistent and plausible description of a possible future state of the world. It is not a forecast; rather, each scenario is one alternative image of how the future can unfold."

As they say, a scenario is not a prediction of the future instead a scenario give possible options about how the future can unfold and also what kind of roads can be taken to come to an alternative future. In this way scenarios can be used for planning over long time horizons but also it can help in the decision making on the short term because short term decisions can have consequences for the long-term. Here the scenarios can widen the perspectives and also it can lighten some key issues that otherwise could be missed.

To develop a scenario many people with different backgrounds are involved. This is because the scenario can be created with the knowledge of many specialists and so a more realistic scenario is created. In healthcare projects this could be people from the healthcare organizations, project managers and financial experts. Besides the positive side it has also a downside because the misunderstandings that can arise due to communication barriers through the different fields and organizations.

Most of the time there are three types of scenarios considered when making a decision. The first is the worst case scenario, a scenario where one assumes the worst that can occur. Then there is the business as usual, a baseline scenario that examines the consequences of continuing current trends in population, economy, technology and human behaviour. And at last there is the best case scenario that is the optimum outcome being considered. Based on the actual costs that differ for each scenario, a decision is made.

2.3 Analytical Hierarchy Process

The analytical hierarchy process (AHP) is a general method for measurement. It can develop ratio scales with the help of both discrete and continuous paired comparisons. It is used in many different fields like multi criteria decision making, planning and resource allocation and in conflict resolution. In its general form the AHP is a nonlinear framework for carrying out both deductive and inductive thinking without use of the syllogism by taking several factors into consideration simultaneously and allowing for dependence and for feedback, and making numerical trade-offs to arrive at a synthesis or conclusion. T. L. Saaty developed the AHP in 1971- 1975 while at the Wharton School (University of Pennsylvania, Philadelphia, Pa) (Saaty, 1987).

When AHP is used it is necessary to represent the problem as a hierarchic or network structure so that with the help of pair wise comparisons the relations are established within the structure. It is important that the hierarchy is big enough to capture the situation and small and nimble enough to be sensitive to changes.

To solve the given problem there are three main principles to follow: decomposition, comparative judgements and synthesis of priorities (Saaty, 1987). Decomposition means that the problem is structured in different levels; every element in one of the levels is independent from the elements in the levels above. The main level is the focus of the problem, the second level are the criteria that focus on the second level and the last level are the sub criteria. The number of levels can be adapted on the kind of problem that is dealt with. The different kind of criteria can be interdependent in two ways, the first is the functional dependence and the second is the structural dependence. When the structural dependence is ignored than absolute measurement takes place, this is also sometimes called scoring.

After the decomposition, the comparative judgements is applied to construct pair wise comparisons of the relative importance of elements in some given level with respect to a shared criterion or property in the level above, giving rise to the kind of matrix encountered above and its corresponding principal eigenvector (Saaty, 1987).

Then at last the priorities are synthesized. The priorities are calculated from the second level down by multiplying the local priorities by the priority of their corresponding criterion in the level above. By doing this the global priority of that element is given, this is then used to calculate the weights of the criteria in the level below. An example is given to show how the calculation method is working in the appendix on page 117.

2.4 System Dynamics Method

The system dynamics (SD) method can be used to understand complex issues by modelling it in a mathematical way. It is originally developed to help corporate managers understand the industrial processes they were dealing with. Today it is used by the public and private sector to analyse policies and helping them with designing policies. Literally any dynamic system that is characterized by interdependence, mutual interaction, information feedback and circular causality can be modelled with the help of SD.

Causal loop diagram

A causal loop diagram can be used to visualize how interrelated variables have effect on each other. The variables are connected to each other with arrows that represent the kind of relationship between them. There are two kinds of relations, the first is a positive relation and the second is a negative relation. When a relation is positive it means that when one variable changes in one direction the other one will follow that direction. So when one variable increases, the other will also increase. A relation is called negative when the two variables will change in a different direction. So, when one variable increases the other one will decrease.

All the variables together will make a loop balancing or reinforcing. When a loop is reinforcing that an exponential increase or decrease is expected. For a balancing loop, as the name already will reveal, the reaching of a plateau is to be expected. It is easy to identify whether a loop is balancing or reinforcing. Just count the amount of negative relations and when this number is uneven then the loop is balancing, is the amount even then it is a reinforcing loop.

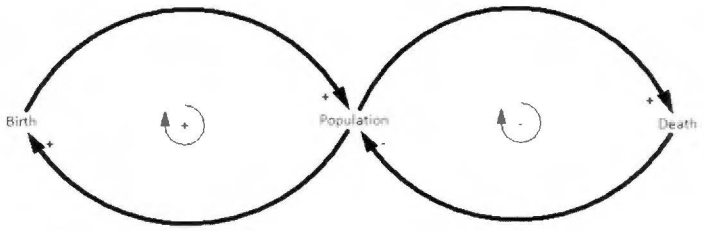


Figure 2-2 Example causal loop diagram

A simple example is the causal loop of a population that can be seen in Figure 2-2 above. When a population increases also the amount of births will increase so it is a positive connection. This is the same for the amount of deaths. The difference in death and birth is the fact that birth will increase the population, so a positive connection and death will decrease the population, so a negative connection. This makes the loop of population and birth a positive reinforcing loop and the loop of population and death a negative balancing loop.

Stocks and flows model

To solve complex issues with system dynamics a stocks and flows model need to be made. After the completion of a causal loop diagram a translation can be made into a stocks and flows model. When setting up such a model a distinction is made between quantities that are stocks and those that are flows. The difference between them is the unit of measurement. A stock is something that is measured at one specific time, and it represents a quantity at that point in time. A flow is a variable that is measured for a specific time, for example a year or a week. It can be also named as a rate or a speed.

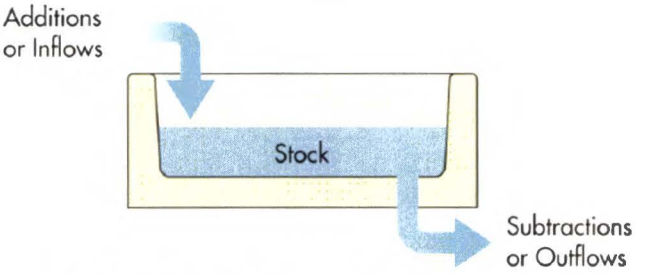


Figure 2-3 Example how a stocks and flows model functions (Reprint www.union.edu)

A stock is influenced by the flows in the model. A stock can decrease or increase over a certain time by its outflow and this can be calculated by subtracting the inflow minus outflow. With the help of formulas a dynamic model can be created to do some measurements over a certain time. The formulas give the behaviour of a stock in relation to its inflow and outflow. Also delays can be incorporated into the model so that execution time of the inflow and outflow will be influenced.

A good example of stocks and flows is a bathtub that will be filled by the help of inflow of water (Figure 2-3). If the inflow is 1 liter per minute than the inflow rate/ speed is 1 liter/ minute. The bath will become empty by its outflow that is for 0.5 liter/ minute. The stock of water in the bathtub will then be inflow – outflow. It will increase (1 – 0.5 =) 0.5 liter per minute.

The whole model can represent a real life problem and by varying the inflows and outflows and the stocks, based on scenarios, tests can be conducted to realize an optimal result.

2.5 Expertise / know-how

This graduation research is performed at draaijer+partners. The expertise of several employees of d+p is used to getter information for the research; this was done by meetings and with the help of interviews. A short introduction about the company can be seen below:

Draaijer + partners has since 1995 worked in the world of area, building and use. For us, this is primarily a world of people and then of stone. We therefore set the use of areas and buildings central. That is our focus, from start to finish. But with both feet on the ground, our advice is practical and executable.

draaijer+partners
geeft waarde

PART I
CONTEXTUAL ORIENTATION

3 Demand for Care

When people get ill or when they cannot take care for themselves anymore they will need care. But also the consequences and the prevention of illnesses and diseases create a demand for care. This care can be given in the form of intramural care that takes place in the house of the dependent or extramural care that is given in different kind of care institutions. A variation on these two types of care is the trans mural care that is provided by care institutions where the patients stay in their homes between the various treatments. Based on the kind of care that is needed a choice will be made for the best possible treatment option. In the following report a distinction will be made between different kinds of care types based on the nature of the demand. There are also different kinds of care functions that are financed by the Ziektekostenverzekeringswet (Zvw), Algemene Wet Bijzondere Ziektekosten (AWBZ) or Wet Maatschappelijke ondersteuning (Wmo), that help to describe the nature of the demand for care. These care functions will be described below.

- Home Care; gives support or takes over the household activities.
- Personal care: gives for example, help with showering, dressing, shaving, pills, eye drops or go to the bathroom.
- Guidance: gives help in organizing practical things in everyday life.
- Nursing: gives for example help with wound care and injections, or help on how to inject.
- Treatment: is aiming at restoring or improving the condition of the patient or helps to improve skills or behaviour.
- Stay: long-term stay in for example a nursing home, or short stay in a care institution.
- Prevention: the prevention of illnesses and diseases and the prevention of problems due to diseases and disorders.
  (NIVEL, 2011)

The demand for care in The Netherlands will increase in the upcoming years because of changes in the population. There are also different kinds of developments that will influence the demand for care, these developments and the population developments will be explained in the next paragraphs.

3.1 Size and age structure population.

The demand for care is directly linked to the population (Figure 3-1). This means that when there are changes in the size of the population the demand for care changes with these developments. So, to see how the demand for care will evolve in the future it is important to see how the population will evolve.

3.1.1 Population developments

The people who need care the most are in general the elderly people. Because of the aging of this group they will have the greatest demand for care. The sectors that are involved the most with these people will also need to answer this demand. The sectors are the following:

- The nursing homes. The majority of the people that stay in a nursing or care home are elderly persons: 94% are aged 65 or older. Between 2010 and 2020 an increase in

healthcare demand of about 33% is expected based on a calculation research that is been done by NIVEL (Dutch Institute for Research in Public Health). Based on the numbers of the CBS (Centraal Bureau voor de Statistiek) about the population of people of 65 years and older a growth also can be expected between 2020 and 2030. In this period this population grows with 23% which will have an effect on the demand for care. There are also indications that the nature of the care that is needed in that sector will be more complex in the future: a recent report of SCP [42] (Sociaal en Cultureel Planbureau) shows that residents more frequently than before have a chronic illness or a serious physical limitation.

- Home care. In this sector 82% of all the patients is 65 years or older. This is a bit less than the nursing homes but it is still the majority. Because of all the elderly in this sector it is expected that it will increase with 27% until 2020. After 2020 it will grow again because of the growth of the elderly population.
- Hospitals. This sector is less focused on the elderly then the two sectors above. Only 46% of all the patients in the hospitals are 65 years or older. But that 46% is still much more than the 15% of the population that 65 years or older. Because of that the demand for care will increase with 16% with a simultaneous increase of 4% in the size of the population.

There are more sectors in the healthcare but they will not be influenced so much by the aging of the population because the patients in these sectors are from all the different layers in the population. These sectors are the intramural mental healthcare and the intramural disabled care.

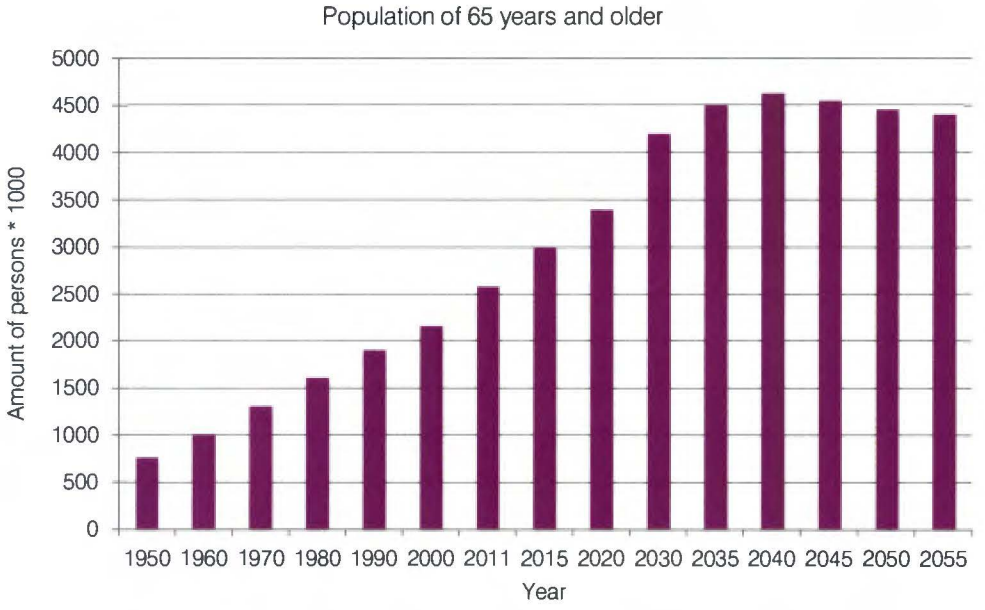


Figure 3-1 Population of people of 65 years and older (source: CBS)

3.2 Developments that affect the demand for care

Not only have the developments in the size and structure of the population effect on the demand for care. There are also some other developments that can be noticed that will influence the demand for care. In this paragraph those developments will be discussed.

3.2.1 Epidemiological developments

Epidemiological ~the branch of medicine that deals with the study of the causes, distribution, and control of disease in populations (Dictionary)

The reports set up by the RIVM (Rijksinstituut voor Volksgezondheid en Milieu) say that the demand for care in The Netherlands will be influenced by some epidemiological developments. Because of this the demand for care will change and so the care institutions need to respond on this. There are two developments that will have the highest influence on the demand for care; these are the increase of the amount of people that have a chronic disease and the increase of co morbidity. Because the percentage of people with a chronic disease increases it will be necessary to invest more in the prevention of these diseases. The RIVM and the SCP have reported that the ratio healthy / unhealthy life is improving. This means that the elderly will have a healthy longer life in the future.

Because of the increase in people with a chronic disease or co morbidity it will be necessary to give more attention to promote the self-management of patients. This will help to decrease the shortage of staff in the healthcare.

3.2.2 Policy/ financial developments

With the use of financial instruments the government tries to inhibit the growing demand for care. Also the natures of the demand for care need to be influenced. In the future the municipalities will have to decide them self whether someone will get a personal budget also the guidance function from the AWBZ will be transferred to the municipality. This means that the municipalities can give custom designed care for every care recipient. Besides this the execution of the AWBZ will be given to the insurers so that the choice of the patients will be promoted. Because of this the consistency of the cure (Zvw) and the care (AWBZ) will be improved.

3.2.3 Socio-cultural developments

The nature of the demand for care is also influenced by socio-cultural trends. Increasing empowerment, whether or not related to an increasingly higher level of education, is a relatively frequently mentioned socio-cultural factor that will change the nature of the care demand. Certain is the fact that patients get more and more opportunities - especially via the Internet - to access information about care options. Because of that the demands of the care recipients will increase on the care itself, the treatment options, technology, medicine, but also to the information and communication about care. According to reports from the SCP, future care recipients in the Netherlands realize that the supply of care in the Netherlands is not infinitely available and affordable. One is prepared that there will be times where one might need to adjust the demands on the healthcare.

Another important socio-cultural development is the growing participation of women on the labour market in relation to the expected increasing shortage of informal care. Another cause of shortages in care is that the traditional support networks such as family in the area, people from the same neighbourhood or the church in recent decades have become smaller. It is expected that the availability of informal care will not be sufficient for the growing demand for it. This will mean that care that most of the time is done by informal care (e.g. household chores) will need to be done by professional care helpers.

Also the demand for care is expected to be more diverse because of the increasing number of non-western immigrants. The coming decades the first generation that came between 1965 and 1980 the Netherlands will be elderly. Recent research has shown that older migrants have the same basic needs for example, safety and social contacts with other elderly people. The desired interpretation is however often specific and can collide with the care, differences in language, different eating habits or beliefs about hygiene.

Furthermore, a development is seen that patients want to live as long as possible at their own home. The desire of the elderly to live as long as possible independently has implications for adjusting care, welfare and housing to each other. The demand for care of elderly will not only grow in volume, it will have to deal with the new generation of elderly people that are more demanding both in terms of size, content and organizational alignment.

Next to all the developments that will increase the demand for care, there are also developments that will decrease the demand. One of these is the rise of education level of the population. In general people with a higher education level have a healthier lifestyle en because of that less need for care. In most researches these developments are not taken into account. Also the fact that people will stay healthier for a longer time will help to decrease the demand for care.

Finally it is important to mention the shift from intra mural care to extra mural care. The demand for care does not linear increase with the demographic trends as maybe would be expected. Though, it must be noted that the intensity and complexity of the care during the period in an institution probably will go up.

3.3 Care in 2030

Based on all the developments that are mentioned in the paragraphs before and estimation can be made about the amount of patients until 2030. Based on the numbers found by the SCP (Sociaal Cultureel Planbureau) the following figures are created. In Figure 3-2 the growth percentage of the users of nursing and care from 2005 -2030 is showed. Here the year 2005 is the index year. The total amount of users in nursing and care is growing with 30%. The largest growth can be found in the care homes, the amount of users is growing with 53%. The nursing homes grow with 38% and the home care is growing with 30% (SCP, 2012).

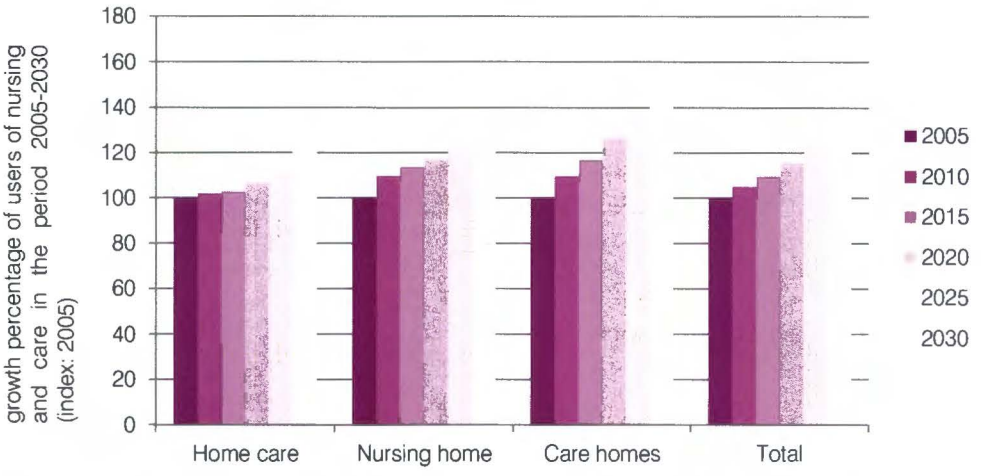


Figure 3-2 Estimates of the number of users of nursing and care in the period 2005-2030 (source: SCP (VeVeRa-iii)

A distinction can be made in the different kinds of care that is given and how these kinds of care will grow in the upcoming years as can be seen in Figure 3-2. These kinds of care are given in different care packages, these are: short-term home care, informal care, self-funded care, home help, personal care, nursing, support, short stay, care home care, nursing home care. The annual growth rate is given in Figure 3-3 below. The total annual growth rate of all the care packages together is 1,5. The care home care [1], nursing home care[2] and self-funded care[3] are the care packages that have the highest growth rate; respectively 2,4 [1], 2,2 [2] and 2,2 [3]. Next to the growth rate the estimated amount of patients in 2030 is given in table 1.1. For the care home care are this 86,000 patients in 2009 compared to 141,000 patients in 2030, this is a growth of 64%. For the nursing home care 52,000 patients in 2009 compared to 82,000 patients in 2030, this is a growth of 57%. And at last there is the self-funded care 124,000 patients in 2009 compared to 194,000 patients in 2030, this is a growth of 56%.

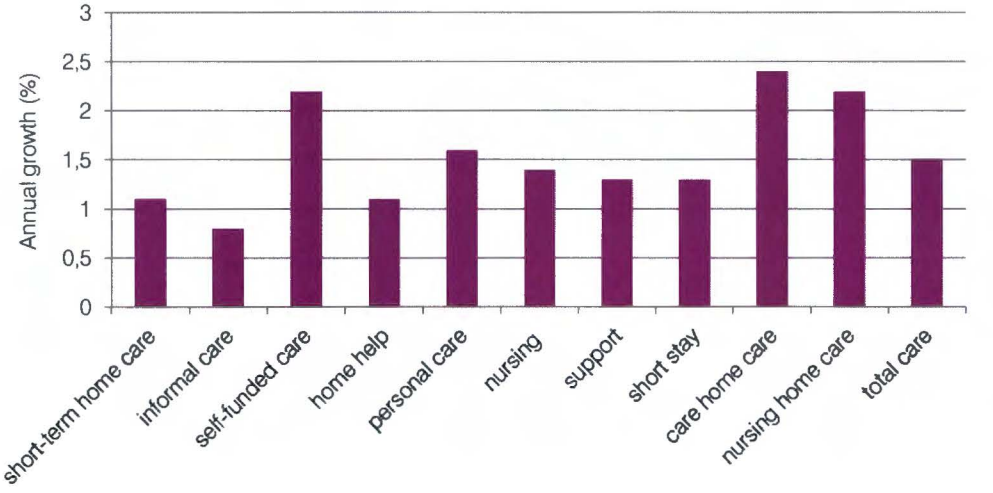


Figure 3-3 Annual growth of the different care packages from 2009- 2030 (source: SCP/cCBS (avo'07)

3.4 Conclusion

The sub question that is answered in this chapter is:

How will the demand for care develop the upcoming years?

The demand for care will increase in the upcoming years because of the changes in the population. The people that need care the most are in general elderly people. Because of aging of this group they will let the demand for care increase. The sectors that are involved the most with these people will also need to answer this demand.

Not only the developments in the size and structure of the population have effect on the demand for care, there are also some other developments that can be noticed that will influence the demand for care, like epidemiological developments. These developments can be seen in the increase of chronic diseases and socio cultural developments, like the fact that patients get more and more opportunities - especially via the Internet - to access information about care options.

The total amount of users in nursing and care will grow with 30%. The largest growth can be found in care homes, the amount of users is growing with 53%. The nursing homes will grow with 38% and home care will grow with 30%.

To still guarantee the availability of care in the future for people who are dependent upon it, a number of policy adaptations are developed for the nursing and care sector. These policies have a direct influence on the financial operation of care organizations. What these policies are and which kind of influence they have can be found in the next chapter.

Points for model

- Population
- Estimates of the number of users of nursing and care in the period 2005-2030
- Annual growth of the different care packages from 2009- 2030
- Numbers of users of the different care packages in 2009 and 2030

4 Income

Before January 2012 care organizations only needed to knock at the door of the government to get some money for realizing or maintaining their property. Of course there were an amount of requirements that needed to be met but this was not hard to do. Millions of euros were spend on huge inefficient buildings that specifically were designed for the care sector. This means that when the building was not necessary anymore the only option was to demolish it because it wasn't designed to be adapted to other functions. The government really wanted to stop this so they came in 2006 with the idea of compensation for performance instead of compensation for the amount of square meters. The result of this intervention is explained in the upcoming paragraphs.

4.1 Real estate compensation

From 2012, the compensation for interest and depreciation of the real estate of healthcare organizations is part of the integral rates. The compensation for the real estate costs in the form of the normative housing component (NHC) will be connected to the intensity of the given care packages (Zorg Zwaartepakketten, ZZP). This leads to three major changes. The compensation is dependent on the care that is provided, the compensation is uniform and normative and the moment of investing and reimburse is disconnected. This is based on the idea that the care organizations themselves become responsible for their property and that they will better respond to the individual care demand. Healthcare providers should therefore focus on their clients: without clients no income. The new funding system will come fully into force in 2012, but for existing buildings there is a transition period of six years. In Table 4-1 the transition period is showed. In 2018 the whole funding for existing buildings for real estate in the care sector is coming from the NHC.

Year	Budget NHC	Remaining %
2011	0%	100%
2012	10%	90%
2013	20%	80%
2014	30%	70%
2015	50%	50%
2016	70%	30%
2017	85%	15%
2018	100%	0%

Table 4-1 Budget NHC for new care providers. Source: (Nederlandse Zorgautoriteit, 2011)

4.1.1 Normative Housing Component/ Normatieve Huisvesting Component

The NHC is introduced for the standardization of the housing costs (capital costs) of healthcare organizations. By giving the organizations the benefits and burdens of their own property they will have the intrinsic and economic stimuli to better respond to the individual care demand of a client.

An NHC is part of the total product price, which institutions should give the possibility to invest in their property so that they can keep their buildings in a good condition and also maintain them during a lifetime that is considered appropriate.

The NHC will cover the following costs:

- Capital costs (interest and repayments on land and building)
- Conservation Service (large and small maintenance)
- Vacancy (3%)

The management costs, insurance, taxes and property tax (OZB) are not part of the NHC but are included in the ZZPs compensation. The height of the NHC is purely coupled to the amount of care needed and is therefore not connected to the actual realized housing. Age and condition of the real estate play no role in the height of the compensation.

4.1.2 NHC calculation method

For the calculation of the NHC as a normative compensation for capital costs, a methodology is developed which is based on the 'net present value method'. This method aims at the recoup of historical investments based on principles including lifetime, interest, indexation and occupation as can be seen in Table 4-2.

	Basic/ value	Part of NHC maintenance?
Definition investment sum		
ZZP-support	ZZP-support 2006	No, outside the scope
Building Standards	Performance-demands for new building 2007	No. Unless political decision about (safety) regulations / (general) requirements of the Inspectorate which is mandatory for a provider to high costs and make room for this within the macro framework.
Construction Costs	Construction note 2008 (CBZ), (Bouwkostennota)	No. Development through indexation.
Land, interim housing and site facilities (average land price +10%)	Annual Review construction cost healthcare 2010 - TNO	No. Focus on market-sensitive components
Construction period	18 months	No. Focus on market-sensitive components
NHC-Calculation		
Life-cycle period	30 years	No
Interest	5,00%	Yes. Market-sensitive
Indexation (fixed)	2,50%	Yes. Market-sensitive
Maintenance	0,80%	No. Focus on market-sensitive components
Vacancy	3,0%	No. Focus on market-sensitive components

Table 4-2 Standards for NHC calculation method. Source: (Nederlandse Zorgautoriteit, 2011)

In the NHC method an investment is determined for every ZZP. The operational consequences of this standardized investment (including interest and depreciation / amortization) for 30 years is then recalculated (made 'net present') to a NHC per year and then to a compensation per day. These compensations per day can be seen in Table 4-3 on the next page.

NHC	Including day care			
	Without treatment		With treatment	
	Performance code	Total value per day	Performance code	Total value per day
3VV	N031	€ 26,17	N033	€ 26,56
4VV	N041	€ 26,54	N043	€ 26,93
5VV	N051	€ 26,13	N053	€ 26,93
6VV	N061	€ 26,06	N063	€ 27,52
7VV	N071	€ 26,90	N073	€ 28,37
8VV	N081	€ 27,71	N083	€ 29,19
9aVV	N094	€ 25,35	N096	€ 34,50
9bVV	N095	€ 25,35	N097	€ 34,50
10VV	N101	€ 27,71	N103	€ 29,19

Table 4-3 NHC Compensation per ZZP per day Source: (Nederlandse Zorgautoriteit, 2011)

The NHC compensation is being indexed so that a connection is made to the historical investments. Also because of the indexation, future investments are made possible because these investments will be more expensive in the future as they are today.

It is important to mention that the NHC calculation is a theoretic model. The practical elaboration is diverse for every single institution, loan types, fixed-interest periods, occupancy etc. It is impossible that the NHC method and the maintenance, will be connected to the financial situation of every individual care provider

4.2 Care packages/ zorg zwaartepakketten

With the use of the "Exceptional Medical Expenses Act (Algemene Wet Bijzondere Ziektekosten, AWBZ)" every citizen that works or lives in the Netherlands is compulsory insured for exceptional medical expenses. These costs can be so high so that the private health insurance does not compensate these. To set up a clear procedure for reimbursing medical costs there are some concrete marketable products created in the form of ZZPs. A ZZP is an accurate description about the kind of care someone receives for the situation where that person is located in; this can be seen in Table 4-4. Every ZZP consists of the following parts: client profile, functions and time per client and residence characteristics. The Care Assessment Centre (Centrum Indicatiestelling Zorg, CIZ) decides whether a person gets a ZZP and which ZZP that is. In total there are 52 different kinds of ZZPs where there are 10 specific set up for the nursing and care sector, these are included in the appendix.

ZZP	Content ZZP
ZZP 1	Sheltered housing with some guidance
ZZP 2	Sheltered housing with support and care
ZZP 3	Sheltered housing with support and intensive care
ZZP 4a	Sheltered housing with intensive support and extended care
ZZP 5	Sheltered housing with intensive dementia care
ZZP 6	Sheltered housing with intensive care and nursing
ZZP 7	Sheltered housing with intensive care - emphasis on support
ZZP 8	Sheltered housing with intensive care, emphasis on care / nursing
ZZP 9a	Geriatric rehabilitation care
ZZP 9b	Restorative treatment with nursing and care
ZZP 10	Protected stay with intensive palliative-terminal care

Table 4-4 Content ZZP 1 - 10

The ZZPs are linked to the NHC so that the compensation for the real estate is based on the care that is provided. The compensation for the real estate then forms a part of the compensation for the care. The compensation that is included in the ZZP can be seen in Table 4-5. Here the compensation per day for residential care, day care, therapists, and stay is showed.

ZZP	Including day care			
	Without treatment		With treatment	
	Performance code	Total value per day	Performance code	Total value per day
1VV	Z015	€ 64,08		
2VV	Z025	€ 81,70		
3VV	Z031	€ 99,02	Z033	€ 123,86
4VV	Z041	€ 112,66	Z043	€ 137,51
5VV	Z051	€ 154,61	Z053	€ 180,74
6VV	Z061	€ 154,89	Z063	€ 181,03
7VV	Z071	€ 181,97	Z073	€ 215,66
8VV	Z081	€ 212,35	Z083	€ 246,03
9aVV	Z094	€ 150,71	Z096	€ 214,65
9bVV	Z095	€ 150,71	Z097	€ 214,65
10VV	Z101	€ 232,35	Z103	€ 266,05

Table 4-5 Cost price ZZP per day 2012 Source: (Nederlandse Zorgautoriteit, 2011)

4.3 Conclusion

The sub question that is answered in this chapter and the following chapter is:

What are the main elements in the financial balance of a healthcare organization in relation to its real estate?

Before January 2012 care organizations were sure that they could finance their properties. Because of budget cuts of the government the regulation of compensation for performance instead of compensation for the amount of square meters was introduced. The compensation for the real estate costs, the normative housing component (NHC), will be connected to the intensity of the given care packages (Zorg Zwaartepakketten, ZZP). This means that a risk is created for care organizations because they are not sure any more about their income. However the government expect that by giving the organizations the benefits and burdens of their own property they will have the intrinsic and economic stimuli to better respond to the individual care demand of a specific client.

When the income is becoming a flexible variable it is important to closely monitor the expenses that are made. In real estate these expenses are in the form of operating costs. What these costs are is explained in the upcoming chapter so that this gives a complete impression of the finance together with the compensations that are elaborated in this chapter.

Points for model

- Determination kind of ZZP
- ZZP compensation
- NHC compensation
  - Life Cycle 30 years
  - Interest 5%
  - Indexation 2,50%
  - Maintenance 0,80%
  - Vacancy 3,0 %

5 Expenses

When a building is developed the capital costs have the biggest share in the total budget. When the budget is examined for a longer term it is noticed that the capital costs are only 31% of the total budget as can be seen in Figure 5-1. This means that all the other have a greater influence on the operating of a building. With the introduction of the NHC, care

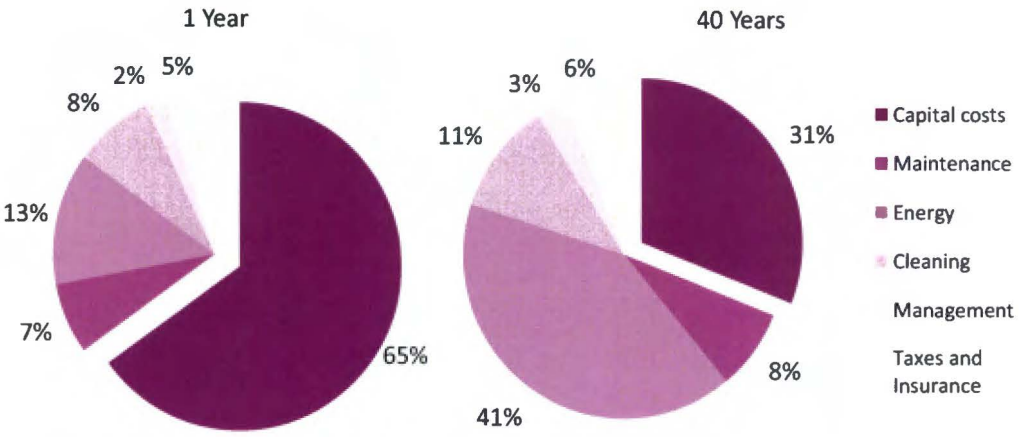


Figure 5-1 Share of capital costs in the total budget

institutions are responsible for their own budget and so because the operating costs take a important share in their budget it is important for them to make a clear overview in all the costs that are made during the usage phase. What are exactly the operating costs? And how can this be calculated during the life time of the building. This will be further elaborated in the upcoming paragraphs.

5.1 What are the operating costs?

To explain what operating costs are "Investopedia" uses the following definition:

Expenses associated with administering a business on a day to day basis. Operating costs include both fixed costs and variable costs. Fixed costs, such as overhead, remain the same regardless of the number of products produced; variable costs, such as materials, can vary according to how much product is produced.

To get a better understanding what the cost division of the operating costs is exactly the NEN standard 2632 is examined. In this standard it is precisely given which kind of costs needs to be taken into account. First there are five different types of costs. These are the fixed costs, energy costs, maintenance costs, administrative management costs and the specific operating costs. Each cost type is made specific in the Table 5-2 below.

Fixed costs:	• Financing costs • Depreciation • Leasehold • Rent and eventual loss of rent • Insurance
Energy costs:	• Electricity • Gas • Water • Other energy costs
Maintenance costs:	• Costs for technical maintenance • Maintenance costs for cleaning
Administrative management costs:	• Rental costs • Intermediation costs • Accounting costs • Personnel Administration costs
Specific operating costs	• Monitoring • Security

Table 5-2 Division in operating costs based on NEN 2632

5.2 How to calculate the operating cost?

The focus of life cycle costs of buildings will play an increasingly prominent role in healthcare projects. That's why it is very important to make a more precise cost approach so that care institutions know if they can manage the organization during the operational phase. The operating costs are calculated for the time a building will be used. This is often for about 40 years. In these years there are a lot of uncertainties that can have a major impact on the operating costs. To minimize the influence of these uncertainties it is useful to adopt some scenarios to see what is the most likely to be expected. Based on these scenarios calculations can be done with the use of several methods. The most used method is the Life Cycle Costs (LCC) method another less used option is the real options method. Both methods will be explained and a trade-off will be made to decide which method fits projects in healthcare the best.

5.2.1 Life Cycle Costs method

In the life cycle method a calculation is made for the calculation of the operating costs of the life cycle of a building. But, what is the life cycle of a building? A building has different life cycles. At first there is the technical life cycle, this life cycle is set by the technical state of the building. How long can the building be used until some renovations or adoptions need to take place. This is purely for the materials used in the building. Then there is the functional life cycle, this life cycle is set by the time the building can be used without any adoptions. Adoptions will be done when the users think that the building can't be used anymore. The dynamic in the society, organizations and in their environment the functional life cycle is becoming much shorter than the technical life cycle. Another life cycle is the esthetical life cycle, this is of course very subjective because everybody has another opinion about what is

beautiful and what not. The economic life cycle is set by the fact of the building is still profitable or not, when it will cost too much money to keep the building in use this life cycle will end. At last there is also a juridical aging of a building; new legislation may suddenly incur additional charges.

The life cycle itself is divided in three phases. At first there is the production phase. In this phase a location is obtained, a construction plan is created and also the realization and the completion are part of this phase. After this there is the use phase where the building is being used for the originally designed function with of course the maintenance and management of the building included. At last is the transmission phase where the building is transmitted because it is aged, into demolition or renovated so that it can be used with another function. The method of Life Cycle Costing is designed to evaluate design alternatives at the expense of the intended time of service. A computational model tries to put costs' defining elements together. This model can estimate the costs of a system (over an extended period of time). The estimation of the costs over the lifetime of a target object is a very complex process. The calculation model only becomes useable when an organization understands the true (future) cost categories of the object lifecycle. This will include the answering of the following questions:

- What are the maintenance costs during the use phase?
- What are the historical inflation rates of the maintenance costs?
- What is the lifespan of the different components and materials?
- What is the loss of income (expenses) of the unavailability of an object?
- Which LCC model best fits your organization?
- On what grounds should an LCC model be evaluated?

In every phase of the construction the LCC will become more detailed. At the beginning the LCC is calculated based on standard norms like the building costs per square meter and operating costs per square meter. When the design is becoming more detailed also the LCC is becoming more exact. When the final design is finished the operating costs can be calculated precisely and afterwards a maintenance plan is made definitive.

5.2.2 Real Options method

The operating costs are often characterized by uncertainties in all the aspects that influence the operating costs. Because of these uncertainties it is difficult to make a proper forecast about all the events that will take place in the future and how these will have an effect on the operating costs. With the use of the Real Options (RO) method several options are considered. This means that after each possible development another option can be chosen so that the best possible operating strategy is considered. In conventional methods it is always assumed that once the project starts all investment steps will automatically be carried out. With the Real Option method the flexibility to stop, postpone, redirect, or put on hold further investment creates the option value (MacMillan et all, 2006). The flexibility also creates the fact that the decisions can be made as a response on the market conditions and this will decline the risks that are incorporated in the process.

Decisions in the care housing development are usually made as series of sequential decisions. With this sequential strategy risk are faces in sequence with relatively smaller

steps at every phase of the project, but at the expense of relatively higher construction costs. If in the first step the market acceptance is good then the next construction stages will increase in value. If the project is not well accepted in the initial stage, there is an option to postpone the next phases. This fragmentation of the project is typical for the RO method. In this method the next step is only taken if the value of continuing to the next stage of project development exceeds the cost of doing so. Below an example is given to show the difference between conventional ways of calculating and the RO method.

Example

A project developer wants to adopt a new cleaning technology for care organizations. This new technology will save a lot of cleaning costs in the future because less people are needed for cleaning only it is never used before so that first need to investigate if it will work. This investigation costs €2500, - when it is useable it will be scaled up for €20.000 so that it can be used in the whole organization. It has high risk but also high potential. There is only 5% chance that the new technology will work, but if it does work it will save operating costs of about €400.000.

Conventional Net Present Value calculation

- NPV = expected total costs + expected revenues
- = -(22.500) + 0.05 x 40.000
- = -22.500 + 20.000
- = -2.500

With this result the new technology will not be used because the result is negative.

Real Options method

When adapting the RO method the argument will be as followed: the €2.500 will only be spend to see if the new technology is useable. The €20.000 to scale up will only be spend if the technology is working and if it not works the technology will be rejected.

This means that there is 5% chance that €20.000 is needed for the scaling and 5% chance that the €400.000 is saved. The calculation will be as followed:

- NPV = -2.500 + ((-20.000 + 400.000)*0,05)
- = -2.500 + 19.000
- = 16.500

With this option the new technology will be used. But only if the technique works and if the project could be stopped if the technique not works.

Table 5-3 Example calculation Net Present value and Real Options method

5.3 Conclusion

The sub question that is answered in this chapter and the previous chapter is

> *What are the main elements in the financial balance of a healthcare organization in relation to its real estate?*

When a building is developed the capital costs have the biggest share in the total budget. But when the budget is examined for a longer term it is noticed that the capital costs are only 31% of the total expenses. The other expenses are all related to the operating phase of a building. With the introduction of the NHC, care institutions are responsible for their own budget and because the operating costs take an important share in their budget it is important for them to make a clear overview in all the costs that are made during the usage phase. These operating costs consists of the following costs; fixed costs, energy costs, maintenance costs, administrative management costs and the specific operating costs. The focus of life cycle costs of buildings will play an increasingly prominent role in healthcare projects. And because of that it is very important to make a more precise cost approach so that care institutions know if they can manage the organization during the operational phase.

In the life cycle method a calculation is made to find the operating costs for the life cycle of a building. The method of Life Cycle Costing is designed to evaluate design alternatives at the expense of the intended time of service. A computational model tries to put costs and the defining elements together. On other option to calculate the operating costs is the real options method. This is very useful because it can deal with the uncertainties that will influence the operating costs. For every calculation method it will be needed to deal with scenarios so the possible future states can be examined and taken into account.

So, to get a clear overview of all the expenses that can be expected during the life cycle of a healthcare property it is important to conduct a proper analysis. This can be done with the help of several methods that each gives an overview of the operating costs. Based on this analysis, decisions can be made early in the process to minimize the operating costs. The operating costs can also be minimized by setting up a smart design for a healthcare complex. By adjusting the amount of square meters on the height of the NHC compensation the healthcare organization can save money that can be used for their core business, providing care. The guidelines for the design and how to set up strategic real estate will be discussed in the next chapter.

Points for model

- Fixed costs
- Energy costs
- Maintenance costs
- Administrative management costs
- Specific operating costs
- Life-cycle costing

6 Real estate

The new NHC compensation forces healthcare organizations to handle their real estate with care. When a huge inefficient building will be developed the NHC compensation will then not be enough to cover the housing expenses. This means that it is important to adjust the design of a healthcare complex to the height of the NHC compensation. TNO has studied the square footage per function for a particular type of care. For every client in the complex a certain amount of square meters is needed for the care that is provided. The most important information for this research will be given in the next paragraph.

6.1 Floor space principles

Based on the performance requirements of several target groups a translation is made to the amount of square meters per bed. There is also a distinction made between several housing types and the different ZZPs as mentioned in the previous chapters. The accommodation concepts for every care type are; individual stay, small group accommodation and section stay and group accommodation in large-scale setting. These accommodation concepts can be designed in different ways like a nursing home, small group homes, a residential care centre or individual housing like apartments. Not every design can be used for every kind of care that will be provided so this is why there are three categories; light, severe and protected. Of course there are also combinations of different accommodation concepts and designs possible but the research is based on the most common variants. As an example the elderly sector is taken to explain the floor space per bed per building type as can be seen in Figure 6-1 (TNO-rapport | Jaarbeeld).

Category (performance requirements)	AWBZ-function	accommodation concept (performance requirements)	Building type	GFA (m^2 p.p.)
Light	Stay	Individual (including guidance and treatment)	Nursing home, Residential care centre Apartment	From 71,7 to 82,3
	Supportive services		Office (central desk)	3,2
Heavy	Stay	Small group accommodation	(clusters of) Small group homes	From 54,0 to 69,4
		Section stay and group accommodation in large-scale setting (including guidance and treatment) not-mobile	Nursing home, clustered low-rise buildings, group homes	From 67,1 to 87,5
	Supporting Services	Office (central desk)	4,6	

Figure 6-1 Overview gross m2 per building type derived from the expired performance requirements elderly care (Reprinted from: TNO- rapport| Jaarbeeld Bouwkosten Zorgsector 2010, page 14)

Next to the residential area that is necessary there is also space necessary for supporting services that is in this case office space. When the total amount of square meters will be calculated then the amount of square meters is multiplied by the amount of beds. Based on this amount of square meters the operating costs of the previous chapter can be calculated.

6.2 Strategic real estate

Next to the amount of square meters it is also important to think about the flexibility of the real estate. The demand for real estate is continue changing because of demographical, economic, political, ecological, socio-cultural and/ or technical influences. The real estate itself does not take these changes into account because the focus lays on the short term. Because of this the real estate becomes unusable before the real estate has reaches the end of its life time. To handle this problem 2 PhD-students, Niel Slob and Saman Mohammadi, at draaijer+partners started with a research called "®evolutionair goed" to find the best way to develop strategic real estate that can be adapted to the changing demand.

The basic of revolutionary thinking makes a distinction between three essential scale levels in real estate: texture (urban / rural fabric), frame (the hull) and infill (installations) as can be seen in Figure 6-2. Every scale level is composed of several layers. The life cycle is determined by the esthetical, functional, spatial and technical life time of these layers together.

- The texture has the longest life cycle and because of this has a slow pattern of change.
- For the frame the life cycle is often shorter and because of that the pattern of change is quicker.
- The infill is directly connected to the ambitions, habits and needs of the user. This is the key of demand-driven development.

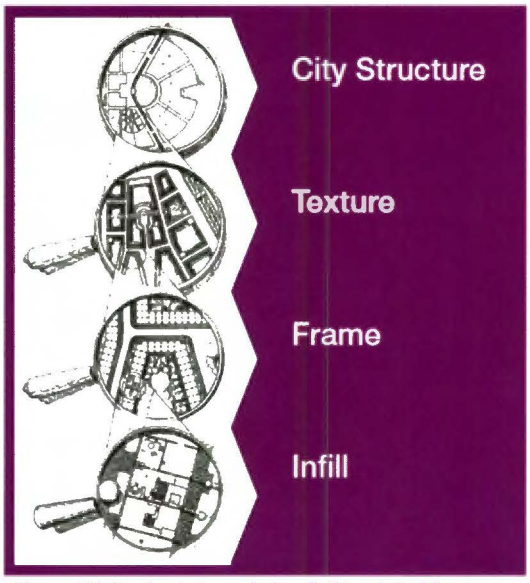


Figure 6-2 Real estate scale levels (Reprinted from: White paper ®evolutionair goed)

The user demand often changes within a few years. This means that the infill often has a very short life cycle. The frame needs to respond on this every time the demand changes. In buildings nowadays that is the main flaw. The different layers are strictly connected to each other so that it can't be adopted for another function. If the infill disappears the frame becomes unusable. Because of this a big gap arises between the different kinds of life cycles of investments.

As an answer to this it is becoming necessary that the real estate can "evolve" to react on intern and extern changes. The size of evolving power is decided by three aspects: the flexibility, the extensibility and the demount-ability of the real estate scale level. This kind of dynamic real estate is called strategic real estate.

6.3 The conditions to create strategic real estate

In "®evolutionair goed" a distinction is made between "utility value" and "system value".

Utility value

The utility value is the value for the users on different real estate scale levels. Two important terms are functionality and experience. Functionality is the extent to which user groups are supported in their needs and functioning. Experience is the estethic factor and other perceptions. The utility value can be different wthin every real estate scale level en for different owners and users. With the right function mix a building can be created that fits for every group so that a symbiosis arises. The utility value is very subjective and individual and that will make the evolving power of the three scale levels even more important.

System Value

The system value is determined by the material and energy flows during the realisation and operational phase of real estate within the context of the ecological system. Materials and energy are seizing the available stock. That why it is important that the ambition needs to the total re use of materials while maintain the quality. It is also important that the environment of the real estate not only uses energy but also that it creates energy.

Another important aspect of the system value is the ecological functioning. Here the value of green in the built environment is explored. It is not only the esthetical effect of green in the environment but it can also add some value to the different scale levels. It can be used for example for water purification or CO2 storage and this can help with solving the urban climate problems.

6.4 How to develop strategic real estate?

During all the phases of the development process form is given to the utility value and system value. This process consists of the initiation phase, program phase, design phase, construction phase and operational phase and every phase is built up from the three levels: texture, frame and infill

- The initiation phase starts with formulating the wishes and demands in relation with the utility value and system value.
- During the program phase the wishes and demands will be made more specific, measureable, acceptable and realistic. Several analyses on different scale levels are performed to set up the performance requirements.
- During the design and construction phase a design is developed based on the performance requirements. To keep an eye on the fact if all the requirements are really in the final design, several ict-tools are used like BIM (Building Information Modeling) and Briefbuilder®

By formulating and steering on performance matters such as tender forms, partnerships, risk distribution and the role of actors will change. Performance will take the lead in the process so that during the life-cycle every time a different solution can be connected to this. Hereby it is so, that each spatial, functional or aesthetic change eventually has a technical and financial impact. This impact is also decisive for the feasibility of a certain procedure, while preserving or adding extra value to the lifecycle of the project.

The same process can be completed for the redevelopment of existing property. Only there need to be considered the fact that the building area is already connected to a frame. Within these conditions the use will need to be redefined.

6.5 Conclusion

The sub question that is answered in this chapter is:

> *Which elements are compulsory in developing healthcare real estate and how can it be made flexible?*

The new NHC compensation forces healthcare organizations to handle their real estate with care. For every client in the complex a certain amount of square meters is needed to provide the care. Based on the performance requirements of several target groups a translation is made to the amount of square meters per bed. For every accommodation concept the amount of square meters is different. Also the building types are different per concept. When this information is known an estimation can be made about the amount of square meters that is necessary. Together with the information found in chapter 5 the operating costs can be calculated, which later on can be used in chapter 8 about the model.

Next to the amount of square meters it is also important to think about the flexibility of the real estate. The demand for real estate is continue changing because of demographical, economic, political, ecological, socio-cultural and/ or technical influences. With the "®evolutionair goed" method created by Slob en Mohammadi real estate can be designed in such a way so that it can adapt to the changes in real estate demand.

Points for model
• Floor space principles • Texture • Frame • Infill • Utility Value • System Value

7 Organization

The regulatory changes offer some opportunities when it comes to real estate for healthcare, the degrees of freedom to develop new facilities will increase and the procedural time for the Department of Health is drastically reduced. This means that the real estate can be used as a corporate asset and because of this; surpluses may arise between revenues and costs of real estate which then can be used for operating the property. It also appears that it legally cannot longer stop the "weglekbeding" (selling healthcare property to third parties) and this can lead to a new philosophy regarding the ownership of healthcare real estate in favour of the core business of a healthcare organization.

7.1 Corporations

Corporations are the main owners of the real estate that is not owned by healthcare organizations themselves. Healthcare organizations hire about 50,000 nursing places of housing corporations. With that, corporations possess almost half of all units in nursing homes. With the introduction of the NHC corporations are not sure any more for their rental income. To hedge this uncertainty, the negotiations between corporations and healthcare organizations will be focused more on sharing risks and capturing them in leases. Corporations will judge the financial position of their partner more critically and try to set up long-term leases. There are three different kinds of cooperation possibilities based on the theory of Sanders et al. (2003)

Collaboration on a project basis

The most common form of cooperation is that both parties, on an occasional basis, agree on a specific project. Usually, this involves the construction of a sheltered housing complex, although it may also concern setting up an office or a service package. Working on a project basis is often governed by a partnership, preceded by a letter of intent.

Working in a separate legal entity

If the cooperation is more structural of nature, a joint legal entity on behalf of one or more joint projects can be the option. The creation of a separate legal entity is usually addressed when operating risks are incurred that are not within the core business of the participating organizations (Sanders et al, 2003, p.11). For example, in the restructuring of old neighbourhoods a "joint venture" can be established to ensure that the activities will be structurally aligned and to the outside world will be acted as one entity.

Collaborating in a holding company or through a merger

The most far-reaching form of cooperation is the creation of a holding company or entering into a merger. A holding company - or holding - manages the shares of one or more subsidiaries. Substantively it concerns a partnership between several legal persons, where the overall entity has control over the other entities. The Ministries of Environment and Health do not allow holdings and mergers between corporations and institutions yet, because it is hinders monitoring the institutions.

Though, if parties would like to enter into a holding or a merger construction, they need to consider a personal union. A personal union means that the board of one organization is

identical to the board of the other organization. The union may also extend over the supervisory board or the commissioners board. Entering into a personal union is considered as a connection and is subject to the approval of the Ministry of Environment. The Ministry has so far twice given permission to enter into a personal union

A new form in which corporations and institutions can join forces is the 'Maasland' model (Singelenberg, 2006). This device has been used by the corporation BrabantWonen and the care organization ZVOM. The care organization had a separate foundation, which all her property was located in. This foundation had the status of an authorized institution within the meaning of the Housing Act. The properties of the foundation were valued at € 39.1 million. BrabantWonen has doubled this capability in return for 50% control obtained in the foundation.

7.2 Transition

A lot of the healthcare real estate, such as care institutions built in the 80's, is outdated and ready for demolition, but still not depreciated. Because they are nothing worth any more, they are still booked for too much money. That means for corporations a loss of at least 340 million euro's. The government do not want to compensate the corporations for this. This will make new investments in real estate impossible. That is a frightening prospect now there is a growing need for care housing because of the aging of the population.

A solution for this problem can be the help of private investors, especially because of the fact that financing through banks is becoming increasingly difficult. Private investments in healthcare can contribute to structural funding problems in this sector. Because the government indicates that profit distribution might be possible in the future more and more private investors become interested in investing in healthcare. To get a clear view about how to act when making a decision regarding real estate it is useful to set up a real estate strategy. In this strategy healthcare organizations can decide how their real estate can contribute to their business strategy. The real estate strategies will be further elaborated in the next paragraph.

7.3 Real Estate strategy

In an earlier research of Ensing (2006) she found that there are large variations possible in real estate strategies. There are for example numerous strategies regarding like lease, ownership or rental. A real estate strategy needs also to address other essential issues such as business policy, location, capacity development (market share), building concepts, implementation planning, efficiency and ambitions as for example a distinctive character, sustainability and technology. To deal with this adequately it is necessary to develop a real estate strategy for healthcare organizations. In Table 7-1, the development of traditional housing management in compare to strategic property management is showed.

Traditional housing management to strategic property management	
Traditional housing management	**Strategic property management**
• Depreciation thinking • Specific real estate • Capital defined in real estate • Focus on building and furnishing • Maximum surface • Normative argumentation and ceiling costs • Building as enclosure of the primary process • Property as obviousness	• Performance and value thinking • As much as possible flexible and marketable real estate • More Capital used on the primary process • Attention to location, architecture, environment and portfolio construction Less, but better square meters • Optimal investment through business economics arguments • Building and location as a marketing tool • Conscious choice between rent and sale

Table 7-1 Traditional housing management vs strategic property management (Source WTZi-werkgroep, 2006)

7.3.1 Strategic management

Strategic management is the set of processes aimed on defining business objectives for continuous value creation and value distribution and on how the organization is composed, structured and coordinated for the pursuit of these goals. Strategic management has different methods and tools for analysis and synthesis, such as the SWOT analysis and the PEST analysis (DESTEP). Strategic management can be used by healthcare organizations to set up a real estate strategy. To develop a strategy there are three steps that need to be followed: a strategic analysis need to be performed, a strategic choice need to be made and after this the strategy need to be implemented. A further elaboration of these steps is given below.

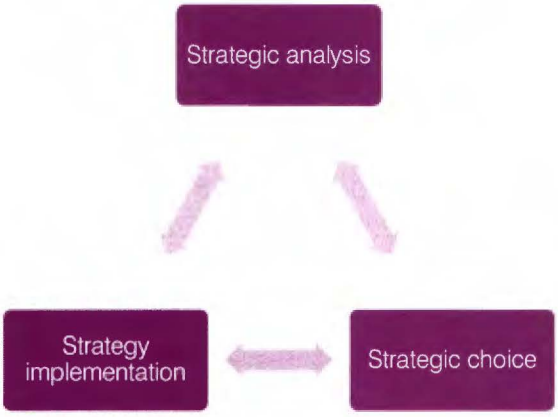


Figure 7-1 the three key elements of strategic management (Johnson & Scholes, 1999)

Strategic analysis

A strategic analysis is performed to determine the factors that affect the present and future 'health' of the company. In addition the analysis should provide insight into the main opportunities arising from the environment (environmental analysis) and the strategic capabilities of the company (internal analysis). The main themes that are part of the strategic environment analysis (Johnson & Scholes, 2009):

- Understanding the nature of the environment in which the company is located;
- Identifying the major environmental influences (macro level);
- Determining the competitive environment (Porter's five force model);
- Determining the competitive position of the company.

Johnson & Scholes add to this that a good strategic analysis is also looking at the expectations of stakeholders and a number of aspects that general affect the future of a company (e.g. culture, corporate governance and public opinion).

Strategic choice

A strategic analysis is performed as a preparation for the strategic choice. It is especially the strategic choice that is decisive for the development and future of the company. It is about making choices where many interests are involved. In the process of making a strategic choice number of elements play a role, namely (Johnson & Scholes, 2009):

- Ownership structure, strategic intent, scope and diversity;
- Desired competitive advantage (' Strategy clock')
- Options for strategic developments (PIMS, product development, market penetration, etc.);
- Alternatives for strategy development (mergers, alliances, networks, etc.);
- Determining the suitability of the strategic choices (lifecycle / portfolio matrix, value);
- Analyzing the acceptance level of the strategic choices (ROI scenario's);
- Analyzing the enforceability of the strategic choices (availability means sources);
- Selection of possible strategies

Foregoing elements are again divided into three elements, namely: (1), the broad basis for the strategy, (2) the directions of strategy development and (3) the methodology of strategy development. When the strategic choices are made, then the strategy should be implemented in the operating of the company.

Strategy implementation

Strategy implementation involves the strategy that has been established at the strategic analysis and strategic choice. Choices must now be transformed into change and the blueprint of the company will change. The following elements can be part of the strategy implementation:

- Determining the organizational structure and organizational design (configuration);
- Configuring the agent resources (resources, competencies, technology, etc.);
- Planning and process (input-throughput-output);
- Analyzing, interpreting and processing information;
- Managing processes of change;

7.4 Real estate strategy development model

There are already a couple models created to develop a real estate strategy. Van Schijndel (2010) has created a model to set up a real estate strategy and this model will be further explained below. Van Schijndel developed a model in which consistency and sequence is applied. This makes the whole process transparent and also the areas in which strategic decision-making are necessary. The shape of the model is a checklist and a choice planner and includes three consecutive phases that are coming from the DOR instrument. DOR stands for Designing goals - Organizing – Realizing. The goals that are need to be set up follow from the vision and the mission of the company. Organizing means creating conditions involved in the organization to deliver the right performance.

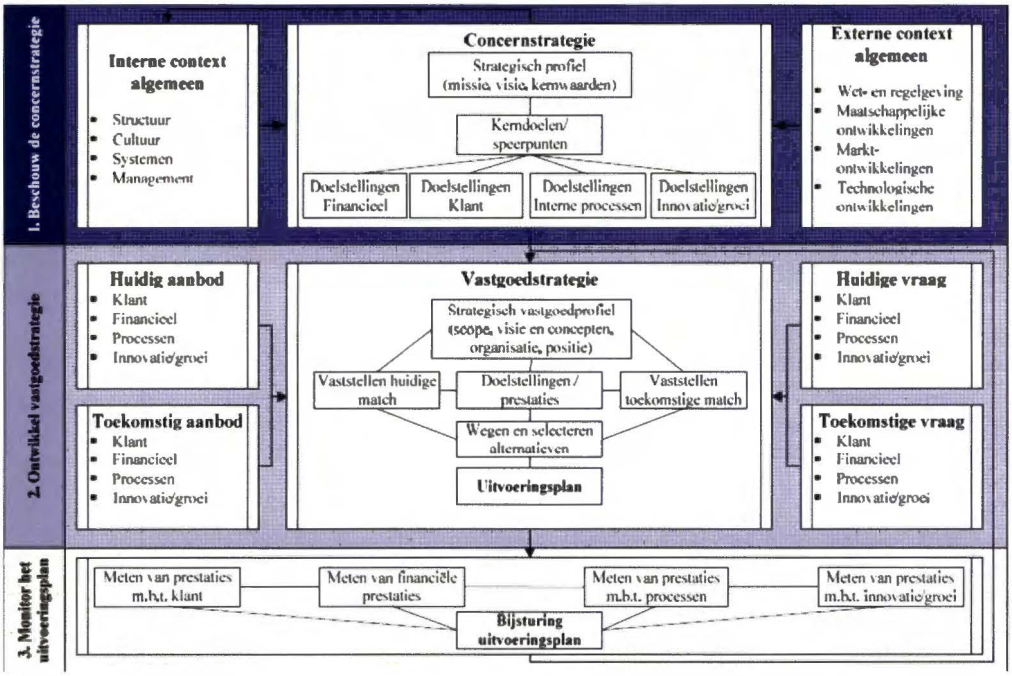


Figure 7-2 Model-based view of strategic real estate planning (van Schijndel, 2010)

The first phase is determining the strategy of the company and the goals that are a result of the strategy. The strategy for the real estate is derived from this. To determine the company strategy a SWOT-analysis can be performed. This is very useful because of the intern and extern context framework wherein the analysis is performed. The extern context can be made clear with the use of the DESTEP-factors: Demographic – Economic – Social Cultural – Technological – Ecological/ Psychological – Political/ Spacial. The intern context is determined with the use of the six variables from the ESH-model (Equilibrium (Evenwicht) – Cohesion (Samenhang) - Heterogeneous (Heterogeen)): Structure, Strategy, Management style, Systems, Personnel and Culture.

The second phase is developing a real estate strategy with the use of the DAS-framework designed by the Technical University of Delft (De Jonge et al. 2009). This model is based on four 'steering events':

- (mis) match between the current supply and demand
- (mis) match between the future supply and demand
- Devising ways and solutions for the future demand in alignment with the future demand
- A roadmap to transform the current stock into the desired file

This analysis results in a policy plan for the execution on which the organization can be tuned and that concretizes the portfolio policy for the object policy.

In the third phase the execution of the developed policy takes place. When the results do not follow the objectives it is important that the policy is adjusted. The monitoring is performed based on the model of the Balanced Score Card (BSC). The BSC is based on critical success factors for at least four areas of attention, or performance fields: performance in relation to the market / customer, the financial results, internal processes and innovation / growth. In the model of Van Schijndel is a fifth performance field added in the form of society.

Within the real estate sector there is a special division that focuses on healthcare real estate and the implementation of strategic strategies, this is the division Corporate Real Estate Management. To get a better understanding it is explained in the upcoming paragraph.

7.5 Corporate Real Estate Management (CREM)

Corporate Real Estate Management approaches the housing needs of an organization at a strategic level. In this theory property is considered as a fifth mean of production, in addition to staff, capital, technology and information. In short, the static property as investment and use object within the dynamic environment of the company.

Tay and Liow define CREM as:
Corporate real estate management (CREM) is concerned with the management of land and buildings owned by companies not primarily in the real estate business. (Tay and Liow, 2006)

The discipline of CREM can be described as the unit which strategically deploys real estate in order to maximally support and contributes to the primary objectives of the company or governmental institution (Van Driel, 2006). It distinguishes itself from the CREM related discipline REM (Real Estate Management), where the goal is to achieve a maximum return on capital invested in real estate. In order to make a significant contribution to the objective of the company as a whole, it is imperative that the strategic real estate plan seamlessly connects to the strategic plan of the company.

Dewulf et al. (2000) distinguish within CREM four areas of interest, where a subdivision can be made to focus (organization versus real estate) and level (strategic versus operational). The field of attention of facility management tries to support the core activities of the end users optimal. It deals with the daily need for space and flexibility. The second focus, financial management, assesses the financial capability of real estate in relation to the financial position of the company. This focus area stems from the need to use scarce

production resources in the most efficient way. The field project management develops real estate objects according to the program of requirements and steers on quality, time, money, information and organization. In general management, finally, one aims on the realization of the corporate objectives with respect to efficiency and continuity in the long term.

All the parties that are involved in the process of developing strategic real estate have different interests that they find important. The board of an organization focuses of course on the continuity of their organization. The financier has an interest in the way means and activities are financed. The interest of the users is to be able to work in a nice environment. At last there is the manager that has a technical interest in the real estate so that the building is useable for people and processes.

Den Heijer en De Vries (2004) have made an inventory of the most common real estate related performance indicators and made a breakdown of the stakeholders in the CREM model as can be seen in Table 7-2. This table shows that the most indicators relate to the square meters, depreciation and operating costs combined with the amount of buildings. There are no indicators that will measure if the objectives of the organization are achieved. This explains why real estate considerations are in the most favourable case based on the investment and operating costs. To get a better overview on the indicators the performance of an organization need to be monitored. Which indicator will have an influence and how can this be optimized to get the best result possible.

	Organizational Perspective	Real Estate Perspective
Strategically Perspective	**The Board** • Mix of sub-targets for achieving set objectives • Housing expenses / total expenses • Housing income / total income	**Financier** • Total replacement value • Replacement value m_2 gross floor area • Invested capital • Book value • Size total real estate stock
Operational Perspective	**User** • m_2 gross floor area / operator or function • (Internal) rental prices	**Manager** • Construction costs / m_2 gross floor area • Investment / m_2 gross floor area • Operating costs / m_2 gross floor area • Lifetimes • Maintenance frequencies

Table 7-2 Stakeholders and indicators (Heijer & De Vries, 2004)

7.6 Conclusion

The sub question that is answered in this chapter is:

How to incorporate real estate in the management of a healthcare organization?

Because of the fact that healthcare organizations have become responsible for the financing of their real estate, it is necessary to set up a real estate strategy so that they have a base for their real estate decision making. Strategic management can be used by healthcare organizations to set up a real estate strategy.

Van Schijndel (2010) developed a model for strategic real estate planning. The first phase is determining the strategy of the company and the goals that are a result of the strategy. The second phase is developing a real estate strategy with the use of the DAS-framework designed by the Technical University of Delft (De Jonge et al. 2009). And the third phase is the execution of the developed policy. This execution can be performed with the help of CREM. The purpose of CREM is to contribute through the strategic use of real estate to the primary objective of the company, in this research this is the execution of healthcare.

Points for model

- Strategic analysis
- Strategic choice
- Strategy implementation
- Corporate Real Estate Management (CREM)

PART II
MODEL & RESULTS

8 The model

In this chapter the problem definition and the literature study are connected to each other by the development of a system dynamics model to give insight in a possible solution. First the AHP questionnaire will be introduced that is spread under 26 employees that are involved in the real estate development process of the healthcare organization, Philadelphia. Philadelphia is a national organization with over 7.600 employees in approximately 700 locations and support over 7.800 clients with intellectual disabilities. The support ranges from a few hours coaching per week to daily intensive care, and intramural care to day care and supervised methods. (Philadelphia, 2012) An extensive description and a description about the case can be found in the appendix on page 102.

After this the system dynamics model that is created will be thoroughly explained. First the causal loop diagrams will be discussed and later on the stocks and flows model that is based on these diagrams will be explained. At the end of this chapter the scenarios that have been set up to run the model are clarified. These scenarios are based on a research performed by 'Mee Friesland'. MEE Friesland offers information, advice and support to people with disabilities in every phase of life and all areas of life (MEE Friesland, 2012).

With all the information coming from this chapter and the results from chapter 9 it will be possible to draw some conclusion with regard to the given research question in chapter 1. These conclusions can be found in chapter 11.

8.1 The purpose of the model

The model is created to set up a forecast about the demand for care and the income and expenses that are depending to this. Based on the literature research it is to be expected that the demand for care will change in the coming years by the influence of many different factors. Change in the demand for care will also causes changes in the income and expenses of healthcare organizations.

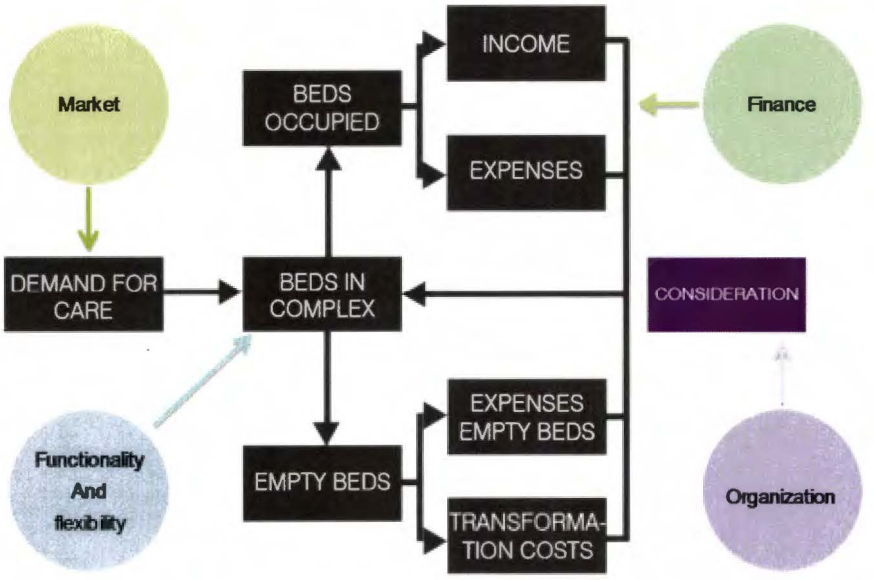


Figure 8-1 Schematic view of the model

A schematic view of this process can be seen in Figure 8-1. The demand for care will determine how many beds are needed in a complex. These beds can be later on in the process be occupied or be vacant. The income and expenses are connected to the beds that are occupied. The beds that are vacant also bring certain expenses with them. These are the operating costs that are connected to the amount of square meters real estate. The vacant square meters can also be transformed into another function and this will involve transformation costs. So a healthcare organization needs to make a decision on that specific moment. Is it okay if the bed stays empty or is it important to intervene and transform the vacant square meters on that moment? Based on which criteria will such a decision be made and which consideration needs then to be made?

The first step in developing such a model is finding the criteria that are considered the most important by the healthcare organization in the development of real estate. This can be done by the use of the AHP method as explained in the second chapter. The outcome of this research will be used as the 'consideration' part of the system dynamics model. After the AHP, causal loops will be developed to find the relations between the variables that are found during the literature research. These variables are summed up in Table 8-1. Based on the causal loop diagrams the stocks and flows model will be created. This model will calculate the demand for care for 30 years and also the expected income and expenses for the same period.

The model can be used by every kind of healthcare organization in the Netherlands with some minor adaptations. In this case a model will be created for the healthcare organization Philadelphia. More information about this organization can be found in the next paragraph.

Market - Demand for care
• Population • Estimates of the number of users of nursing and care in the period 2005-2030 • Annual growth of the different care packages from 2009- 2030 • Numbers of users of the different care packages in 2009 and 2030
Finance - Income
• Determination kind of ZZP • ZZP compensation • NHC compensation - Life Cycle 30 years - Interest 5% - Indexation 2,50% - Maintenance 0,80% - Vacancy 3,0 %
Finance - Expenses
• Fixed costs • Energy costs • Maintenance costs • Administrative management costs • Specific operating costs • Life-cycle costing
Functionality and Flexibility
• Floor space principles • Texture • Frame • Infill • Utility Value • System Value
Organization
• Strategic analysis • Strategic choice • Strategy implementation • Corporate Real Estate Management (CREM)

Table 8-1 Points for the model coming from chapters 3 - 7

8.2 Analytical Hierarchy Process

With the use of the analytical hierarchy process method a questionnaire is set up to research the preferences in the control frameworks of the employees, in developing healthcare real estate for Philadelphia. The criteria for the questionnaire are classified by the four control frameworks in real estate development as can be seen in Table 8-2. These criteria are derived from conversations with Johan Thijssen who is a specialist in healthcare projects at draaijer+partners and from the literature research performed in the first part of the report. Based on these criteria a development process for healthcare real estate can be structured. The questionnaire and the results can be found in appendix on page 108.

Market	Finance	Functionality and Flexibility	Organization
Capacity	Housing costs	Functional quality	Image
Distribution locations	Operating costs	Sustainability	Architecture
Interaction with environment	Revenues	Flexibility	Corporate Identity
Market position	Personnel costs	Indeterminacy	Employees Value
Collaboration		Effectiveness	Client Value
Location			

Table 8-2 Criteria used in the AHP questionnaire

In the questionnaire employees of Philadelphia are asked to make a choice between two criteria. Based on all the comparisons a ranking of the criteria can be constructed. When the average of all the questionnaires is taken an overview is created about which criteria are founded the most important. Based on this ranking a strategy can be developed on how to act towards the developing of their real estate development. This can then be the input for the consideration part of the system dynamics model. The consideration part will decide how to act when certain decisions need to be made so that there can be responded on changes that can occur during the operational phase.

8.2.1 The outcome

From the 26 questionnaires that were sent, 13 came back filled in. The answers of the questionnaires can also be found in the appendix on page 108. Here also the complete calculations are given to come to the results that will be discussed below.

First the four control frameworks are compared to each other as can be seen in Figure 8-2. Market is considered the most important framework based on the outcome of the questionnaire. So the employees of Philadelphia think the most important control framework in the development process of real estate is to be able to react on the circumstances of the market.

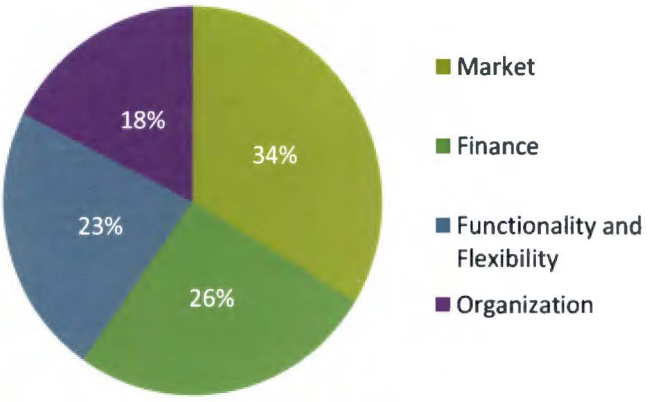


Figure 8-2 Ranking the four control frameworks

To see more specific how this can be done also all the criteria from the four control frameworks are being compared to each other. The result can be seen in Figure 8-3. The housing costs are considered the most important criteria. Next to this the operating costs are considered quit important. Both of these criteria are coming from the control framework finance. This means that the financial part of the development process will play an important part in the consideration part of the model. The model will be further explained in the next paragraph.

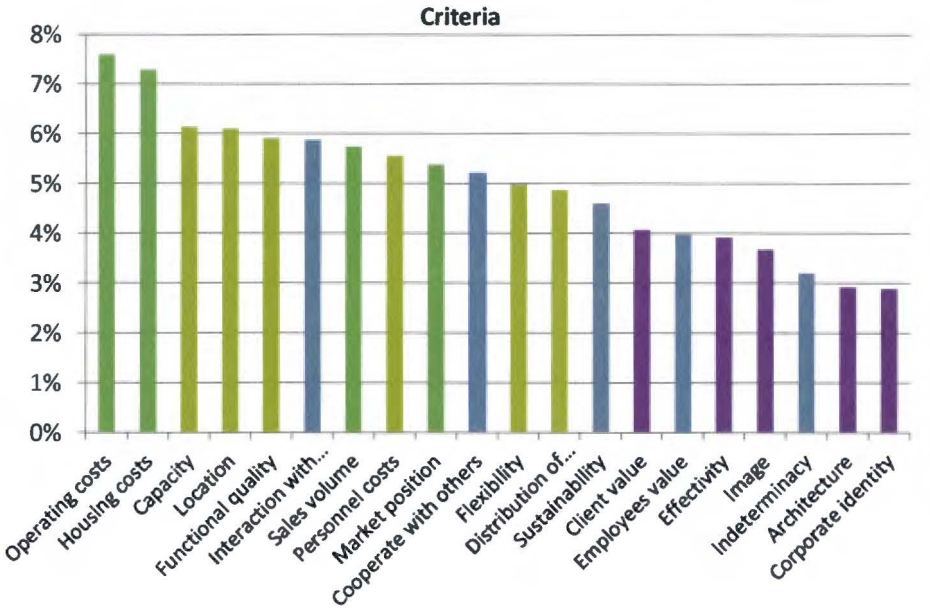


Figure 8-3 The ranking of all the criteria from the four control frameworks

8.3 Causal loop diagrams

Causal loops are used to visualize the relationships between different variables. It is also used to see how these variables have effect on each other. The connections between variables can be positive or negative. When a connection is positive then the variables have a reinforcing effect on each other. This means when one variable increases the other one will also increase. When a connection is negative it is the other way around. When one variable increases the other will decrease. For the demand for care and the financing that is related to this, a few causal loops are developed to see what the interdependencies are in this process. First the causal loop of the total process will be further explained.

8.3.1 Total Process

In Figure 8-4 the causal loop diagram of the total process can be found. The whole diagram is split up in three sub diagrams; the demand for care causal loop, the income causal loop and the expenses causal loop. Because the high level of interdependence all the loops are connected to each other. The income and expenses are both depending on the demand for care and the amount of beds that are occupied.

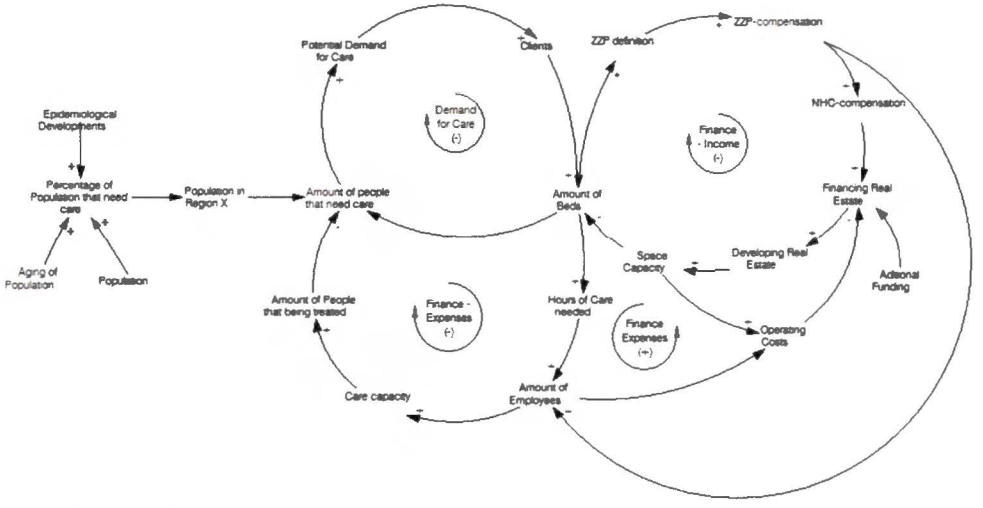


Figure 8-4 Causal loop total process

8.3.2 Demand for care Causal Loop

The causal loop about the demand for care starts at the percentage of population that need care. This is influenced by the total population, the aging of the population and the epidemiological developments. When the population increases and also the aging level rises the percentage of people that need care will also increase. On top of this there are the epidemiological developments that will also increase the percentage of people that need care. When this will be connected to a population in a specific region than a estimation can be made about the amount of people that need care. This amount is in potential the demand for care. Not everyone that needs care will also ask for it so when only the real demand for care is left then the amount of clients is known. Every client needs another

intensity of care so based on this a ZZP can be connected to every individual client. The ZZP will decide how many care a client needs and also if he needs a bed or not. When these clients are treated then this will increase the amount of people that need care.

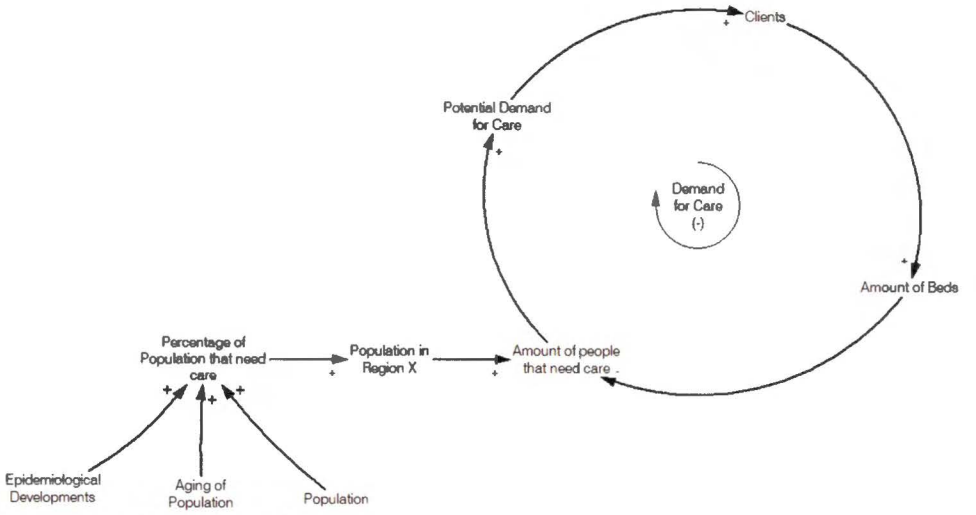


Figure 8-5 Causal Loop Demand for Care

8.3.3 Finance – Income

The income in healthcare is connected to the intensity of care that is given and also to the amount of bed that are occupied. This can also be seen in the causal loop of the income. Based on the definition of ZZP compensation is given. The NHC compensation is then given based on the kind of ZZP. The NHC is then used to finance the real estate of the organization. Because the NHC compensation is given after the realization of a healthcare building it is needed there will be some additional funding so that the capital investment can be done. This investment can be for example from a private investor. When the financing is round then the real estate can be developed. By developing real estate the space capacity of an organization is created or expanded. The capacity together with the amount of beds that are needed can be the reaction on the demand for care. When the same amount of care is given the income will be balancing, this is because it is connected to the demand.

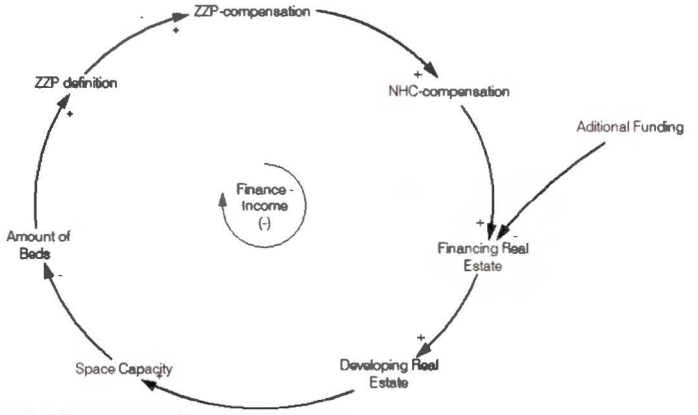


Figure 8-6 Causal Loop Finance – Income

8.3.4 Finance - Expenses

In the loop of the expenses there are two kinds of expenses that can be found. The first kind is the expense that is connected to the care that is provided. The other expenses are connected to the housing of an organization. Looking at the first kind it can be noticed that the expenses of the care are connected to the amount of beds that are needed. Based on the earlier defined ZZPs the amount of hours of care that are needed the amount of employees can be derived. These employees will increase the care capacity but they will also increase the administrative management costs that need to be made. The costs that are made can be made even with the ZZP compensation that is provided. A consequence of the increased care capacity is the amount of people that are being treated and because of this the amount of people that need care.

Then there are the expenses that are related to the housing of a care organization. The starting point is the space capacity. The bigger the buildings the higher the operating costs are. Operating costs are here divided in fixed costs, energy costs, maintenance costs, specific operating costs and administrative management costs. These last costs mentioned are also influences by the amount of employees because in these costs are the personnel costs incorporated. All the costs before are compensated with the NHC compensation that is provided to pay for the housing of a care organization.

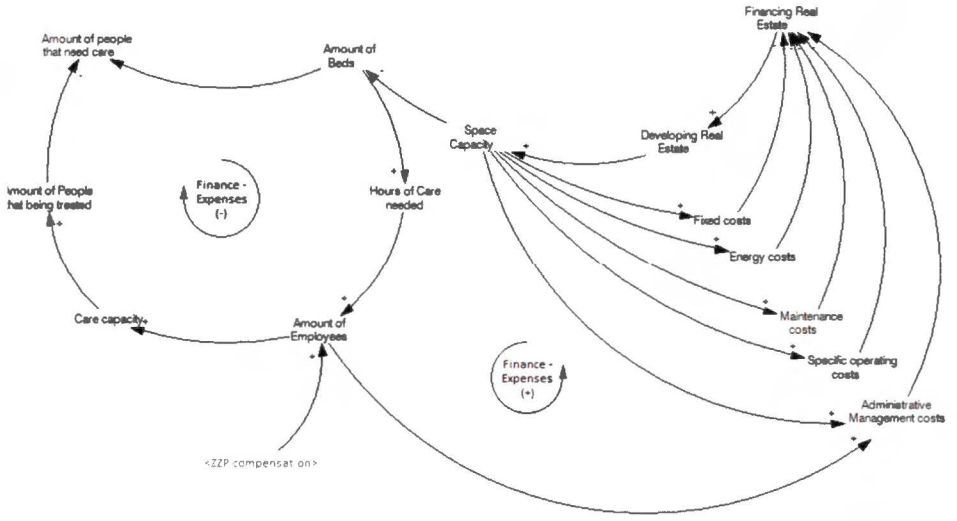


Figure 8-7 Causal Loop Finance – Expenses

8.4 Stocks and Flows model

This paragraph will discuss the stocks and flows model that is created based on the causal loops from the paragraphs before. As already explained in paragraph 2.4 the stocks and flows model can be used to model a dynamic system. In this research the model is used to model the real estate development process based on the demand for care. The whole model is build up from 5 sub models that are attached to each other via several variables.

The first sub model is the demand for care model. In this model an estimation can be made about the demand for care in future. The second sub model is the income model that is linked to the first model. The income depends on the demand for care and can be calculated based on this. Then a sub model is created for the spatial principles. Based on the amount of beds that are needed to answer the demand for care, an estimation is made about the amount of square meters that are needed. With the estimation of the square meters also an estimation about the investment costs can be modelled. Then with the operating costs that can be calculated based on the amount of square meters and the amount of beds occupied the expenses can be modelled. When the expenses and the income are known the balance can be set up with this information. Based on the expenses of the unused square meters and the costs for transforming the vacant square meters, a consideration can be made if an apartment will be transformed to another function, in this case apartments for elderly, or if it will remain empty. This will make the model dynamic and with this the model will be run several times based on a variety of scenarios that will be discussed in paragraph 8.5.

To get a better understanding of all the separate models every model will be further explained in the next paragraphs. Every variable that influences the process will be clarified and also the formulas behind the model will be shown.

8.4.1 Demand for care sub-model.

In the demand for care sub model there are three stocks and three rates that influence the outcome as can be seen in Figure 8-8. The "demand for care" stock depends on the demand inflow and the answering the demand for care. The demand inflow depends on the population where the healthcare organization is situated and the percentage of people that have a mental disability and the percentage of these people that will need care. The market position decides how much of people that have a mental disability will be helped by Philadelphia.

Demand inflow =
*(Population*Percentage of Population with a Mental Disability) * Market position * Time * Percentage that need care*

Demand for care = Demand Inflow - Answering the demand for care

Then there is the stock "amount of beds occupied" that is influenced by answering the demand for care and the move rate. Answering the demand for care and the number of beds occupied are restricted by the number of beds in the complex. The number of beds in the complex is a dynamic variable that changes over time by the influence of several kinds of expenses. This variable will be further explained in paragraph 8.4.4. The initial beds occupied are the amount of beds that already are occupied from t=0.

Answering the demand for care=
IF THEN ELSE (Amount of Beds occupied="Amount of beds in the complex (Dynamic)", 0, Demand for Care)

Amount of beds occupied =
INTEGER (IF THEN ELSE (Answering the demand for care>"Amount of beds in the complex (Dynamic)", "Amount of beds in the complex (Dynamic)" - Move rate, Answering the demand for care - Move rate))

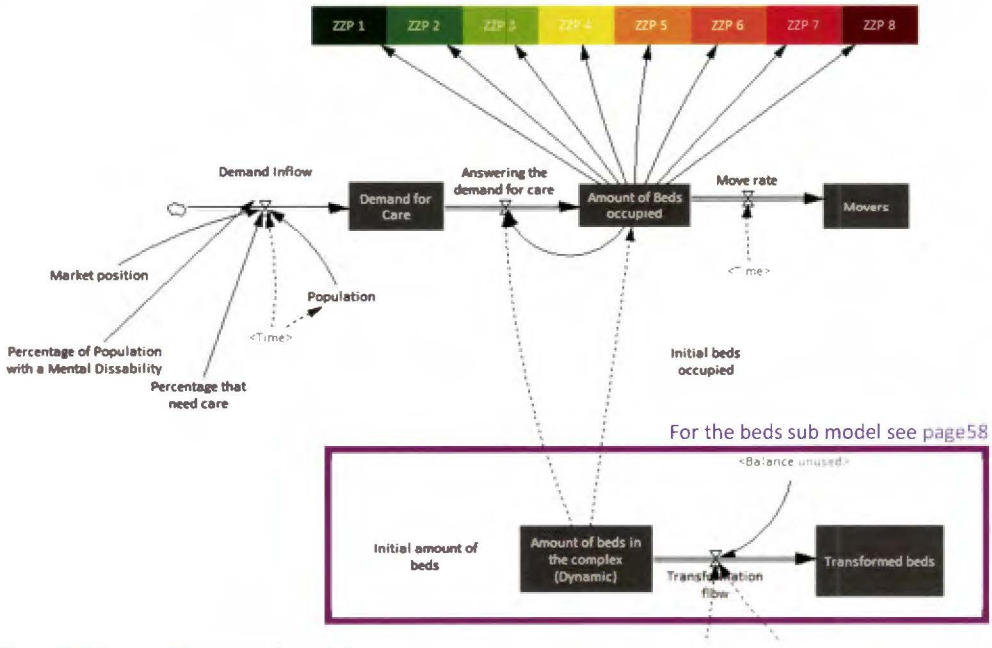


Figure 8-8 Demand for care sub model

Each bed occupied stands for a patient with a certain ZZP. An assumption is made for the division in ZZPs. This is done based on a research into the development in demand for care, performed by Mee Friesland. Mee Friesland offers information, advice and support to people with disabilities in every phase of life and all areas of life. This information can be found in the appendix on page 117.

At last there are the movers. Not every client will stay his whole life in the same complex; these clients will form the movers. An assumption is made about the amount of movers per year. In this model the move rate is set on (0.1 * time) clients per year. This means that the move rate will increase in time. This is due to a decrease in quality, and new housing facilities that will be developed in the surrounding area. Also it is possible that a client will die and that will also have an influence on the move rate.

The most important outcome is the amount of clients and the division in ZZPs. Based on these numbers the following sub models can start their calculation.

8.4.2 Income sub model

In the income sub model there are four stocks and two rates that influence the income. Also the four variables that are in the model are very important for the outcome. Based on the amount of ZZPs that is set in the demand for care model the income can be calculated.

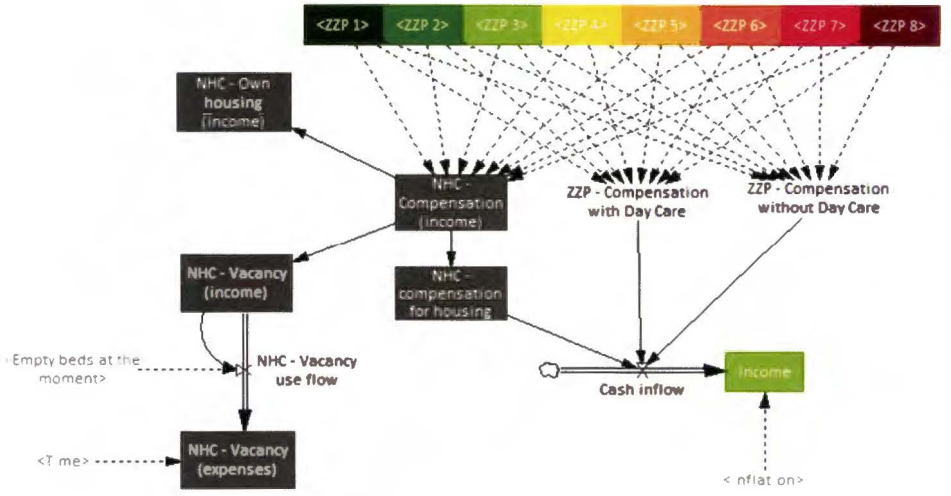


Figure 8-9 Income sub model

First there is the 'NHC compensation (income)' stock that is set by the compensation that is given for each of the ZZPs, the exact numbers can be found in the appendix on page 105 . These compensations are incorporated into the formula of the stock. Not the whole amount of the NHC compensation is used for the operation of a healthcare organization, 4% of the compensation is reserved for vacancy and 11% is reserved for the housing of the main office of a healthcare organization. This division can be seen in the formulas of the NHC own housing variable and the NHC vacancy stock.

NHC – Compensation (income) =
*((ZZP 1*10121.5)+(ZZP 2*10121.5)+(ZZP 3*10121.5)+(ZZP 4*10121.5)+(ZZP 5*9895.15)+(ZZP 6*9895.15)+(ZZP 7*9895.15)+(ZZP 8 *12953.8))*

NHC – vacancy (income) =
*("NHC - Compensation (income)" * 0.04) - "NHC - Vacancy use flow"*

NHC own housing (income) =
*"NHC - Compensation (income)" * 0.11*

The NHC vacancy compensation is used when a bed is empty. So when there is no bed empty the compensation can be saved for later. At the moment that it is needed the NHC vacancy use flow is turned on. This means that the savings will decrease and that the expenses for the vacant square meters are compensated by these savings.

NHC Vacancy use flow
IF THEN ELSE (Empty beds at the moment>=1, "NHC - Vacancy (income)", 0)

The other two variables that influence the cash inflow are the ZZP compensations that are given to perform the care that is needed. For every kind of ZZP compensation is determined and a distinction is made between the ZZPs with day care and without day care. The ratio of these two kinds of ZZPs can be found in the appendix on page 105.

ZZP compensation with day care =
(ZZP 1 0.37*36846.8)+(ZZP 2*0.49*43143)+(ZZP 3*0.66*48468.4)+(ZZP 4*0.79*53363)+(ZZP 5*0.88*66400.8) +(ZZP 6*0.71*63827.6)+(ZZP 7*0.87*88143.9)+(ZZP 8*0.88*76047.8)*

ZZP compensation without day care =
*(ZZP 1*0.63*24403.9)+(ZZP 2*0.51*430693)+(ZZP 3*0.34*36021.9)+(ZZP 4*0.21*40912.9)+(ZZP 5 *0.12 * 49377.2) + (ZZP 6*0.29*46803.9)+(ZZP 7*0.13*59808.9)+(ZZP 8*0.12*59024.1)*

Cash inflow =
"NHC - compensation for housing"+"ZZP - Compensation with Day Care"+"ZZP - Compensation without Day Care"

8.4.3 Expenses sub model

In the expenses sub model the costs that are made during the operational phase are calculated. There are 6 kinds of stocks that influence the expenses. First there are the amount of beds in the complex that are present at moment t=o and the dynamic amount of beds that are in the complex. Based on the amount of beds the amount of square meters real estate is calculated. This calculation can be made based on the amount of beds that are needed. The amount of square meters that are used in the design of Sneek are used as an input. The exact numbers can be found in the appendix on page 106. A distinction is made between residence area, supportive counselling area, supportive services area and treatment and activating guidance area. All these areas are connected to the amount of beds and all these areas summed form the total amount of square meters of a healthcare building. This will be used in the investment sub model that will calculate the investment that is needs to develop a new healthcare building.

Real Estate (m2) =
"Residence area (m2)"+"Support services Area (m2)"+"Treatment and activating guidance Area (m2)" +"Supportive counselling Area (m2)"

A distinction is made in the costs that depend on the amount of square meters and the costs that are depending on the amount of beds that are occupied. The costs that depend on the amount of square meters are the maintenance costs for minor maintenance, the energy costs, the cleaning costs and at last the fixed costs. The key figures for the costs are obtained by experts at draaijer+partners.

Next to this there are the costs that are depending on the amount of beds occupied. The stay costs are the costs for food for patients, hotel costs and other accommodation costs that are connected to the amount of beds that are occupied. Overhead costs are calculated based on a percentage of the personnel costs that are found at the bottom of the expenses model. The percentage is based on a research "Overhead gewaardeerd" that is performed by Mark Huijben in 2011. He found that the overhead percentage for care was 14.3% of the personnel costs.

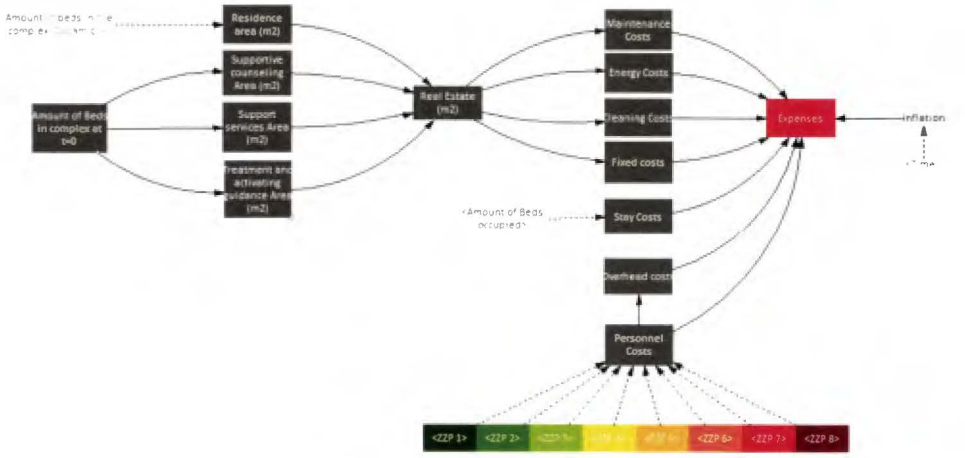


Figure 8-10 Expenses sub model for mentally disabled care

Based on policy CA-300-476 the personnel costs can be calculated. This is an essential part of the expenses of a healthcare organization. Every ZZP has its own amount of minutes that are needed for every care task per week. There are several care tasks that are made explicit, these are: personal care, supportive guidance in general, nursing, activating guidance, therapy, supportive guidance during the day and daytime activities. The NZA has set the personnel costs per minute for every care task. When these costs are multiplied by the amount of minutes that are needed than it is known how much the personnel costs are per week per ZZP. This is converted to the personnel costs per year to fit into the model. The exact numbers can be found in the appendix personnel hours and costs on page 97.

Personnel costs =
*(ZZP 1*14041.1)+(ZZP 2*20339.5)+(ZZP 3*25557.2)+(ZZP 4*30236.9)+(ZZP 5*38394.1)+(ZZP 6*36108.2)+ (ZZP 7*48962.9)+(ZZP 8*47255.6)*

All these costs together form the expenses of a healthcare organization. When these costs are calculated over a period of 30 years, they are subject to inflation. The calculation inflation is set to 1.5% that is prescribed by the NZA for the NHC calculation.

Expenses=
(Energy Costs + Fixed costs + Cleaning Costs + Maintenance Costs + Personnel Costs + Overhead costs +Stay Costs) * Inflation

8.4.4 Amount of beds sub model

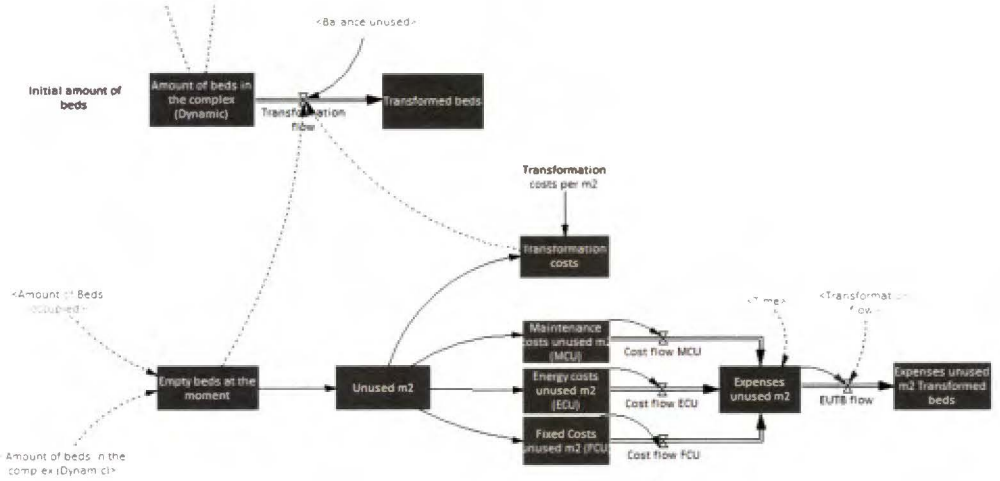


Figure 8-11 Empty beds sub model

In the amount of beds sub model there are eight stocks that influence the transformation flow. The transformation flow influences the amount of beds in the complex (dynamic) and the transformed beds. This model calculates whether a bed needs to be subtracted of the stock of beds.

The first step in the model is to see if there is a bed empty. This is being done by subtracting the amount of beds occupied of the amount of beds in the complex. When there is a bed empty then this will be multiplied by the amount of square meters per bed. With this amount of square meters the expenses for these meters can be calculated. The expenses are the operating costs that are related to the amount of square meters, these remain the same when a bed is empty. The 'expenses unused' are summed up as long as nothing is being done with the amount of empty beds; this means that EUTB flow is zero.

Expenses unused=
*(Cost flow ECU *Time + Cost flow FCU*Time + Cost flow MCU*Time) - EUTB flow*

The expenses for vacancy are compensated with the NHC vacancy income as mentioned before in the income sub model. Based on this a balance can be made for the expenses and the NHC vacancy income.

Figure 8-12 balance NHC vacancy income and expenses unused m^2

Next to the expenses of the unused square meters there are also some hypothetical transformation costs that can be calculated. These costs are the costs of the transformation of the residential area into another residential function (in this case residential dwellings for

elderly). The transformation costs per square meter are found by consulting an expert who has a lot of experience in transforming care dwellings into normal residential dwellings. *(Vries, A. de, (2012). General Director at Ter Steege Veluwse Bouw. Telephone call with M. Bodenstaff. 4th June 2012. Bunnik.)*

Transformation costs =
*Unused m2 * Transformation costs per m2*

In this model a financial consideration is made, whether to transform or not, based on the balance of the unused real estate and the transformation costs of these square meters. This means that when the balance of the empty real estate transcends the transformation costs of that same empty real estate, and there is a bed empty at that time, the decision is made to extract a bed from the amount of beds in complex (dynamic). At the same time the EUTB flow is turned on and by doing this the expenses is set back to zero.

Amount of beds in the complex (dynamic) =
INTEG (INTEGER (-Transformation flow))
(Initial value = initial amount of beds)

IF THEN ELSE (Balance unused>=Transformation costs: AND: Empty beds at the moment > 1, 1, 0)

When a bed is subtracted from the stock then the whole process can start all over again. The amount of square meters real estate is changed; with this the operating costs are changed also influenced by the personnel costs that will decrease. The NHC vacancy (income) will be saved again and there will be no bed empty. The income will also decrease but because the expenses have also decreased the balance will stay normal.

8.4.5 Investment sub model (only applicable when the complex is owned by the healthcare organization itself)

In the investment sub model the investments costs are calculated/ estimated. Based on the amount of square meters that are necessary and the key figures about the investments costs that can be found in the appendix on page 100, the capital costs are calculated. The other costs are calculated based on the percentages of the capital costs. These percentages are extracted from the research of TNO Jaarbeeld Bouwkosten Zorgstector 2010 and can be found in the appendix on page 100. Next to the capital costs there are also the costs for the plot of the complex. These key figures are also extracted from the research of TNO Jaarbeeld Bouwkosten Zorgstector 2010. The last variables that influence the total investment sum are the interest and unforeseen variables, these are influenced by additional costs, management costs and the capital costs. This all together will form the total investment sum.

Total investment sum =
Additional costs + Capital Costs + Increase in wage and price + Interest + Land costs + Management costs + Start Costs + Unforeseen

The investment sum is in particular important for the owner of the building. So when a healthcare organization will be renting the complex this model is not used.

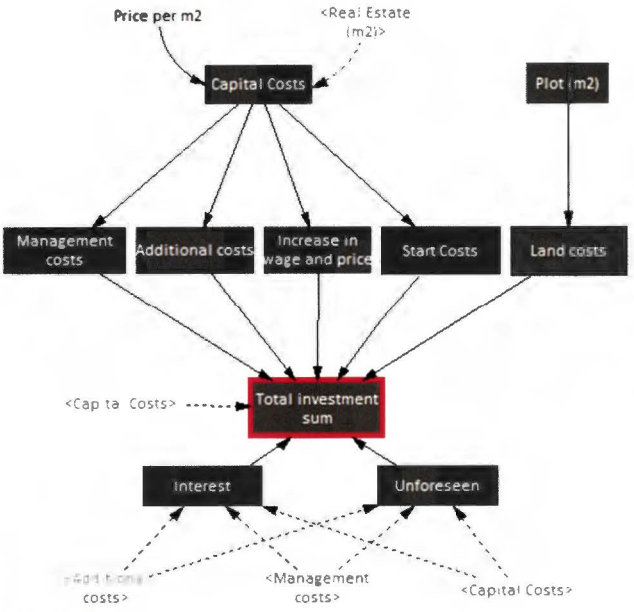


Table 8-3 Investment sub model

All the models together will form a complete image of the total real estate development process and the period after this. In order to produce genuine results, it is important that there first a number of scenarios will be developed that can be used as the input for the model. These scenarios can be found in the next paragraph.

8.5 Scenarios for the demand for care

After the completion of the model it will be run based on different scenarios. These scenarios are based on the developments in the demand for care. The underlying information is based on a municipal report set up by MEE Friesland.

In this municipal report the amount of care askers are given in the year 2011 and also the developments in the amount of care askers in the previous years are discussed. From this report it can be noticed that the amount of care askers is declined in the previous years, as also can be seen in Table 8-4. At a more detailed level it can be seen that the amount of care askers in the age category 40 – 64 year has increased 10% the last three years. The age category 0 – 24 years has decreased 10% the last three years, the other age categories, 25 – 39 years and 65 years and older, remained about the same. 40% of all these care askers are people with a mental disability and that means they form the target group for Philadelphia.

Sudwest Fryslan Annual figures	2009 Sudwest Fryslan	2010 Sudwest Fryslan	2011 Sudwest Fryslan	Friesland
Number of residents	81938	82250	82445	647282
Number of clients MEE	696	764	673	5523
Number of provided services MEE	1179	1263	975	7921
% That uses MEE	0,85%	0,93%	0,82%	0,85%

Table 8-4 Annual figures Sudwest Fryslan (Reprinted from: municipal report MEE Friesland, 2012)

For the model only the age categories from 25 years and up are important because this is the target group for the new to build complex. From these categories there are 112 care askers for residential care (Municipal report MEE Friesland, 2012). Then 40% of these 112 care askers for residential care are people with a mental disability, which are 45 people. Based on these numbers three different scenarios will be created. These scenarios will be discussed in the next paragraphs. More detailed information from the municipal report can be found in the appendix on page 117.

8.5.1 The growth scenario

The growth scenario assumes an increase in the number of requests for care for the next 30 years. As starting point the year 2011 is taken. Based on the numbers found by MEE Friesland there are 45 people that ask for residential care in 2011. Based on the development of the target groups the last three years a growth percentage is assumed for the next 30 years. As can be seen in Table 8-5 the total growth of all the target groups the last three years is 3%, this is 1.44% per year.

	2009	2010	2010	Growth
25 - 39 year	102	113	101	-1%
40 - 64 year	133	159	143	7%
65 year and older	34	41	34	0%
Total	269	313	278	3%

Table 8-5 Developments in amount of care askers

The amount of care askers per year for the upcoming 30 years can be seen in Figure 8-13. With a steady growth of 1.44% per year the amount of care askers in 2041 is 68. This will be the input for the demand for care variable in the model.

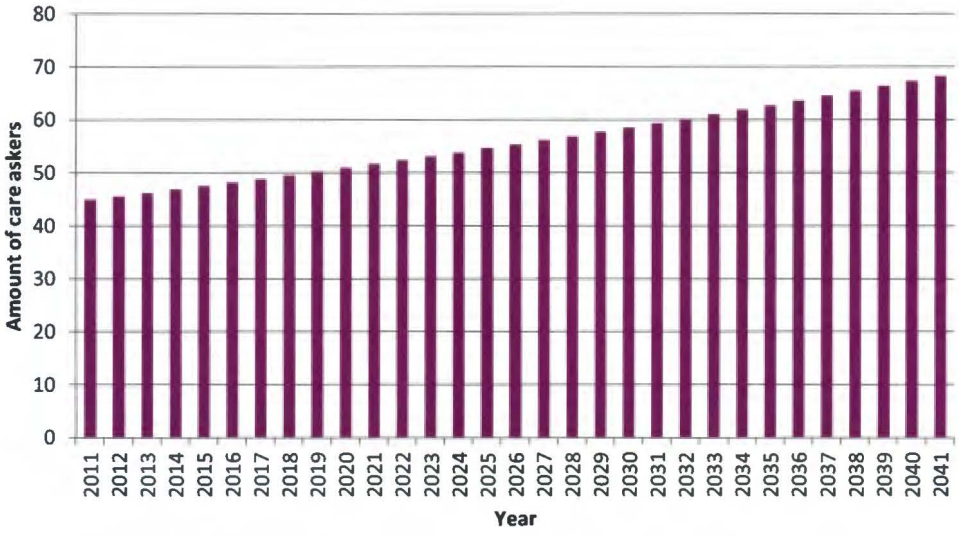


Figure 8-13 Amount of care askers based on the growth scenario

8.5.2 The shrink scenario

The shrink scenario assumes a decline in the number of requests for care for the next 30 years. This will mean that the 45 people that will ask for residential care in 2011 will decline with a certain percentage each year. This percentage is the reversed growth percentage that is found in the municipal report of MEE Friesland. Here they found that the target group has grown with about 7% the last three year, which is 1.44% each year. Therefore, in the shrink scenario the amount of care askers will decline with 1.44% the upcoming 30 years as can be seen in Figure 8-14.

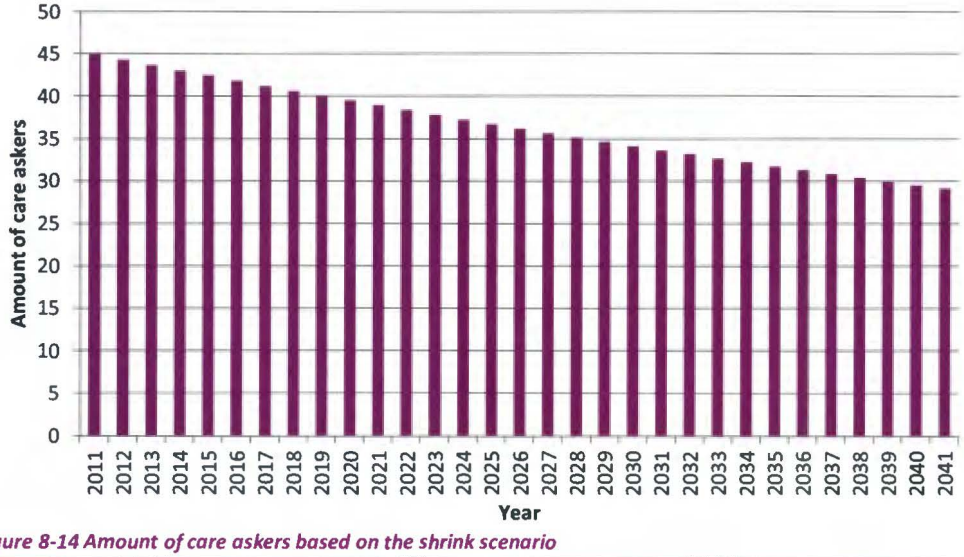


Figure 8-14 Amount of care askers based on the shrink scenario

8.5.3 The steady scenario

The steady scenario assumes that the number of requests for care for the next 30 years will remain the same as can be seen in Figure 8-15. This will mean that an amount of 45 care askers will ask for residential care in 2011 and that will be the same in 2041. So the input for the model will be steady 45 for the whole period.

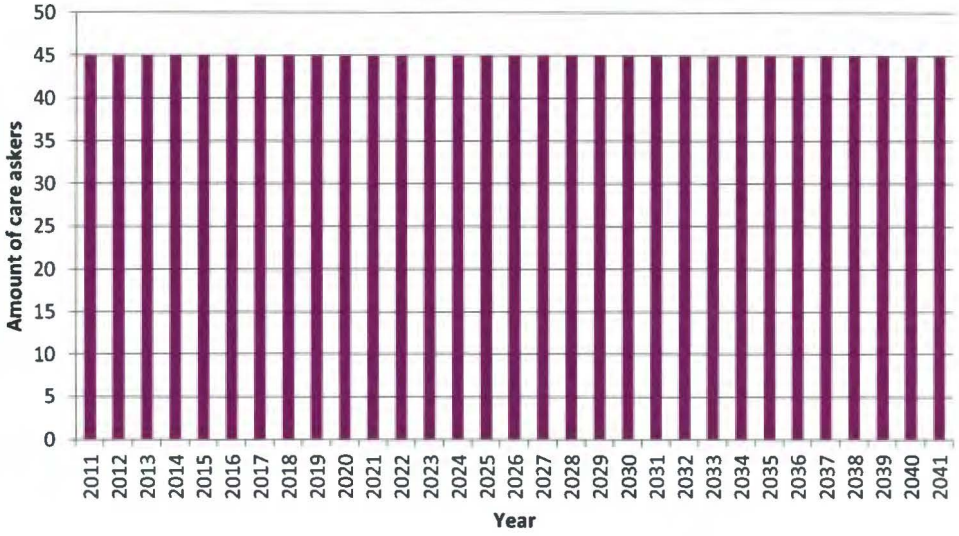


Figure 8-15 Amount of care askers based on the steady scenario

9 Results

In this chapter the results that are coming from the model are being discussed. The case of Sneek is used to get these results. The case is tested with three different scenarios like explained in the previous chapter. There is a distinction made in the results based on the three of the four control frameworks. These frameworks are market, 'functionality and flexibility' and as last the finance. The fourth control framework is already used in the AHP method in paragraph 8.2.

The results will be discussed based on 5 different outcomes. First is the percentage of beds that are occupied in the complex that is linked to the control framework market. After this the amount of beds that are situated in the complex is discussed and the amount of square meters that is vacant, both connected to the control framework 'functionality and flexibility'. Based on these vacant square meters the balance of vacancy is discussed and at the end the total balance for the healthcare organization is discussed. These balances are linked to the control framework finance.

As a comparison there will be also some results with regards to a control run. During this run the possibility to transform square meters will be disabled. In this case the amount of square meters will only grow and this will have a certain effect on the two balances. Based on these results the conclusions will be developed that will be discussed in chapter 11.

9.1.1 Market: Percentage of beds occupied

The first result coming from the system dynamics model based on the three scenarios is the 'percentage of beds occupied' during the upcoming 30 years, and can be seen in Figure 9-1. The percentage is calculated based on the amount of beds in the complex and the amount of beds that are occupied. The percentage of beds that are occupied is directly related to the demand for care. So the higher the demand for care the more beds that are occupied.

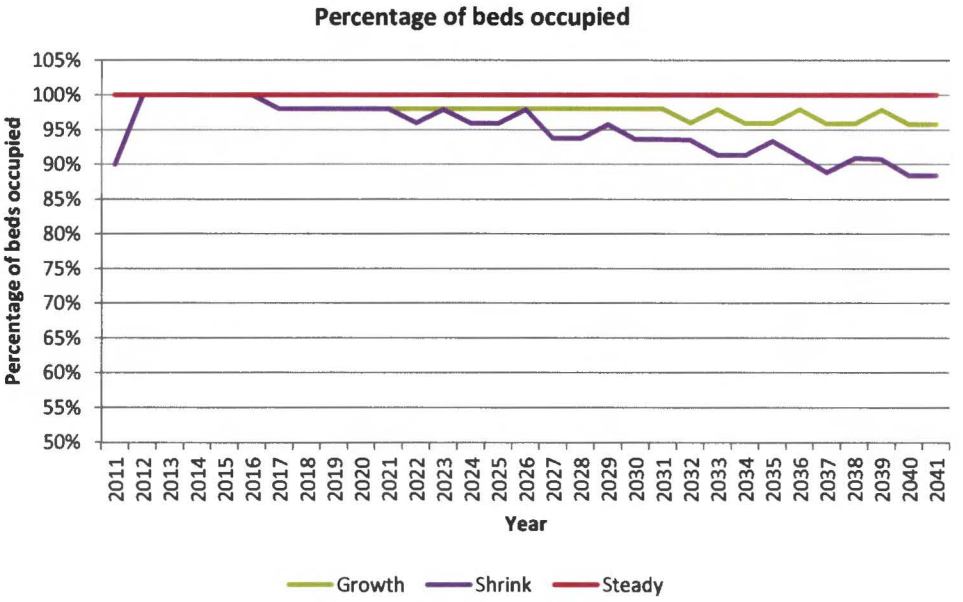


Figure 9-1 Percentage of beds occupied

In the case of the complex in Sneek it is to be expected that at t=0, 45 beds will be occupied based on the demand for care in 2011. In 2017 2% will be empty for both the shrink and growth scenario. Then from 2021 both paths will start to differ from each other. The growth scenario stays stable for a longer period. This can be related to the fact that the demand for care will not decrease. The percentage of beds occupied in the shrink scenario in contrary will strongly fluctuate from 2021 and on. In 2041 only 88% will be occupied. The growth scenario will start with fluctuating from 2032 and will ends on a percentage of 96% occupation. For the steady scenario the percentage of beds occupied will remain the same for whole period of 30 years. Here all the beds are constant occupied and this results in a steady percentage of 100%.

9.1.2 Functionality and Flexibility: Amount of beds in complex

The amount of beds in the complex is depending on several variables. The first and most important one is the demand for care. At the beginning in 2011 the demand for care will decide how many beds there initial will be. Also the expenses for the vacant beds influence the amount of beds in the complex. These costs will be discussed in paragraph 9.1.4. The expenses are being compared to the costs for transforming the vacant square meters into another function. When the expenses exceed the transformation costs the decision will be made to remove a bed from the stock.

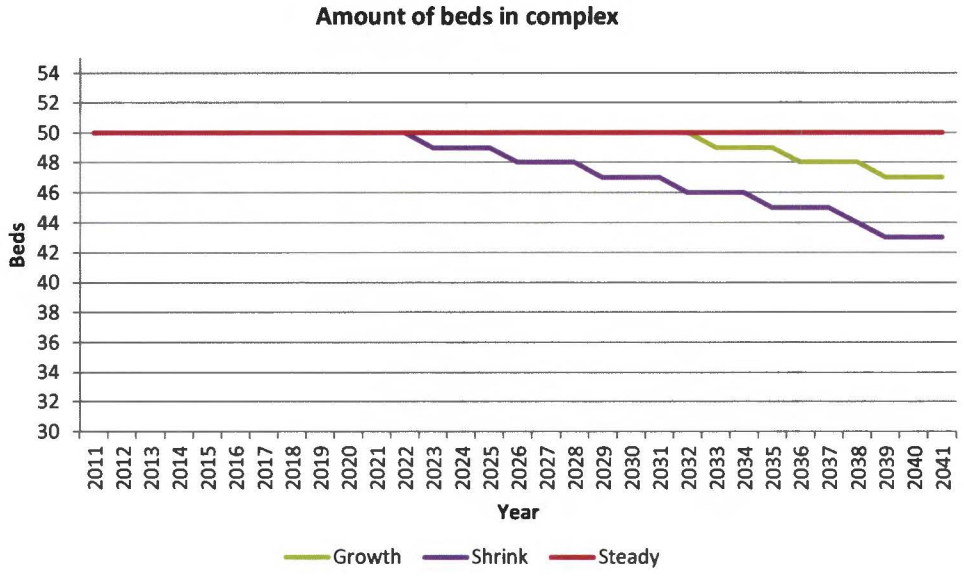


Figure 9-2 Amount of beds in the complex

Above in Figure 9-2 the results for the three scenarios can be seen. For the shrink scenario the first bed will be removed from the stock in 2023. This means that in this period the expenses for the vacant square meter exceed the transformation costs. Then after 2023 there will be six more beds removed from the stock so that at the end only 43 beds will be left. In the growth scenario after 2032 the first bed will be removed from the stock. This is a result of the fact that more beds stay occupied for a longer time as can be seen in the previous paragraph. Until 2041 a total of three beds will be removed from the stock.

Because in the steady scenario all beds will remain occupied no bed will be removed from the stock. So, in this scenario in 2041 still 50 beds will be present in the complex.

9.1.3 Functionality and Flexibility: Amount of vacant square meters

By subtracting the amount of beds that are occupied from the amount of beds in the complex, the amount of vacant square meters can be found. When a bed is empty that also means that a certain amount of square meters in a complex isn't used. In the case of Sneek these are 66.8 square meters per bed because that is the surface of one apartment.

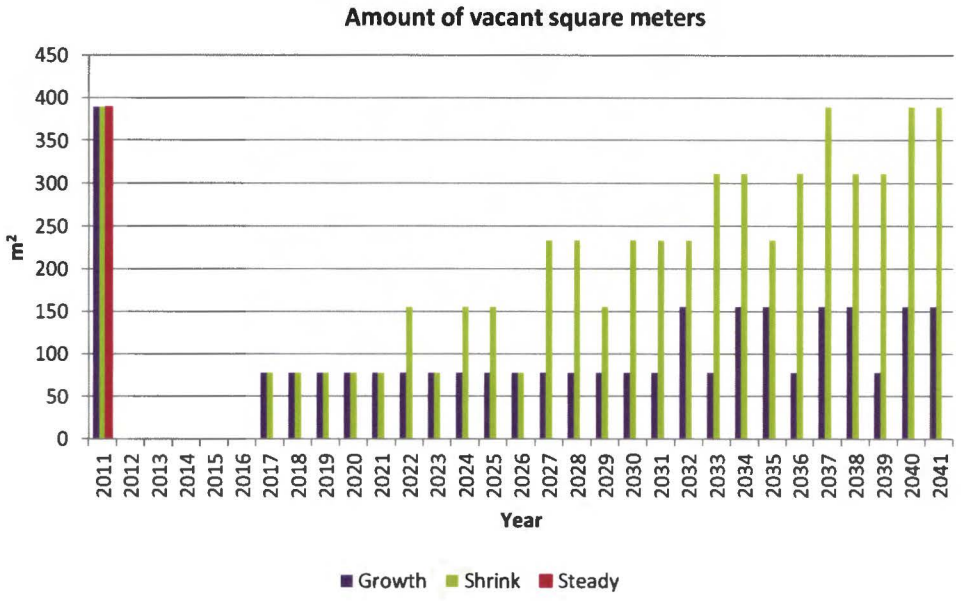


Figure 9-3 Amount of vacant square meters

The results of the runs of the three scenarios can be seen in Figure 9-3. Because there are in the steady scenario only a couple of beds empty at the beginning in 2011 there are also only unused square meters in 2011. In the growth scenario the amount of square meters that are unused starts in 2017 with 68.8 square meters and remains the same until 2032. In 2032 the amount of vacant square meters doubles and as an answer to this one apartment is removed from the stock. This explains the fact that in 2033 the amount of square meters turns back to 68.8 square meters. Until 2041 the amount of vacant square meters fluctuates between 68.8 square meters and 137.6 square meters. Because a healthcare organization receives a compensation for a vacancy of 3%, which is 1.5 beds, it is understandable that there is always one bed empty.

For the shrink scenario a different course is sketched. This can also explained by the fact that in this scenario almost 10 years earlier the first bed will be removed from the stock. In 2023 a bed is removed for the first time and this has as a result that the amount of vacant square meters will be halved at that moment. This fluctuated until 2026 and after this the amount of vacant square meters will grow. At the end there are 6 beds empty which will create 382.8 vacant square meters. The model tries to compensate it by removing several beds from the stock but the beds will become vacant to fast, and because of this it will not be able

to keep it constant. A solution for this problem could be to create the possibility of removing more beds from the stock at ones.

9.1.4 Finance: Financial balance of vacancy

The balance of the vacant square meters is built up from several variables. The first variable is the amount of square meters that are vacant. Based on this amount of square meters the operating costs can be calculated that are related to this, these are the maintenance costs, energy costs, cleaning costs and fixed costs. These kinds of costs are still need to be paid if a bed is empty. As a compensation for these costs there is the NHC – compensation for vacancy. The budget that is built up during the years that there was no bed empty can be used to cover the costs when necessary.

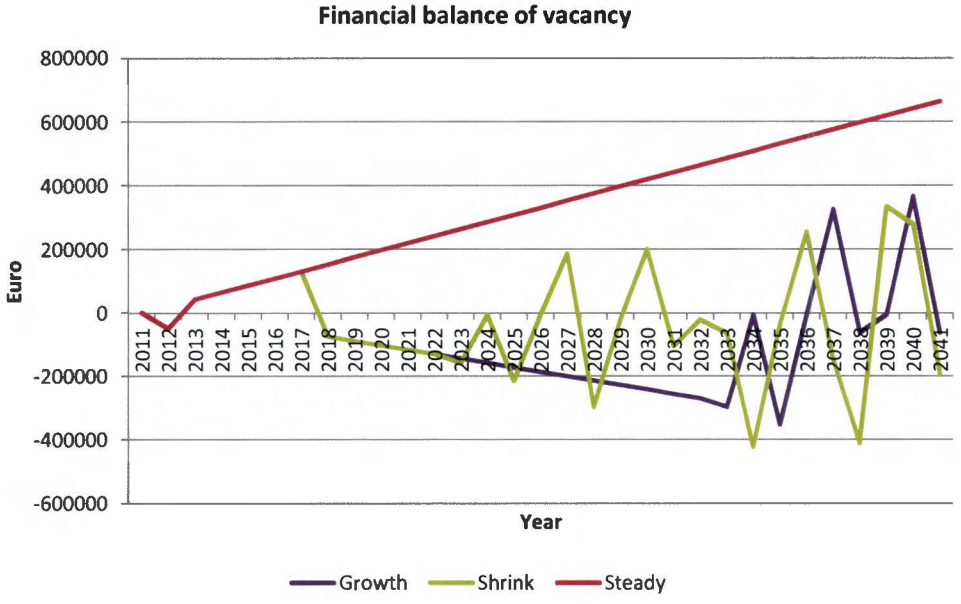


Figure 9-4 Financial balance of the vacant square meters in the complex

The results of the runs of the three scenarios can be seen in Figure 9-4. Because there is no vacancy in the steady scenario the NHC – compensation for vacancy will only grow in the course of the years. The balance will end almost €700.000 positive. This is quite different for the other two scenarios. In the growth scenario the balance turns negative in 2018. This can be explained by the fact that a bed will become empty in that year. Until 2032 this bed will stay empty and because of this the balance will turn more and more negative. When in 2033 a bed is removed from the stock the balance will grow in positive direction but in 2034 another bed will become empty so at this moment again a bed is removed from the stock. This will make the balance again turn positive. At the end the balance is slightly negative.

The shrink scenario has an equal start as the growth scenario; the difference is the moment of intervention. In 2023 one bed will be removed and this will turn the balance to grow to the positive side. The fact that there are double so many beds removed as in the growth scenario explains also why this course fluctuates much more. At the end the balance is almost €200.000 negative because of the great amount of vacant square meters.

9.1.5 Finance: Balance

The balance represents the balance of the whole operating of a healthcare organization. The income is built up from the NHC – compensation and the ZZP – compensation. The expenses are the operating costs but also the costs for personnel, overhead and the stay of the clients. Because the balance is connected to the amount of beds that are occupied and the amount of square meters, it will fluctuate together with the developments where the variables are subjected to.

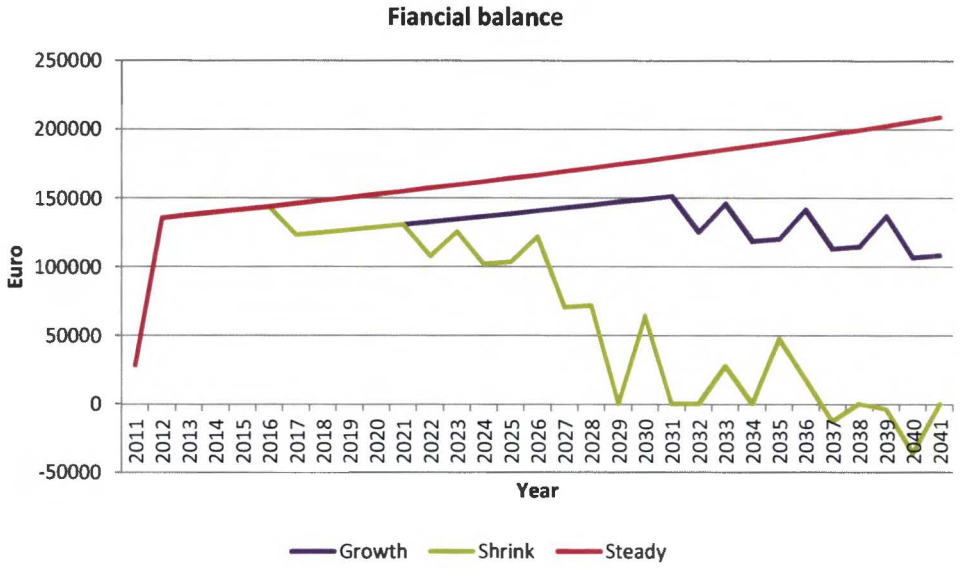


Figure 9-5 Financial balance

In the steady scenario there will be no vacancy so the income and expenses are constant. This also explained the fact why the line in Figure 9-5 is straight. Because the other two scenarios are much more dynamic these lines fluctuates much more. At the moment the decision is made to remove a bed from the stock the balance will descend. But after this the balance will grow again. The cause for the fact that the balance descends after removing a bed can be related to the fact that the proportion of the total amount of square meters real estate will be disturbed. There will be some residential meters removed but all the other functions, like supporting services, remain with the same amount of square meters, though these square meters are also linked to the number of beds. Because of this, the expenses are exceeding the income. The balance of the growth scenario still remains positive in contrary to the shrink scenario that reaches the negative side of the balance in 2037.

9.2 Control run: No transformation

The previous results were all based on the fact that it was possible to transform the vacant square meters. To see what kind of impact the transformation has in contrary to no transformation a couple of test runs are conducted. During these test runs the option to transform was enabled. This means that when a bed becomes vacant it will stay that way until the end of the run. As first the percentage of beds occupied will be discussed.

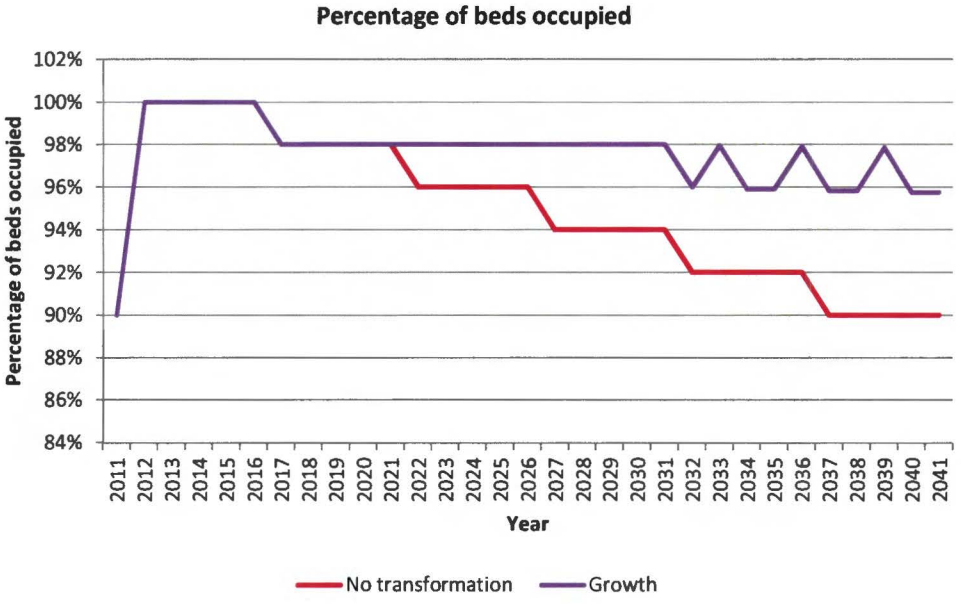


Figure 9-6 Percentage of beds occupied without transformation

Because the growth scenario is the most likely to happen, this scenario is chosen as comparison. This scenario is most likely because it follows the developments of the last three years. Also the literature study is turning out that it is most likely that the demand for care will increase.

Without transformation the amount of beds in the complex will stay constant but vacancy will take place. This means that when the vacant percentage is growing the percentage of beds occupied is decreasing as can be seen in Figure 9-6. The NHC – compensation for vacancy covers 3% of vacancy, in this case that will be 1.5 beds.

In Figure 9-7 the balance between the expenses for the vacant square meters and the NHC – compensation for vacancy is showed. Here it can be seen that after 2021 the amount of square meters will be too high to be covered by the NHC. This means that from then it will costs the healthcare organization money to keep these square meters.

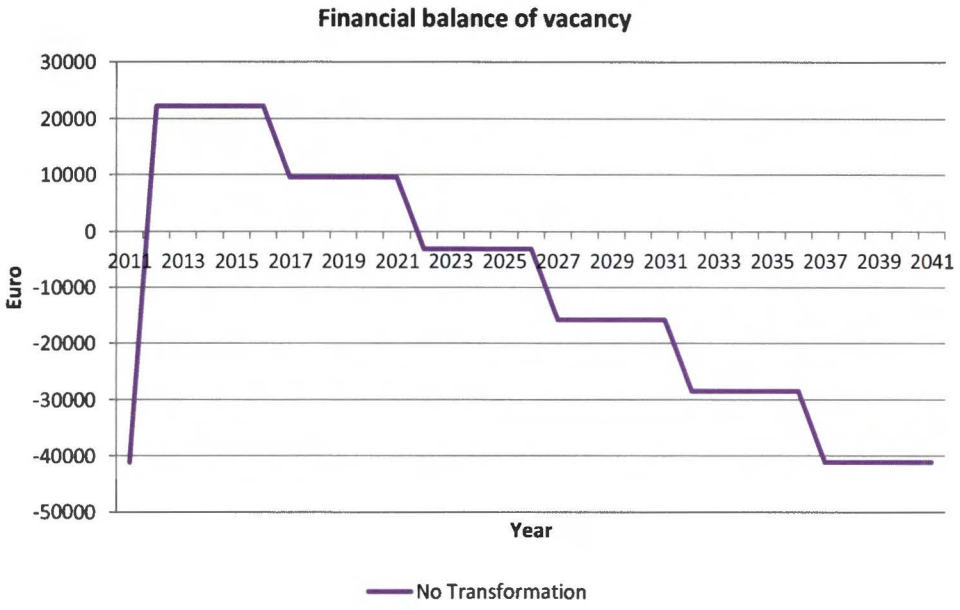


Figure 9-7 Financial balance of vacancy

When the expenses in the different cases are studied it can be seen that if there no transformation will take place the expenses will be constant. This can also be seen in Figure 9-8, in the growth scenario with transformation, the expenses will decrease because of the removal of vacant square meters. The 'no transformation' case will keep its expenses at a constant level. The income (Figure 9-9) in contrary will decrease because the empty beds will not receive any compensation.

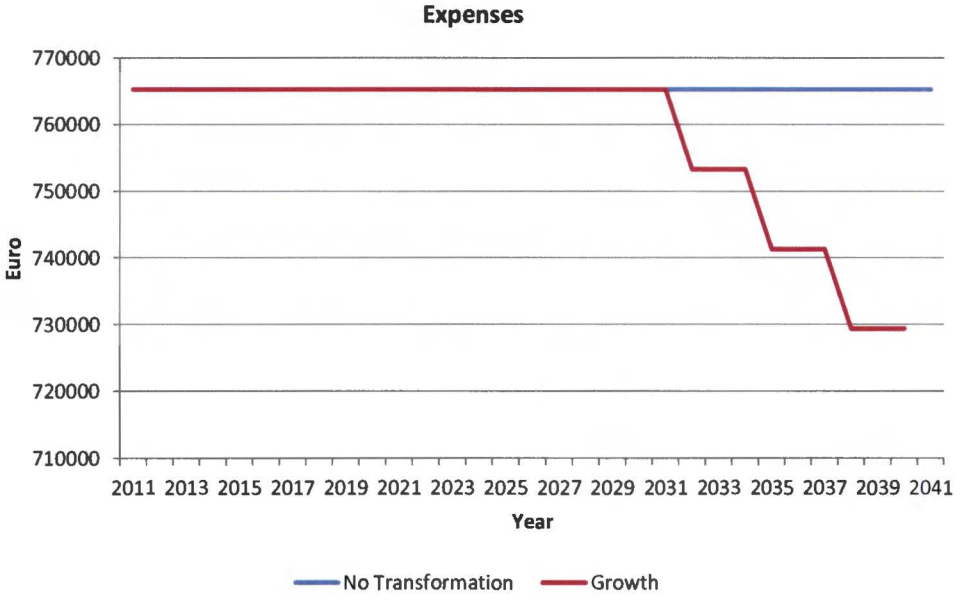


Figure 9-8 Expenses

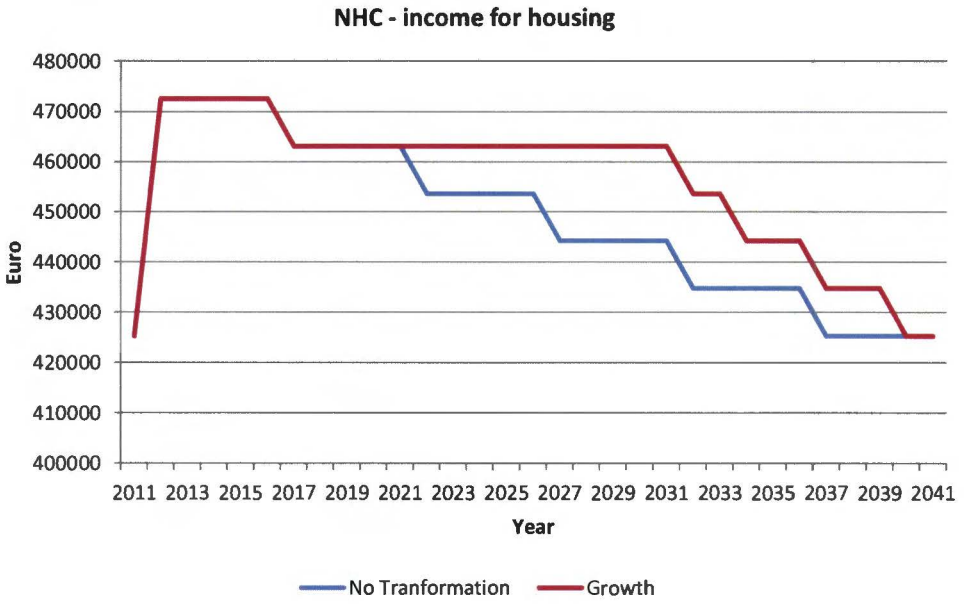


Figure 9-9 NHC - compensation for housing

From the previous results it can be seen that the transformation option has a positive influence on several variables. The percentage of beds that is occupied stays higher with the transformation option and also the expenses will decrease by doing so. Though, it must be noted that the transformation of only the rooms will not give the ideal outcome. The areas that are common used stay the same after transforming one or more rooms. If there is first 450 square meters of living room for 50 persons, after the transformation the same amount of square meters is uses by less people. This will make these square meters in comparison more expensive. And because of this the balance will turn as positive as wished.

9.3 Sensitivity analysis

The variables in the stocks and flows model are all influenced by uncertainty. To check the reliability of the simulation results it is important to perform a sensitivity analysis. Since system dynamics is a behaviour-oriented simulation discipline, sensitivity of behaviour pattern measures, such as equilibrium level or oscillation amplitude to the model parameters should be evaluated in order to explore the effect of parameter uncertainty on the behaviour patterns (Hekimoğlu and Barlas, 2010).

The first step in performing a sensitivity analysis is the one-variety sensitivity analysis which is conducted with "one-at-a-time approach" as stated by Saltelli et all. (As cited in Hekimoğlu and Barlas, 2010) By varying the input of a variable changes in the model output can be expected. These outcomes can be analysed to see which variables are the most influential. When a model is quit complex the one-variety sensitivity analysis is not sufficient. Simultaneous changes in more than one parameter value may create an unexpected output change because of the nonlinear relationships among different model components as stated by Sterman (as cited in Hekimoğlu and Barlas, 2010). So the next step after the one-variety analysis is the multi-variety sensitivity analysis. There are many different options to perform

a multi-variety sensitivity analysis. One option is the screening method from the study of Ford and Flynn (2005) (as cited in Hekimoğlu and Barlas, 2010). In screening method, correlation coefficients between each parameter and values of output variables at each time point are calculated and plotted against the simulation time. This plot provides information about the dynamic importance of model parameters during simulation (Hekimoğlu and Barlas, 2010). Based on this plot the dynamic behaviour of the system can be analysed and so the critical variables can be found.

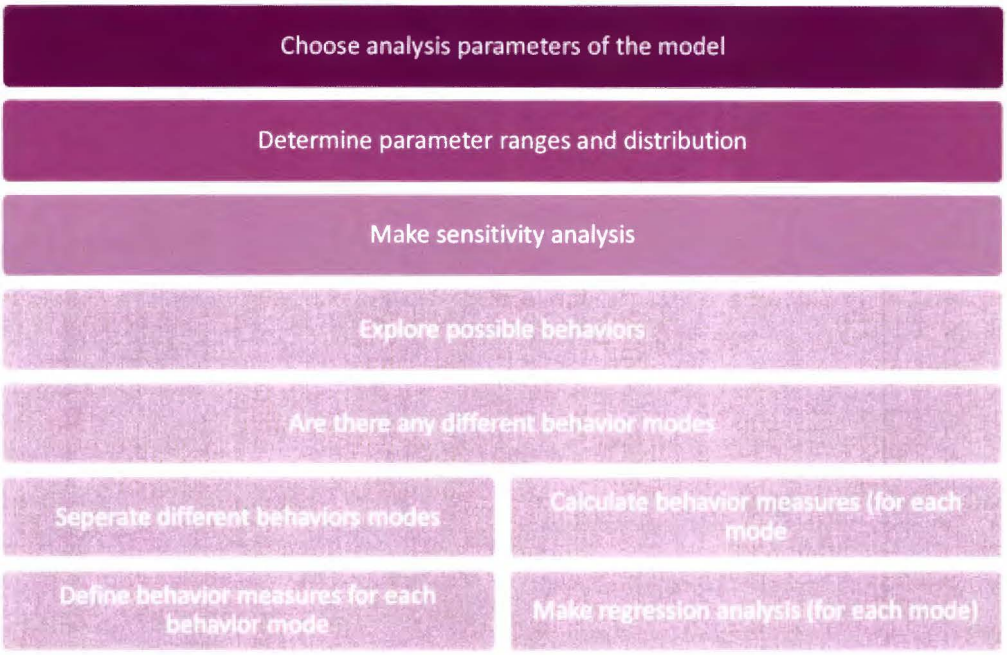


Figure 9-10 Behaviour sensitivity analysis algorithm (Reprinted from Hekimoğlu and Barlas, 2010)

In this case the sensitivity analysis is combined with a research to the optimal settings for a healthcare organization. By varying two variables it can be seen how sensitive the model is and with this at the same time the optimum can be reached.

9.3.1 Sensitivity test with optimal run

In the search for the most optimal combination of variables and the values of these variables an optimal run is conducted. During this run a two variables are changed until the most optimal result is retrieved. The two variables are the residence area and the amount of square meters that is transformed at once. The variation can be seen in Figure 9-11.

To compare the different outcomes with each other a couple of results are choosen. The first is the percentage of beds occupied; this must be of course as high as possible. Then there is the balance between the housing costs and the NHC – compensation for housing, the most preferable case is that this will be positive or at least around zero.

To be able to find these numbers the system dynamics model will be slightly adapted so that only the variables that influence the housing of an healthcare organization directly, are kept. This means for example that the overhead costs, stay costs and the personnel costs are

eliminated from the model and also the income for the given care is eliminated. In this case only the income and expenses are left over. The adapted model can be seen in the appendix on page 121.

Option	Residence Area	Option	Transformation
1	56.1 m^2 (case 5neek)	1	1 apartment
2	30 m^2	2	2 apartments
3	45 m^2	3	3 apartments

Figure 9-11 Run options

When the percentage of beds is studied then it can be seen that there are only three different outcomes for the nine different variations as can be seen in Figure 9-12. Only the amount of beds that are removed during a transformation have an influence on this. The best result gives the variation where only one bed is removed. Here 88% of the beds are still occupied at the end in contrary to the variation of 3 beds removed where the end percentage is 83%.

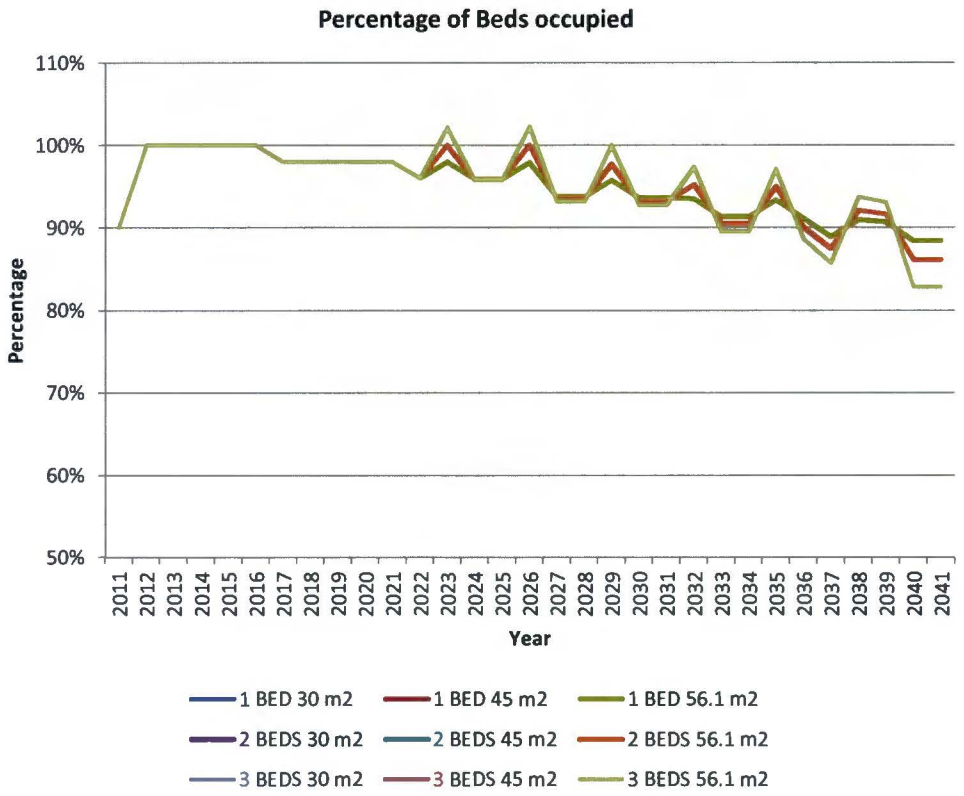


Figure 9-12 Optimal run, percentage of beds occupied

The balance has in contrary to the percentage of beds occupied nine different outcomes for the nine variations. The balance is the difference between the NHC – income for housing and the expenses that are related to the housing of an organization. Because the income is depending on the amount of beds that are occupied and the expenses are depending on the amount of square meters, a dynamic course of the balance can be seen. The best option for the less negative balance is the variation where one bed at a time is removed and the residential area is 30 square meters. This can be seen in Figure 9-13 as the highest line in the balance. The worst variation is that of 56.1 square meters residential area and one bed removed at a time. It must be noted that this is the case of Sneek.

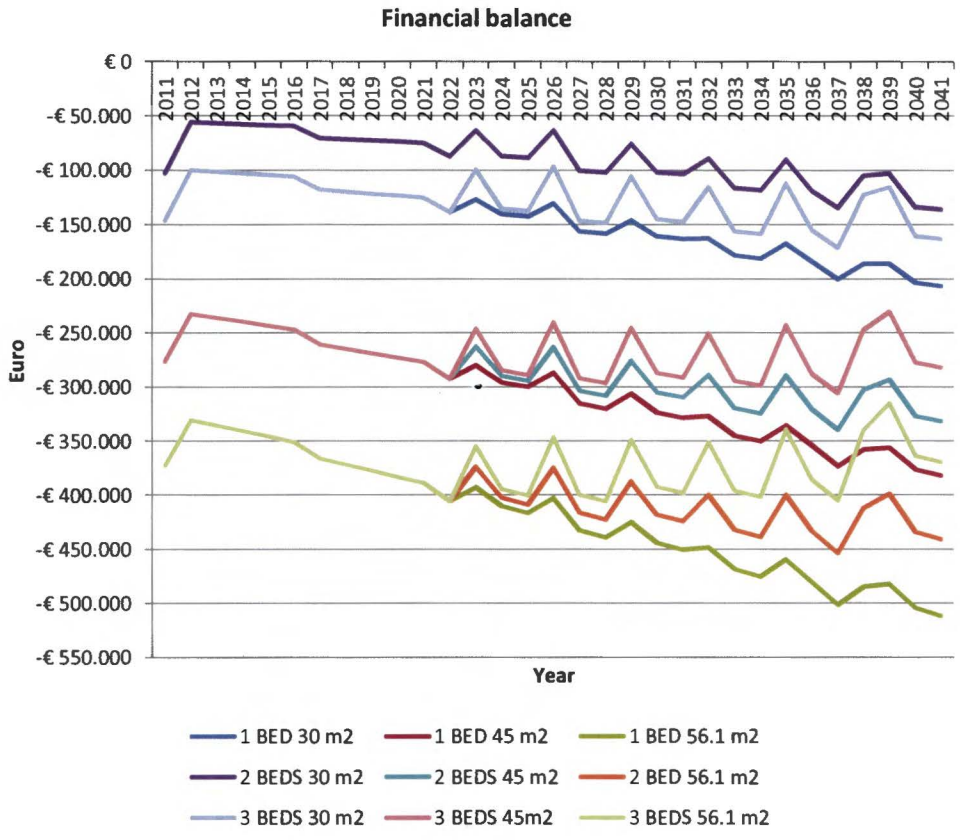


Figure 9-13 Optimal run, financial balance

In Figure 9-14 the balance of the vacant amount of square meters can be seen. It is striking that the course is almost identical for all variations. The vacancy balance is the balance between the NHC – compensation for vacancy and the expenses for the vacant square meters. When a bed is removed the expenses will decline immediately and because of this the course of the diagram fluctuates. The variation where the residential area is 56.1 m^2 and there are 3 beds removes at a time, is the most positive at the end of the run. This is remarkable because this variation has the highest vacancy at the end of the run. This can be explained by the fact that vacancy is solved in huge steps so that the vacancy time is shorter than in the case where only one bed at a time is removed.

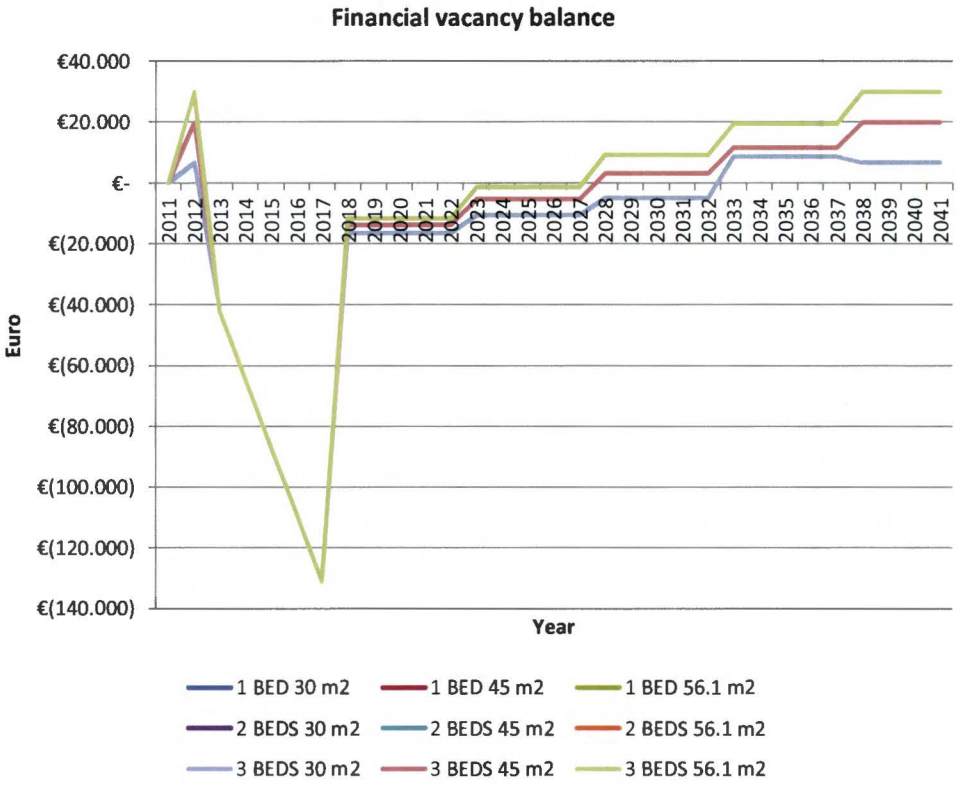


Figure 9-14 Optimal run, financial vacancy balance

9.3.2 Conclusion

The lowest percentage of vacancy can be seen in the variation where only one bed at a time is removed. In contrary to the best output for the balance, here the best variation is that of 56.1 m^2 residential area and where three beds are removed at a time. This is also the case for the balance of vacancy, here also the variation of 56.1 m^2 residential area and one bed removed at a time gives the best option.

For the sensitivity of the model it can be seen that the maximum beds removed at the same time are three. When more beds will be removed at the same time the amount of beds in the complex will be lower than the amount of beds occupied and this is of course not possible.

The amount of residential area influences a lot of parameters in the model. In Figure 9-12 it can be seen that the amount of square meters do not influence the percentage of beds occupied. Though, in Figure 9-14 it can be seen that this variable has influence on the vacancy balance. The higher the amount of square meters the lower the balance turns out. The changes in the balance are directly proportional to the changes in amount of square meters.

10 The business Case

All the information that is found in the earlier chapters can be the input for a business case. Nowadays healthcare organizations need to set up a business case when to see if there plan will be feasible. Because of the lack of experience in developing a business case it will be necessary to help them a little bit. The model that is developed can be used to produce the input for a business case. In the upcoming paragraphs a clear explanation is given what a business case is and how the results of the model can be used to set it up.

10.1 What is a business case?

The primary purpose of a business case is justifying the project on the basis of expected revenues, costs and risks. It also helps with setting up the goals, a strategy and a vision of a healthcare organization. A business case can help when an investment need to be made based on the goals, strategy and vision. Also the effects of an investment can be made specific for the whole organization. A business case can be created before a project is being developed but also when an organization detects that there is an operational problem. Examples of this are problems with the quality of the housing of an organization, the functional operation of a building is insufficient, the housing costs are too high, a discrepancy between the vision of an organization and the housing of the organization and of course when the competitive position need to be improved.

A business case is built up from two parts; the first one is the qualitative part. Here the strategy of the organization is explained and which visions and missions it wants to reach. This is done by studying the competitive position and the expected life cycle of the organization. Also the technical, commercial, financial and organizational risks are analysed so the organization can respond on this in an early stage in the process. The second part is the financial part where the expected expenses and revenues are studied for the whole life cycle of the organization. Here also some analyses are done to find the critical factor that can influence the process. Different scenarios are set up so that based on this a decision tree can be made. With the help of this tree the milestones can be defined that will be important during the life cycle.

10.2 How to set up a business case?

When setting up a business case a lot of analyses need to be performed. Examples of these analyses are the break-even analysis, impacts and effects analysis, cost / revenue analysis, value chain analysis, investment opportunities analysis, sensitivity analysis and trend analysis. All the information found while performing these analysis' can be the input for a business case. The information is in the form of marketing information, benchmarks and financial data as can see below in Table 10-1.

A lot of the information that is needed can be found by using the model that is developed in chapter 8. The demographical developments are modelled also the position on the market is a part of this. With the use of this a sales forecast can be developed.

The several benchmarks that are needed in the business case are used as parameters in the model. And with these parameters the financial data can be found. The personnel costs, the overhead costs, housing costs, revenues and profits and the taxes and insurances are all part

of the model. So when the parameters of a healthcare organization are put into the model then it is just one mouse click away to find all the necessary data.

Marketing information	Benchmarks	Financial data
• Demographical developments • Position on the market • Competitive position • Sales forecast	• Norms from the healthcare sector • Internal comparison • Current state versus future state	• Personnel costs • Overhead costs • Transport costs • Housing costs • Revenue and profits • Taxes and insurances

Table 10-1 Input business case (Source: draaijer+partners)

When all the information is found it is gathered into one report. In this report every part has its own chapter. In total the report exists of 6 chapters;

1. Management summary
2. Project description
3. Market, care concepts and competitive position
4. Cost/ revenue analysis
5. Risk analysis and sensitivity scenarios
6. Success and fail factors

When this report is finished a complete overview is created that can be used in several ways. The report can be handed over to a bank to get a loan but also when important decisions need to be made that have an influence on the life cycle of the project. The quality of the business case can be linked directly to the success or failure of a project.

10.3 Points of attention

While using a business case as a help for decision making it is important to pay attention on the duration of the decision making. In many cases the duration of making a decision is very long when a business case is used. The elaboration takes so much time and it will cost so much money that is not efficient anymore to elaborate about every little aspect. This will ask a lot of commitment of the organization.

A business case is also not very useable for very little projects. The business case is too complex to be useful for such a small project. It will take too much time and it will cost too much money in relation to its size.

It is also important that all the numbers will not give any false security. All the calculations that are done are of course not totally sure. There could always have been made some mistakes so that decisions can be made based on false information. It is therefore important to also make a decision based on experience.

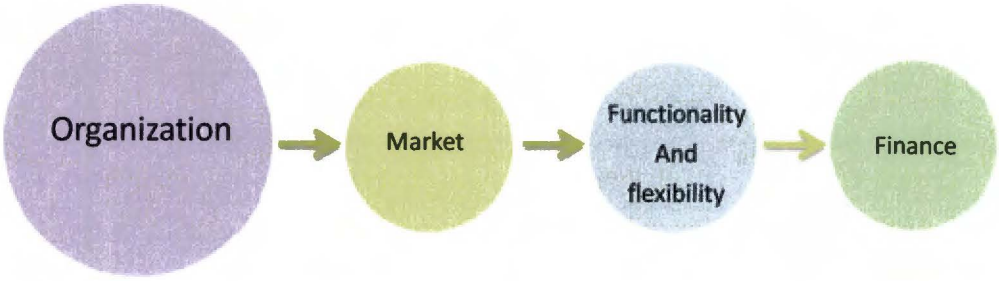
PART III
CONCLUSIONS AND RECOMMENDATIONS

11 Conclusion

First an overall conclusion will be given in relation to all the four control frameworks. After this each control framework will be discussed separately with its own conclusion. At the end an answer will be given to the research question as stated in the first chapter. Then, based on these conclusions, recommendations for healthcare organizations and for further research will be given in the next chapter.

Conclusion: organization

On the level of the organizational control framework couple of conclusions can be found. Each conclusion will be briefly explained below.



New way of thinking / demand driven thinking

Because of the introduction of the NHC compensation at the beginning of this year (2012) the responsibility of the housings costs has shifted. Earlier healthcare organizations would get compensations based on the amount of real estate that they had. From the 1st January 2012 only an occupied bed will generate a compensation for housing. This means that the healthcare organizations need to adapt a new way of thinking. This way of thinking will be and needs to be driven by the demand for care. By monitoring the demand for care it will be possible to anticipate on eventual changes. The anticipation starts at the organizational level. The conventional idea should be abandoned that a building will maintain the same function for its whole lifespan. So by adapting a flexible attitude as a healthcare organization, problems on several levels and in several control frameworks in the future can be avoided

The outcome of the questionnaire showed that healthcare organizations still steer the real estate development process on the costs of housing and operating. This says that the focus of a healthcare organization lays on a short period and they don't look at the consequences of such decision on a longer term. If they really want to adopt the new way of thinking, the focus must lay more on the underlying factors that determine these costs. This means that the process needs to be steered much more from the organization itself. When the organization has a good base than the operating costs and housings costs will reduce as a logical reaction to this.

Contract forms

As already mentioned in the part above it will be necessary to adopt a flexible attitude as a healthcare organization, this in regards to the possibility to create flexible real estate. But a new way of thinking alone will not be enough to let this succeed, creating more flexible housing contracts will be a necessity as well. When a healthcare organization rents its

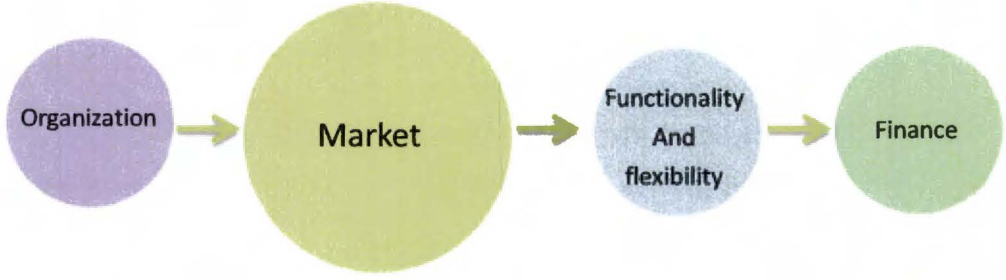
complex from a housing corporation this is often bound to a contract of about 30 years but this need to change. When it will be likely that vacancy will appear then the healthcare organization need to be able to anticipate to this situation by terminating the contract. This may not need to be the contract for the entire complex but can also be the termination of the agreement for one room or one section of the complex. A solution to this can be the option for a healthcare organization to rent each apartment separately with each its own contract. Then when this is combined with a flexible period of notice, a healthcare organization can choose to remove an apartment from its stock whenever it becomes vacant for a longer period.

Strategic real estate strategy

When the way of thinking is adopted and there will be a new contract form, then there will be a lot of questions that a healthcare organisation constantly needs to ask itself. The bed that is empty, how long will it stay empty? What are we going to do with this? Will we let it be empty or will we transform it? And based on what numbers do we need to make such a decision? To make sure it is clear how to act in relation to the housing of a healthcare organization it will be useful to adapt a strategic real estate strategy. This creates a uniform way of acting and also a steady base where decisions can be built on. Setting up such a strategy asks for a lot of knowledge about the subject and this is something what many healthcare organizations still miss. This means that they need to contract a third party to help them with gathering the knowledge as for ample a housing advice agency. Or they need to obtain the knowledge themselves by hiring a housing specialist into their organization or following some courses with regard to the subject.

Conclusion: Market

Also on the level of the market control framework a couple conclusions can be found. Each conclusion can be found in the text below.



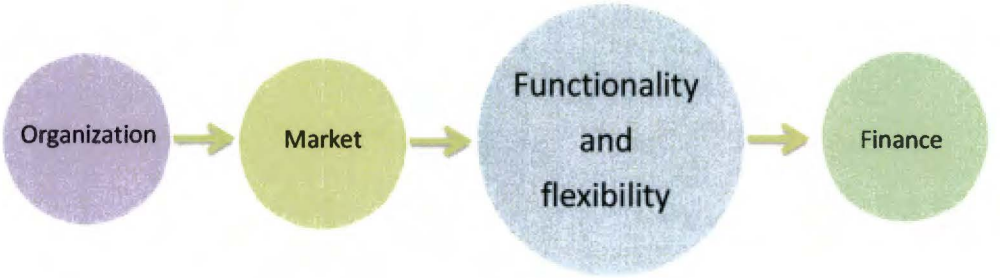
Monitor the market

The market is the most influential control framework. All the developments that take place in the market control framework have direct influence on the other control frameworks. This means that when a healthcare organization want to anticipate on the developments in this control framework it will be necessary to monitor the market carefully. It is also useful to set up several scenarios so that for all the possible events in the future an answer is thought trough. These scenarios can be an element in the strategic real estate strategy as mentioned before.

One option to make predictions about the developments is making use of the model that is developed. This model can make a prediction about the amount of care askers in the future based on three different scenarios.

Conclusion: Functionality and flexibility

'Functionality and flexibility' refers to the real estate of a healthcare organization. How can real estate contribute to a successful operating of a healthcare organization?



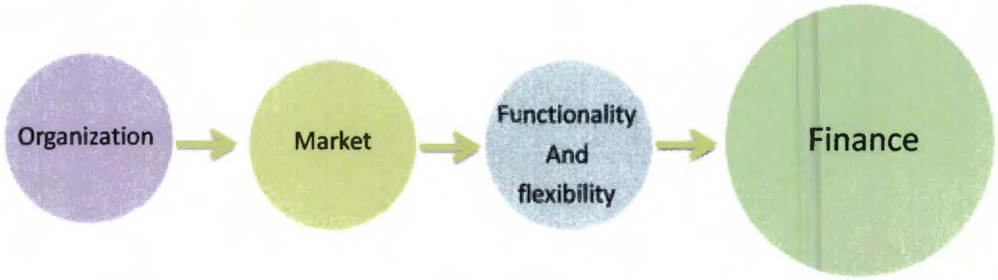
Flexible real estate

When a healthcare organization wants to anticipate on the market as earlier mentioned in the previous conclusions, it will be necessary to develop real estate that is functional and flexible. The results of the model show that by using flexible real estate, the dynamics in the demand for care can be absorbed by removing apartments from the stock. These interventions have a direct influence on the operating of a healthcare organization and its financial balance.

Anticipating on the dynamic society will ask for new flexible building concepts. These concepts need to make transformation as easy and as cheap as possible. When during the development process a choice is made to use a flexible building it will save transition costs in a later stadium. Most of the time these kinds of concepts will ask for a higher investment but these costs can be compensated by the transformation costs. For a healthcare organization it will sound quite illogical to make a higher investment because it will take some time to compensate these costs. To convince them to choose for such a concept the financial and strategic model can be used. The model can directly show what kind of consequences the decision for a flexible building has for the longer term on the financial balance. This is how the model can be used as a decision support model.

Conclusion: Finance

The conclusion of the control framework finance will not be some numbers of the income and expenses that the organization Philadelphia can expect. It will be a more general conclusion about all the connections between all the financial variables that decide the cash flow of a healthcare organization.



Anticipate on vacancy

The anticipation on vacancy is already discussed in the previous conclusions. In the conclusion of the finance in relation to this, important variables that influence the decision making in regards to vacancy will be given. In the financial and strategic decision support model that is created a consideration is made whether or not to transform an apartment into another function. This consideration is based several financial variables. First there are the operating costs that are connected to the amount of square meters that are vacant. The NHC – compensation for vacancy will cover a small part of these costs. Next to this there are the transition costs of the same vacant square meters. When the balance of the unused square meters exceeds the transition, the decision is made to transform an apartment into another function. When the transition costs are as a low a possible the decision will be made faster to transform an apartment, saving unnecessary operating costs for the vacant square meters.

Corporate asset

When healthcare organizations are going to realize that real estate can be used as a corporate asset, they will come to understand the necessity of a well thought real estate development process. They will see that higher investments in the beginning of the process can result in saving money later on in the process. The operating costs that can be saved in this way can then be used for the core business of the organization, what in this case is the execution of care. By doing this the quality of the given care will increase so that people stay satisfied longer and will stay in the complex longer as a result, with this less vacancy will occurring and less income being missed

Major maintenance

When the model turns out that a vacancy can be expected after several years, a decision can be made to transform all the apartments at once. This is especially useful at the moment that the design is divided in the different sections as already mentioned before. This will also mean that some apartments will already be transformed even if they aren't vacant. But doing all the transformations at once can save a lot of money and it will also minimize the amount of nuisance for the residents. For the apartments that are still occupied, a new complex can be found so that the transformation can take place.

In most complexes a major maintenance will take place after 15 years. This moment is a perfect moment to combine with an eventual transformation. The budget for this maintenance can then also be used for transformation. This reduces the net costs of the transformation. This ensures that the care organization after 15 years should incorporate a new decision point. What is the direction the healthcare organization is going and what are the expectations for vacancy the upcoming 15 years?

The overall conclusion

In the overall conclusion an answer will be given on the research question that was given in the first chapter:

How can a healthcare organization manage its real estate in such a way that the dynamic influences have a minimal effect on the functioning of an organization, and can be controlled so that the financial balance of the healthcare organization can absorb these changes?

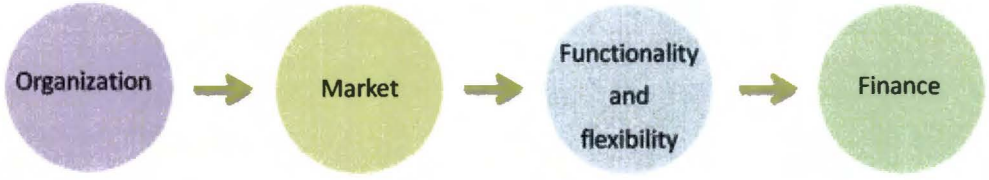


Table 11-1 The four control frameworks in relation to each other

It will be necessary for healthcare organization in order to respond to the dynamics of the market to develop functional and flexible real estate. With this functional and flexible real estate the dynamics of the market can be absorbed and the financial balance stays constant as a result. Firstly, this requires a flexible attitude of the organization. The conventional idea that a building will always remain the same function should be abandoned. It must be also be possible to deal with a change of function within a complex in a flexible manner. To change this, it will be important that contractual changes are made in order to succeed.

Flexibility can be seen as the main solution for all the problems in each stated control framework. Flexibility in the organization and flexibly in the real estate will create the possibility to react on the market and as a result the finance will benefit from this. The underlying solution for this can then be seen in the new way of thinking. This will ask a lot of changing from healthcare organizations but in return it will give them a lot of positive results in all the four control frameworks.

12 Recommendations

Based on findings during the development process of the model and during the literature study some recommendations can be given. First the recommendations for further research are discussed and after this some recommendations for healthcare organizations in general and specific for the case in Sneek will be given.

RECOMMENDATIONS FOR FURTHER RESEARCH

The model that is developed uses a lot of information that is gathered from the literature and by conversations with experts. Though, some information was hard to find so it was necessary to make some assumptions. To make the model more precise it will be necessary to do some further research to optimize the model. The recommendations for further research are listed below:

→ Investigation into transition costs

In the transformation part of the model a consideration is made between the operating costs of the vacant square meters en the transition costs for the same square meters. The operating costs can be calculated pretty precise based on the information from the literature and information from draaijer+partners. Though, the costs for transition are not quit clear. A literature study is done to try to find the transition costs but didn't result in any information. After this several experts are asked to give an estimation in these costs per square meter, also this was not really clear for them. So when a more accurate consideration will be made than a study needs to be performed to find the transition costs. This will be something that is quit hard to find because every situation is unique, so, every situation will have different transition costs.

→ Examination of the demand for care

The demand for care in the model is based on some numbers that are proved by 'MEE' Friesland. They researched the developments in the demand for care for the last three years. Based on this the population is modelled for the upcoming 30 years. To make this prediction more precise this needs to be investigated far more clearly. More developments that influence the demand for care need to be incorporated into the model. These developments can for example be the improvements in technology that influence the period that people can stay at home without going to a care home. Another influence can be the regulations of the government that will decide that some ZZPs will not receive a compensation for housing anymore. This discussion is already there for the first four ZZPs for people with a mental disability.

→ More extensive consideration underpinning

The consideration part of the model is working based on the financial outcomes of the model. When the operating costs for the vacant square meters exceed the transition costs than one bed is removed from the stock. Of course it is possible to base that consideration on more than only the financial side of a project. One option can be the quality of the complex. When this doesn't meet the requirements anymore it can be possible to make another decision based on this outcome. One option then can be to move to a new complex and transform the whole complex to another function.

→ Make the model useable for healthcare organizations themselves

At this moment the model is quit extensive and difficult to understand for a management team of a healthcare organization. When for example a simple interface would be created it will be possible for the healthcare organization to use it during the operational phase. They would only have to fill in the kind of ZZPs that are present the expected demand for care and the operating and transition costs and by this they can calculate what decision to make the best. Even better would be if the model would be linked to a database on the internet so that on every moment the model is up to date and ready to use. The model could then self-give a warning when a certain decision needs to be made. Based on this warning the management team can decide if they will follow the advice.

RECOMMENDATIONS FOR HEALTHCARE ORGANIZATIONS

From the outcome of the model a few recommendations can be given to healthcare organizations that are going to build a new complex. These recommendations can help to create a more flexible and successful design, and make sure that the complex also will function on its best during the operational phase. The recommendations are listed below:

→ Clear communication

Of course, clear communication is important during each kind of project but it is important to emphasize because it concerns projects that focuses on clients. All parties that are concerned in the project need to be able to give their opinion about the new to build complex. When this at the beginning of the process is thoroughly done this can give profit in many ways at the end of the project. Employees and clients will work and live there with satisfaction and this influences also the organization in a positive way.

Because the changes in the legislation of compensations only recently have been introduced it is important that all parties are informed of the consequences. The housing compensation ensures that there need to be built according to strict space requirements. When the architect is not aware of this fact the design will need to be adapted afterwards. This will take time and so also money. When all the new regulations and the consequences that are related to this are summarized into one short manual, this could help to improve and accelerate the process.

→ Anticipate

We are all living in a world that is constantly subject to change and because of this we can be sure that change will happen. To react on this in the best way it will be necessary to make a plan on how to act. The model that is developed can be a help in doing this but it ask for more. One thing is setting up some scenarios that could happen, by doing this; different plans can be set up for every possible situation.

Also the design can be tested with the help of these scenarios. What will happen when the demand for care will abrupt decline and vacancy will appear? With wall need to be removed or which rooms can be connected so that a new apartment is developed. It is often claimed that a design is flexible, but is that the case? By developing multiple floor maps it can be showed that it can work.

One option for a flexible building is the 'RUBIX' hybrid building concept:

In the RUBIX homes the configuration, organization and staging can be modified at any time which may be continuously indented to changing demand. Therefore the RUBIX hybrid building concept is the sustainable solution for reducing the gap between supply and demand in the housing market. (More information can be found in the appendix on page 123)

There are many solutions to make a building flexible; every project will have its own best solution.

→ Ask for help

The last but not the least recommendation is to ask for help when it is necessary. The new compensations have only been introduced for a couple of months so it will not be a shame if not everything is clear. Minor decisions at the beginning of a project can have a major impact on the functioning of a healthcare complex later on. By involving an expert at the beginning of a project it will be possible to save time and money. And especially the money that is saved can be used for the core business of the organizations; providing care for the clients!

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14 Appendix

Appendix 1. Mental disability ZZP 1 – 8 descriptions

ZZP 1		
Residence details		
Setting	Sheltered housing small housing type or independent residence	Total time per week:
Night service	Watch on call	Exclusive daily activities: 5.0 to 7.0 hours
Supply conditions	According to agreement and immediately available or continuously nearby	Including daily activities: 10.0 to 12.0 hours
ZZP 2		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 7,5 to 9,5 hours
Supply conditions	continuously nearby	Including daily activities: 12,5 to 15,0 hours
ZZP 3		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 10,5 to 13,0 hours
Supply conditions	continuously nearby	Including daily activities: 15,0 to 18,5 hours
ZZP 4		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 12,5 to 15,5 hours
Supply conditions	continuously nearby	Including daily activities: 17,0 to 21,0 hours
ZZP 5		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 16,0 to 20,0 hours
Supply conditions	Constantly nearby or 24 hours a day present	Including daily activities: 22,0 to 27,0 hours
ZZP 6		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 15,0 to 18,5 hours
Supply conditions	Constantly nearby	Including daily activities: 21,0 to 26,0 hours

ZZP 7		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 20,5 to 25,0 hours
Supply conditions	24 hours a day present	Including daily activities: 30,5 to 37,0 hours
ZZP 8		
Residence details		
Setting	Sheltered housing	Total time per week:
Night service	Watching or sleeping guard	Exclusive daily activities: 20,0 to 24,5 hours
Supply conditions	Constantly nearby or 24 hours a day present.	Including daily activities: 26,0 to 32,0 hours

Table 14-1 Description mentally disabled ZZPs 1- 8 (bureau HHM, 2011)

Appendix 2. Personnel hours and costs

Based on policy CA-300-476 and the document 'Overzicht uren en prijzen zzp 2012' made by the 'Nederlandse Zorg Autoriteit' (NZa) the personnel hours and personnel costs are calculated for the sector for people with a mental disability, per ZZP. First the meaning of the abbreviations is given in the Table 14-2 below. Also the costs per minute are given so that together with the information from Table 14-3 and Table 14-4 the costs per function can be calculated. These calculations can be found in the Table 14-5 till Table 14-8. Then at the end all the costs all summed up so that the total costs per ZZP can be used as input for the model.

Function	Meaning	Cost price per minute excl. VB
PV	Personal care	€ 0,70
OB-alg	Supportive guidance - general	€ 0,72
VP	Nursing	€ 0,72
AB-alg	Activating guidance	€ 0,79
BH	Therapy	€ 1,46
OB-dag	Supportive guidance - day	€ 0,72
VB	Stay	
DB	daytime activities	

Table 14-2 Abbreviations and costs per function

	ZZP	Hours OB per week	Hours PV per week	Hours VP per week	Hours AB per week	Total amount of hours residential care per week
1	VG	5,93				5,93
2	VG	8,59				8,59
3	VG	10,01	0,87			10,88
4	VG	10,01	2,58	0,44		13,03
5	VG	10,43	4,97	1,32		16,71
6	VG	13,49	0,93		0,93	15,36
7	VG	11,14	4,03	2,07	3,89	21,12
8	VG	8,13	10,49	2,4		21,02

Table 14-3 Hours per function per ZZP needed

	ZZP	OB-dag or AB-dag	% clients with DB	% clients without DB	Hours when DB per week	Hours BH per week
1	VG	OB	37%	63%	5,17	
2	VG	OB	49%	51%	5,17	
3	VG	OB	66%	34%	5,17	0,72
4	VG	OB	79%	21%	5,17	0,85
5	VG	OB/AB	88%	12%	6,76	1,24
6	VG	OB/AB	71%	29%	6,76	1,31
7	VG	AB	87%	13%	10,91	1,7
8	VG	OB/AB	88%	12%	6,76	1,24

Table 14-4 Hours of personnel help per function per ZZP needed

	ZZP	Minutes OB per week	Minutes OB per day	Minutes OB per year	Costs per year
1	VG	355,8	50,83	18552	€ 13.435,05
2	VG	515,4	73,63	26874	€ 19.461,57
3	VG	600,6	85,80	31317	€ 22.678,73
4	VG	600,6	85,80	31317	€ 22.678,73
5	VG	625,8	89,40	32631	€ 23.630,28
6	VG	809,4	115,63	42204	€ 30.563,04
7	VG	668,4	95,49	34852	€ 25.238,86
8	VG	487,8	69,69	25435	€ 18.419,39

Table 14-5 Costs of supportive guidance per year

0	ZZP	Minutes PV per week	Minutes PV per day	Minutes PV per year	Costs per year
1	VG	0	0	0	€ -
2	VG	0	0	0	€ -
3	VG	52,20	7,46	2721,86	€ 1.893,05
4	VG	154,80	22,11	8071,71	€ 5.613,88
5	VG	298,20	42,60	15549,00	€ 10.814,33
6	VG	55,80	7,97	2909,57	€ 2.023,61
7	VG	241,80	34,54	12608,14	€ 8.768,96
8	VG	629,40	89,91	32818,71	€ 22.825,42

Table 14-6 Costs of personnel care per year

	ZZP	Minutes VP per week	Minutes VP per day	Minutes VP per year	Costs per year
1	VG	0	0	0	- €
2	VG	0	0	0	- €
3	VG	0	0	0	- €
4	VG	26,4	3,77	1376,57	988,38 €
5	VG	79,2	11,31	4129,71	2.965,13 €
6	VG	0	0,00	0,00	- €
7	VG	124,2	17,74	6476,14	4.649,87 €
8	VG	144	20,57	7508,57	5.391,15 €

Table 14-7 Costs of nursing per year

	ZZP	Minutes AB per week	Minutes AB per day	Minutes AB per Year	Costs per year
1	VG	0	0	0	- €
2	VG	0	0	0	- €
3	VG	0	0	0	- €
4	VG	0	0	0	- €
5	VG	0	0	0	- €
6	VG	55,80	7,97	2909,57	2.089,07 €
7	VG	233,40	33,34	12170,14	8.738,16 €
8	VG	0	0	0	- €

Table 14-8 Costs of activating guidance per year

	ZZP	Hours day time activities per week	Minutes day time activities per week	Minutes day time activities per day	Costs day time activities/ year
1	VG	5,17	1861,20	265,89	70.279,13 €
2	VG	5,17	1861,20	265,89	70.279,13 €
3	VG	5,17	1861,20	265,89	70.279,13 €
4	VG	5,17	1861,20	265,89	70.279,13 €
5	VG	6,76	2433,60	347,66	100.796,81 €
6	VG	6,76	2433,60	347,66	100.796,81 €
7	VG	10,91	3927,60	561,09	162.676,52 €
8	VG	6,76	2433,60	347,66	100.796,81 €

Table 14-9 Costs of day time activities per year

	ZZP	Hours therapy per week	Minutes therapy per week	Minutes therapy per day	Costs therapy per year
1	VG				
2	VG				
3	VG	0,72	43,2	6,17	8,99 €
4	VG	0,85	51	7,29	10,61 €
5	VG	1,24	74,4	10,63	15,48 €
6	VG	1,31	78,6	11,23	16,35 €
7	VG	1,7	102	14,57	21,22 €
8	VG	1,24	74,4	10,63	15,48 €

Table 14-10 Costs of therapy per year

	ZZP	Total costs (AB, OB, VP, PV) per year	Total costs with day time activities	Total costs with therapy	Total costs with day time activities and therapy
1	VG	€ 13.435,05	83.714,18 €	€ 13.435,05	€ 83.714,18
2	VG	€ 19.461,57	89.740,70 €	€ 19.461,57	€ 89.740,70
3	VG	€ 24.571,78	94.850,91 €	€ 24.580,77	€ 94.859,90
4	VG	€ 29.280,98	99.560,12 €	€ 29.291,59	€ 99.570,73
5	VG	€ 37.409,75	138.206,56 €	€ 37.425,23	€ 138.222,04
6	VG	€ 34.675,72	135.472,53 €	€ 34.692,07	€ 135.488,89
7	VG	€ 47.395,86	210.072,38 €	€ 47.417,08	€ 210.093,60
8	VG	€ 46.635,96	147.432,77 €	€ 46.651,44	€ 147.448,25

Table 14-11 Total personnel costs per ZZP per year

Appendix 3. Key figures construction costs and amount of square meters

TNO has carried out a survey into the construction costs of care buildings. Per building type they have set a standard amount of square meters per function. Also the costs per square meter and per function are given. In Table 14-12 below the GFA per function for mentally disabled care is given. In Table 14-13 the principles for the construction costs calculation are given. With this information the construction costs can be calculated with the help of the costs per square meters, which can be found in Table 14-14.

Category (performance requirements)	AWBZ-function	accommodation concept (performance requirements)	Building type	GFA (m^2 p.p.)
Light	Stay	Individual (living room / walk in	Apartment	From 63,0 to 76,3
	Supportive guidance		Workplace day care	From 13,5 to 21,2
	Supportive services		Office (central desk)	2,9
Heavy	Stay	small group accommodation mobile / not mobile	(clusters of) Small group homes	From 49,5 to 77,9
	Group stay in large-scale setting (including guidance and therapy) mobile		treatment Center SGLVG (monolith)	90,3
	Supportive guidance		Workplace day care	From 13,5 to 25,7
	Therapy and activating guidance		Treatment / therapy building	9,8
	Supporting Services		Office (central desk)	4,1
Protected	Section stay (including guidance and treatment) mobile		Forensic treatment clinic SGLVG +	94,7
	Supporting Services		Office (central desk)	5,6

Table 14-12 Overview gross m2 per building type derived from the cancelled performance requirements for mental disabled Reprinted from: TNO- rapport| Jaarbeeld Bouwkosten Zorgsector 2010, page 14.

Basic principles for calculations	Appart-ments	Group stay	Treatment / therapy building	Workplace day care	Treatment Centre SGLVG	Treatment clinic SGLVG + (protected)	Office central desk
Residence Area	63 - 76	50- 78	10	14 - 26	94	95	3 - 6
Average floor height	3,3	3,3	3,3	3,3	3,3	3,3	3,3
Building period	12	12	12	12	12	12	12
Management costs	14%	14%	14%	14%	14%	14%	14%
Unforeseen	4%	4%	4%	4%	4%	4%	4%
Increase in wage and price	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Starts costs	1,5%	1.5%	1,5%	1,5%	1,5%	1.5%	1,5%

Table 14-13 Principles for the construction cost calculation (source: TNO Jaarbeeld Bouwkosten Zorgstector 2010)

Costs per square meter gross floor area							
Land costs	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.
Capital costs	1,321	1,59	1,56	1,56	1,738	1,919	1,421
Additional costs	33	40	39	39	43	48	36
Inventory	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Management costs	185	223	218	218	243	269	199
Unforeseen	62	74	73	73	81	89	66
Increase in wage and price	19	23	23	23	25	28	21
Starts costs	20	24	23	23	26	29	21
Total investment costs	1,64	1,974	1,936	1,936	2,156	2,382	1,764

Table 14-14 Cost per m2 gross floor area for mentally disabled care (source: TNO Jaarbeeld Bouwkosten Zorgstector 2010)

Appendix 4. Philadelphia

The model is tested on a case of the healthcare organization Philadelphia. A description about the organization and the case can be found on the following pages.

4.1 History

Living in a protected environment

In the first half of the 20th century there are several institutes where people with intellectual disabilities reside. (At that time they were "mentally retarded" and before "idiots" called.) These institutions are usually founded by the churches.

The prevailing view is that people with intellectual disabilities can best live in a private, protected world where they do not need to compete against 'normal people'. The institutes are therefore often far from civilization. There live hundreds, sometimes over a thousand people together.

The Philadelphia Association

In the 50s and 60s, many parents ask whether a large institution outside society is the best place for their child. Many would rather see their child grow up in a normal environment. If they are not able to care for their child, they want to have them in the neighborhood and let them live as normally as possible. Joop Dondorp (1906-1996) is in those years a teacher in Special Education. He motivates parents to support each other and make their wishes known. This results in 1956 in the establishment of the national Parents Association Philadelphia (formerly Philadelphia Support, now Sien).

Support from each other

The association wants to bring parents together so they can exchange experiences and support each other. The association answers a great need by doing this. Parents are often emotionally because there is a taboo on mental retardation. They struggle with shame and powerlessness. The churches do not know well what to do with this

Financial worries

In addition to emotional problems, parents often have financial worries. There is no structural funding and if their child can go in a large institution, they need to pay for the nursing price themselves. If there is no money anymore, they are designated to the church. Only when such assistance is no longer sufficient, they can appeal to the Poor Law.

The Philadelphia Foundation

The association offers parents support and recognition. Soon, however, it shows that they also need other care facilities: close to home and small. For this the Philadelphia Foundation was founded.

The first success of the foundation is “Dennenoord”, a short stay home in Bennekom. It is the first of its kind in Europe. Dennenoord can be realized after the national campaign "A ton for a Mongol." Soon, across the country small houses are being developed, both for people with severe disability as people with lighter restrictions that will go during the day to a day center or sheltered workshop continue (the group homes).

Acknowledged player

The concept is a great succes. The small, accessible services are exactly what parents want. Joop Dondorp knows to involve people at crucial posts in the society in his work. He speaks for the radio andcrosses the country to win associates. Gradually Philadelphia is becoming a recognized player in the world of care for people with intellectual disabilities

Pioneering

In the early years Philadelphia is operating on loans, mortgages and grants. Parents need to go to the municipal for a contribution from the National Assistance (the AWBZ is coming to force around 1972) and the first employees must wait and see whether they receive their pay packet at the end of the month. It is pioneering. Pioneering to get some means, pioneering for new forms of care in consultation and pioneering with the government to realize the wishes of the parents. But it has success. The Philadelphia Foundation has grown into a national organization with approximately 8,200 employees and approximately 800 locations to support more than 8,000 disabled clients.

Good and modern support

Philadelphia wants from a Christian vision to help people with intellectual disabilities so that they can be happy and get the best from themselves. They have an eye for the situation and the possibilities of each individual client and maintain this in mind when it comes to care, housing, employment, education, day care and welfare. They also listen to what their clients and interest groups find of their support. In the Clients' Participation Council they can talk about it

Love of humanity

The word Philadelphia means brother - sister - family – and love of humanity. The name comes from the book of Revelation, in which a letter is addressed to one of the first Christian communities, Philadelphia. It is a small town that still has great power because God gives it to her. And God gives her open doors that no one will close. The parents also felt in the early days small and vulnerable, like Philadelphia. Would the doors open for them and their children?

Philadelphia is there for the care for people with intellectual disabilities. The inspiring element of their work, caring for each other, they want to continue in daily practice and continue to provide substance.

Mission and Vision

Philadelphia wants to help people with intellectual disabilities from a Christian vision so that they can be happy and get the best from themselves.

They do their job with responsibly, passion, attention and professionalism. They assume the possibilities of each client individual when it comes to healthcare, housing, work, learning, day care and welfare. The year 2012 will be marked by professionalism, deploying and positioning. Professionalize the staff, the care-related knowledge and application in daily care and services. Implement new processes, services and products that prepare the

organization for any changes in healthcare and focus on good care and service to the clients, positioning of Philadelphia in the changing force field in the sector.

4.2 Services of Philadelphia

Philadelphia treats people that are mentally disabled. In total there are 8 different kind of ZZPs created for mentally disabled people. Here are the official names of the ZZPs that Philadelphia treats:

1. Living with some guidance
2. Living with guidance
3. Living with guidance and care
4. Living with counselling and intensive care
5. Living with a lot of guidance and very much care
6. Living with intensive supervision, care and behaviour regulation
7. (Closed) live with very intensive supervision, care and behaviour regulation
8. Living with full support and care and nursing

To get a better understanding of the different ZZPs and how they differ from each other Table 14-15 is used. It schematically shows the intensity of the different ZZPs, so that an image is derived from the difference between the different packages. The '+' can be interpreted as follows: + + = survey / stimulate, + + + + + = help and + + + + + = takeover

	Guidance		Care			Nursing	problematic behaviour
ZZP	Social skills	Psychosocial functioning	Personal care	Mobility	Motility Performance		
VG 1	+++	+	+	0	0	0	+
VG 2	++++	++	+	0	0	0	+
VG 3	++++	+++	++	++	0	0	+
VG 4	++++	++++	+++	++	+	+	++
VG 5	+++++	+++++	++++++	++++	++	++	++
VG 6	+++++	++++	++	++	0	0	++++
VG 7	+++++ +++++	+++++ +++++	++ ++++	+ +++	0 ++	+ ++	+++++ +++++
VG 8	++++++	+++++	++++++	++++++	+++++	+++	+

Table 14-15 Differences in intensity between the VG-ZZPs. (bureau HHM, 2011)

Every ZZP has his own residential details as can be seen in Table 14-1 in the appendix. In this table is explained in which kind of setting the client is living, how they receive care during the night and what the supply conditions are when they need care. Next to this the total time per week is given that the clients need help or care. The higher the ZZP the more help they need per week.

For every ZZP Philadelphia receives a different compensation per week for providing the care, as can be seen in Table 14-16. Of course this compensation is linked to the intensity of the care that is provided. The compensation is divided in home care, day treatment, therapists and stay and that gives a total compensation per client per week.

	Home Care	Day treatment	Therapists	Stay	Total (incl. extra's)
ZZP 1	€ 36,06	€ 33,57	€ -	€ 26,77	€ 100,95
ZZP 2	€ 56,26	€ 33,57	€ -	€ 26,77	€ 118,20
ZZP 3	€ 65,98	€ 33,57	€ 15,04	€ 26,77	€ 148,79
ZZP 4	€ 78,58	€ 33,57	€ 16,65	€ 26,77	€ 163,91
ZZP 5	€ 100,37	€ 45,91	€ 21,33	€ 26,77	€ 204,62
ZZP 6	€ 93,74	€ 45,91	€ 22,18	€ 26,77	€ 198,47
ZZP 7	€ 129,69	€ 77,63	€ 37,00	€ 26,77	€ 274,07
ZZP 8	€ 125,20	€ 45,91	€ 21,33	€ 26,77	€ 231,04

Table 14-16 ZZP Compensations per day (Nederlandse Zorgautoriteit, 2011)

Next to the compensation that is given for the care Philadelphia also receives a compensation for the housing of their clients as can be seen in Table 14-17. This is also connected to the different ZZPs, because every client has different demands concerning the housing.

NHC	Approved for treatment			
	without day care		With day care	
	NHC- code	Total value per day	NHC-code	Total value per day
ZZP 1	NZ414	€ 21,26	NZ415	€ 27,73
ZZP 2	NZ424	€ 21,26	NZ425	€ 27,73
ZZP 3	NZ430	€ 21,26	NZ431	€ 27,73
ZZP 4	NZ440	€ 21,26	NZ441	€ 27,73
ZZP 5	NZ454	€ 19,41	NZ455	€ 27,11
ZZP 6	NZ460	€ 19,41	NZ461	€ 27,11
ZZP 7	NZ470	€ 19,41	NZ471	€ 27,11
ZZP 8	NZ480	€ 26,15	NZ481	€ 35,49

Table 14-17 NHC compensations (Nederlandse Zorgautoriteit, 2011)

When the compensations are connected to demand for the given care in the future an estimation can be made about the income of Philadelphia in the future. For the demand it is important that an estimation is made for the specific region Philadelphia is located in. For this case it is about a project situated in area of Sneek, Friesland. It is also important that the demand for care is examined for the care that Philadelphia is providing, ZZP VG 1 – 8. This demand is explored in the next paragraph.

4.3 Case Sneek

The new location Breewijd-Marsdiep has a combination of a number of groups in the age group 20-60 years. It covers a total of 50 clients with moderate to severe mental disability in combination with difficult to understand behaviour. The ZZP indications range from ZZP 3 to ZZP 7. They live in suitable care groups of about 8 people. The location will fall in the future under the Intensive Care division. As regards housing marketability and adaptability are keywords.

The design

At this moment the development process of the case in Sneek is in the stage of the preliminary design. This design can be seen in Figure 14-1. In this design there is a distinction made based on the kind of areas that are used in the model; residential area, supportive counselling area, supportive services area and the treatment and activating guidance area. The amount of square meters can be seen in Table 14-18 and these amounts are also used during the runs of the model based on the three scenarios.

Area	Amount of square meters per client
Residential Area	68.8
Supportive counselling area	6.3
Supportive services area	9.72
Treatment and activating guidance area	3.14

Table 14-18 Floor spaces different areas per client

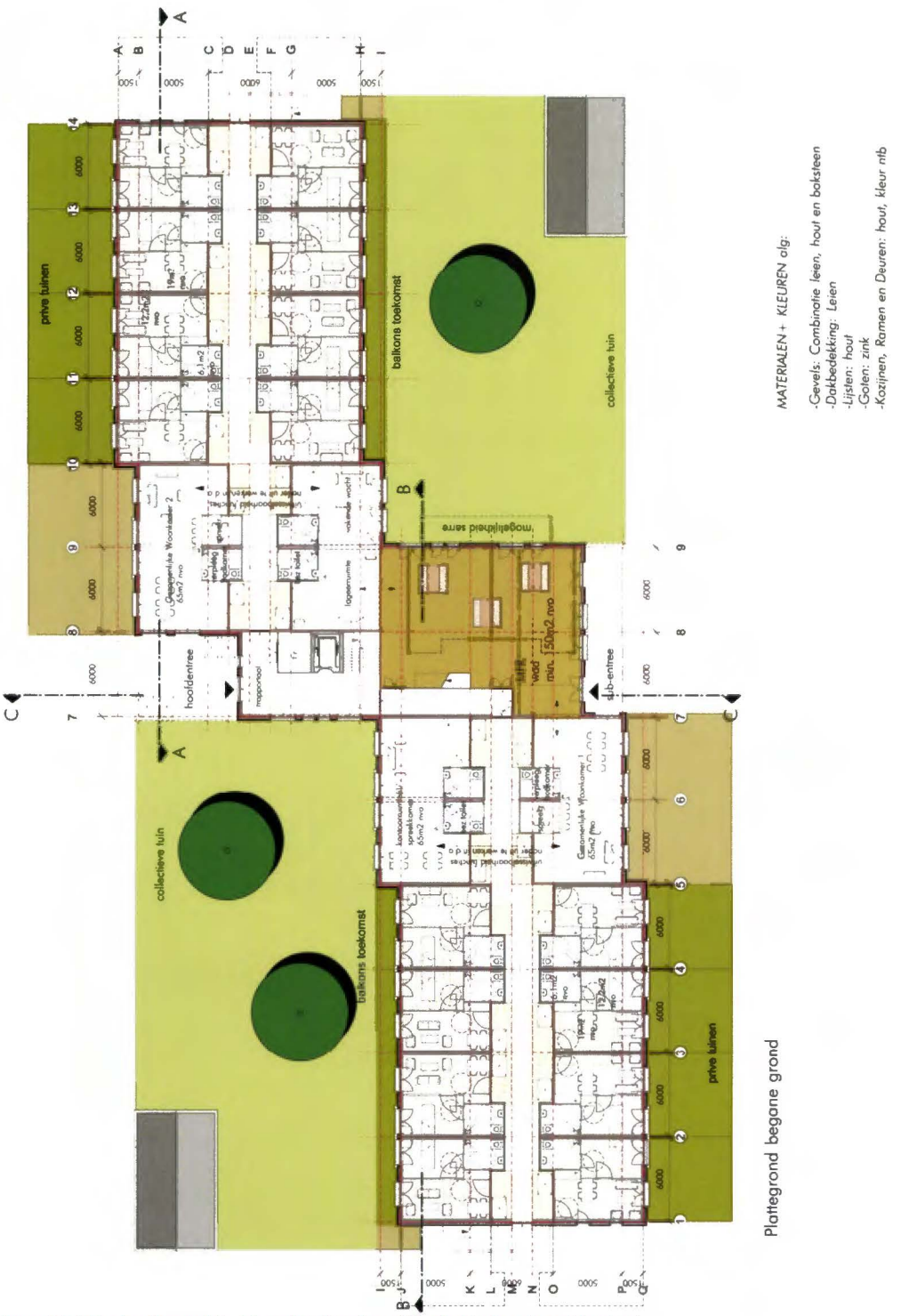


Figure 14-1 Design Breewijd – Marsdiep (Designed by: Achterbosch architecten)

Appendix 5. Elaboration questionnaire

Below the questionnaire can be seen which has been send to 26 employees of the healthcare organization Philadelphia. All employees who were approached are in their daily work involved in the housing of the organization. 13 Questionnaires were filled in and sent back. The results are based on these questionnaires.

Geachte medewerker van Philadelphia,

Op uw beeldscherm staat een enquête die is gemaakt is voor mijn afstudeeronderzoek "Het managen van het vastgoedontwikkelingsproces voor de gezondheidszorg." Het vastgoedontwikkelingsproces wordt gebaseerd op de uitgangspunten van een zorgorganisatie en dit is voor elke zorgorganisatie weer anders. Om voor Philadelphia deze uitgangspunten te kunnen bepalen heb ik een enquête gemaakt. Aan de hand van deze uitgangspunten kan Philadelphia in de toekomst op een meer gestandaardiseerde manier, beslissingen maken over huisvestingsvraagstukken, op basis van een nog op te zetten huisvestingsstrategie.

Om een zo goed mogelijk beeld te krijgen wat de belangrijkste uitgangspunten voor Philadelphia zijn, wordt ook uw mening op prijs gesteld. Ik hoop dan ook dat u 15 minuten de tijd heeft voor mijn onderzoek. De vragenlijst is hieronder te vinden.(Mocht u behoefte hebben aan meer uitleg bij de uitgangspunten dan kunt u deze vinden in de bijlage van de e-mail u heeft ontvangen.)

Alvast hartelijke bedankt voor uw medewerking.

Met vriendelijke groet,

Manon Bodenstaff

1. Hoe belangrijk vindt u de 4 sturingskaders voor huisvesting ten opzichte van elkaar? *

Bijvoorbeeld: Het sturingskader Markt is zeer meer van belang ten opzichte van de Financien

	Zeer meer van belang	Meer van belang	Even belangrijk	Minder van belang	Zeer minder van belang
Markt ten opzichte van Financiën	○	○	○	○	○
Markt ten opzichte van Functionaliteit en Flexibiliteit	○	○	○	○	○
Markt ten opzichte van Organisatie	○	○	○	○	○
Financien ten opzichte van Functionaliteit en Flexibiliteit	○	○	○	○	○
Financiën ten opzichte van Organisatie	○	○	○	○	○
Functionaliteit en Flexibiliteit ten opzichte van Organisatie	○	○	○	○	○

2. Hoe belangrijk vindt u de criteria uit het sturingskader Markt voor het opzetten van een huisvestingsstrategie ten opzichte van elkaar? *

Bijvoorbeeld: Het criteria Capaciteit is even belangrijk als de Verspreiding van de locaties

	Zeer meer van belang	Meer van belang	Even belangrijk	Minder van belang	Zeer minder van belang
Capaciteit ten opzichte van Verspreiding locaties	○	○	○	○	○
Capaciteit ten opzichte van Interactie met omgeving	○	○	○	○	○
Capaciteit ten opzichte van Marktpositie	○	○	○	○	○
Capaciteit ten opzichte van Samenwerken met derden	○	○	○	○	○
Verspreiding locaties ten opzichte van Interactie met omgeving	○	○	○	○	○
Verspreiding locaties ten opzichte van Markpositie	○	○	○	○	○
Verspreiding locaties ten opzichte van Samenwerken met derden	○	○	○	○	○
Verspreiding locaties ten opzichte van Locatie	○	○	○	○	○
Interactie met omgeving ten opzichte van Marktpositie	○	○	○	○	○
Interactie met omgeving ten opzichte van Samenwerken met derden	○	○	○	○	○
Interactie met omgeving ten opzichte van Locatie	○	○	○	○	○
Marktpositie ten opzichte van Samenwerken met derden	○	○	○	○	○
Marktpositie ten opzichte van Locatie	○	○	○	○	○
Samenwerken met derden ten opzichte van Locatie	○	○	○	○	○

3. Hoe belangrijk vindt u de criteria uit het sturingskader Financiën voor het opzetten van een huisvestingsstrategie, ten opzichte van elkaar? *

Bijvoorbeeld: Het criteria Huisvestingskosten is minder van belang dan de exploitatiekosten

	Zeer meer van belang	Meer van belang	Even belangrijk	Minder van belang	Zeer minder van belang
Huisvestingskosten ten opzichte van Exploitatiekosten	○	○	○	○	○
Huisvestingskosten ten opzichte van Omzet	○	○	○	○	○
Huisvestingskosten ten opzichte van Personeelskosten	○	○	○	○	○
Exploitatiekosten ten opzichte van Omzet	○	○	○	○	○
Exploitatiekosten ten opzichte van Personeelskosten	○	○	○	○	○
Omzet ten opzichte van Personeelskosten	○	○	○	○	○

4. Hoe belangrijk vindt u de criteria uit het sturingskader Functionaliteit en Flexibiliteit voor het opzetten van een huisvestingsstrategie, ten opzichte van elkaar? *

Bijvoorbeeld: Het criteria functionele kwaliteit is meer van belang dan de Duurzaamheid

	Zeer meer van belang	Meer van belang	Even belangrijk	Minder van belang	Zeer minder van belang
Functionele kwaliteit ten opzichte van Duurzaamheid	○	○	○	○	○
Functionele kwaliteit ten opzichte van Flexibiliteit	○	○	○	○	○
Functionele kwaliteit ten opzichte van Onbestemdheid	○	○	○	○	○
Functionele kwaliteit ten opzichte van Effectiviteit	○	○	○	○	○
Duurzaamheid ten opzichte van Flexibiliteit	○	○	○	○	○
Duurzaamheid ten opzichte van Onbestemdheid	○	○	○	○	○
Duurzaamheid ten opzichte van Effectiviteit	○	○	○	○	○
Flexibiliteit ten opzichte van Onbestemdheid	○	○	○	○	○
Flexibiliteit ten opzichte van Effectiviteit	○	○	○	○	○
Onbestemdheid ten opzichte van Effectiviteit	○	○	○	○	○

5. Hoe belangrijk vindt u de criteria uit het sturingskader Organisatie voor het opzetten van een huisvestingsstrategie, ten opzichte van elkaar? *

Bijvoorbeeld: Het criteria Imago is even belangrijk als Architectuur

	Zeer meer van belang	Meer van beland	Even belangrijk	Minder van belang	Zeer minder van belang
Imago ten opzichte van Architectuur	○	○	○	○	○
Imago ten opzichte van Corporate Identity	○	○	○	○	○
Imago ten opzichte van Medewerkerswaarde	○	○	○	○	○
Imago ten opzichte van Clientwaarde	○	○	○	○	○
Architectuur ten opzichte van Corporate Identity	○	○	○	○	○
Architectuur ten opzichte van Medewerkerswaarde	○	○	○	○	○
Architectuur ten opzichte van Clientwaarde	○	○	○	○	○
Corporate Identity ten opzichte van Medewerkerswaarde	○	○	○	○	○
Corporate Identity ten opzichte van Clientwaarde	○	○	○	○	○
Medewerkerswaarde ten opzichte van Clientwaarde	○	○	○	○	○

Figure 14-2 Questionnaire Philadelphia

5.1 Explanation of criteria

To ensure that every person who fills in the questionnaire interprets the given criteria in the same way an annex with an explanation of the criteria is attached to the questionnaire. This annex can be seen in Table 14-19 below.

Criteria	Betekenis
Capaciteit	De mogelijkheid om in te spelen op de zorgvraag
Verspreiding locaties	Door de verspreiding van de verschillende locaties wordt de markt vergroot
Interactie met omgeving	De mate waarin de zorgorganisatie(op complex niveau) en de omgeving met elkaar samenleven en elkaar versterken
Marktpositie	De positie op de zorgmarkt
Samenwerken met derden	Door de samenwerking met derden wordt de bekendheid vergroot en daarmee de markt
Locatie	De locatie binnen een dorp of een stad waarop een complex wordt gevestigd
Huisvestingskosten	De kosten die gebonden zijn aan de huisvesting van een zorgorganisatie (zorgcomplex)
Exploitatiekosten	Energie en onderhoudskosten
Omzet	Geld wat binnenkomt bij een organisatie door cliënt vergoedingen
Personeelskosten	Kosten gebonden aan het personeel
Functionele kwaliteit	De mate waarin een gebouw voldoet aan de functionele eisen
Duurzaamheid	Het zo min mogelijk belasten van de natuur door het gebruik van de juiste materialen en slim omgaan met energiemaatregelen
Onbestemdheid	De mate waarin een gebouw aangepast kan worden aan andere gebruiksfuncties
Flexibiliteit	De mate waarin een gebouw aanpasbaar is aan veranderende werkeisen
Effectiviteit	De mate waarin een complex de core business van de organisatie ondersteund
Imago	Het beeld dat andere partijen hebben van de zorgorganisatie, dit wordt mede gevormd door de huisvesting
Architectuur	De uitstraling van een complex
Corporate Identity	Een eenduidig karakter van alle zaken die betrekking hebben op een organisatie, ook huisvesting hoort hierbij
Medewerkerswaarde	De belangen die een werknemer heeft bij het werken binnen een zorgorganisatie
Clientwaarde	De belangen die een cliënt heeft bij het wonen binnen een zorgcomplex

Table 14-19 Explanation of the criteria

5.2 Answers questionnaire

The following pages show the answers of the respondents on the questionnaire. The answers are coded as used in the processing of the results for the AHP method as can be seen in Table 14-20.

Code	Explanation in Dutch	Explanation in English
4	Zeer meer van belang	Very more important
2	Meer van belang	More important
1	Even belangrijk	Equal important
0,5	Minder van belang	Less important
0,25	Zeer minder van belang	Very less important

Table 14-20 Explanation of the codes

Answers question 1

1. [Markt ten opzichte van Financiën]	1. [Markt ten opzichte van Functionaliteit en Flexibiliteit]	1. [Markt ten opzichte van Organisatie]	1. [Financiën ten opzichte van Functionaliteit en Flexibiliteit]	1. [Financiën ten opzichte van Organisatie]	1. [Functionaliteit en Flexibiliteit ten opzichte van Organisatie]
1	0,5	1	1	2	4
4	2	2	4	4	2
2	1	2	1	1	2
2	4	2	4	2	1
2	0,5	0,5	1	1	1
1	1	1	1	1	1
1	0,5	2	0,5	1	1
1	0,5	1	1	2	2
2	0,5	2	1	2	4
1	2	1	0,5	1	2
2	2	2	4	4	2
2	1	0,5	0,5	0,5	2
1	1	1	1	1	1

Answers question 2.

2. [Capaciteit ten opzichte van Verspreiding locaties]	2. [Capaciteit ten opzichte van Interactie met omgeving]	2. [Capaciteit ten opzichte van Marktpositie]	2. [Capaciteit ten opzichte van Samenwerken met derden]	2. [Verspreiding locaties ten opzichte van Interactie met omgeving]	2. [Verspreiding locaties ten opzichte van Markpositie]	2. [Verspreiding locaties ten opzichte van Samenwerken met derden]	2. [Verspreiding locaties ten opzichte van Locatie]	2. [Interactie met omgeving ten opzichte van Marktpositie]	2. [Interactie met omgeving ten opzichte van Samenwerken met derden]	2. [Interactie met omgeving ten opzichte van Locatie]	2. [Marktpositie ten opzichte van Samenwerken met derden]	2. [Marktpositie ten opzichte van Locatie]	2. [Samenwerken met derden ten opzichte van Locatie]
4	4	4	4	4	4	4	4	4	4	4	4	4	4
1	1	2	2	2	2	1	1	1	1	1	1	1	1
1	1	1	1	0,5	1	0,5	1	0,5	1	0,5	1	1	1
1	0,5	4	0,5	0,25	1	0,25	2	1	1	2	2	0,5	0,5
2	1	1	2	1	0,5	0,5	0,5	2	1	2	1	2	2
2	1	1	1	1	1	1	0,5	1	1	1	1	1	1
0,5	0,5	2	0,5	0,5	1	1	1	2	2	1	1	0,5	0,5
2	1	2	2	0,5	0,5	1	0,5	2	2	1	1	0,5	0,5
2	1	2	1	0,5	1	0,5	1	1	0,5	1	2	2	1
1	2	1	1	1	1	1	1	0,5	0,5	0,5	2	2	1
2	2	4	1	1	2	1	1	1	1	1	2	2	1
0,5	2	2	0,25	0,5	2	0,5	1	2	1	2	4	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1

Answers question 3

3. [Huisvestingskosten ten opzichte van Exploitatiekosten]	3. [Huisvestingskosten ten opzichte van Omzet]	3. [Huisvestingskosten ten opzichte van Personeelskosten]	3. [Exploitatiekosten ten opzichte van Omzet]	3. [Exploitatiekosten ten opzichte van Personeelskosten]	3. [Omzet ten opzichte van Personeelskosten]
4	4	4	4	4	4
2	2	1	1	1	1
1	1	1	2	2	1
4	2	0,5	2	4	4
1	1	1	1	1	1
1	0,5	1	2	1	1
1	1	2	2	0,5	1
2	1	1	0,5	0,5	1
0,25	0,5	0,5	2	1	0,5
0,25	0,5	0,5	1	2	1
2	2	1	4	4	2
0,25	0,5	0,5	2	2	0,5
1	1	1	1	1	1

Answers question 4

4. [Functionele kwaliteit ten opzichte van Duurzaamheid]	4. [Functionele kwaliteit ten opzichte van Flexibiliteit]	4. [Functionele kwaliteit ten opzichte van Onbestemdheid]	4.? [Functionele kwaliteit ten opzichte van Effectiviteit]	4. [Duurzaamheid ten opzichte van Flexibiliteit]	4. [Duurzaamheid ten opzichte van Onbestemdheid]	4. [Duurzaamheid ten opzichte van Effectiviteit]	4. [Flexibiliteit ten opzichte van Onbestemdheid]	4. [Flexibiliteit ten opzichte van Effectiviteit]	4. [Onbestemdheid ten opzichte van Effectiviteit]
4	4	4	4	4	4	4	4	4	4
2	4	2	4	2	2	2	4	4	2
1	0,5	2	1	1	1	2	2	1	1
0,5	1	2	1	0,5	2	1	4	2	0,5
2	1	2	1	0,5	0,5	0,5	1	0,5	0,5
1	1	1	1	1	1	1	2	1	1
0,5	1	1	1	0,5	0,5	0,5	1	1	0,5
2	1	2	1	0,5	1	1	2	1	0,5
2	1	2	1	1	2	1	2	1	0,5
2	2	2	4	0,5	0,5	0,5	2	1	1
1	1	1	2	2	2	2	1	1	1
0,5	0,5	2	0,5	2	2	0,5	2	0,5	0,5
1	1	1	1	1	1	1	1	1	1

Answers question 5

5. [Imago ten opzichte van Architectuur]	5. [Imago ten opzichte van Corporate Identity]	5. [Imago ten opzichte van Medewerkersw aarde]	5. [Imago ten opzichte van Cliëntwaarde]	5. [Architectuur ten opzichte van Corporate Identity]	5. [Architectuur ten opzichte van Medewerkersw aarde]	5. [Architectuur ten opzichte van Cliëntwaarde]	5. [Corporate Identity ten opzichte van Medewerkersw aarde]	5. [Corporate Identity ten opzichte van Cliëntwaarde]	5. [Medewerkers waarde ten opzichte van Cliëntwaarde]
4	4	4	4	4	4	4	4	4	4
1	1	1	2	1	1	2	1	2	2
1	0,5	0,5	0,5	1	1	1	0,5	0,5	1
1	1	1	1	1	0,5	1	1	0,5	1
1	0,5	1	0,5	1	0,5	0,5	0,5	0,5	1
1	1	1	1	1	1	1	1	1	1
2	2	1	0,5	1	0,5	0,25	0,5	0,5	1
1	2	0,5	0,5	2	0,5	0,5	0,5	0,5	0,5
2	2	2	1	1	0,5	0,5	0,5	0,5	0,5
2	2	2	1	0,5	0,5	0,5	0,5	0,5	0,5
1	1	0,5	0,5	1	0,5	0,5	1	1	1
2	0,5	0,5	0,5	2	0,5	0,5	0,5	0,5	1
1	1	1	1	1	1	1	1	1	1

5.3 Elaboration AHP

The calculation method for the elaboration of the questionnaire will be given for the ranking of the four control frameworks. Only the ranking of the four control frameworks will be elaborated as an example, the other ranking calculation are done by the same method so these results can be seen in paragraph 8.2.1.

Processing the results

The results that are showed in the paragraph before are processed in a way so that it could be used for the AHP method. This means that first the average outcome for every question is calculated. This outcome is then put into the matrix that can be seen in Table 14-21.

	Markt	Financiën	Functionaliteit en Flexibiliteit	Organisatie
Markt	1	1 3/4	1 1/3	1 2/5
Financiën	4/7	1	1 5/8	1 5/7
Functionaliteit en Flexibiliteit	3/4	5/8	1	1 3/4
Organisatie	5/7	3/5	4/7	1
SUM	3	4	4 1/2	5 7/8

Table 14-21 Matrix 4x4 with outcome of the questionnaire

By squaring this matrix with itself it is possible to calculate the eigenvalue of each criterion. To do this first the matrix is normalized so that with these results the matrix can be squared. This normalized matrix can be seen in Table 14-22.

Normalization				
	normalized matrix			
Markt	0,33033	0,44295	0,29435	0,24113
Financiën	0,18876	0,25312	0,35874	0,29078
Functionaliteit en Flexibiliteit	0,24774	0,15576	0,22076	0,29787
Organisatie	0,23317	0,14817	0,12615	0,17021

Table 14-22 Normalization matrix for calculation eigenvalue

The matrix will be squared to itself just as long as the outcomes will not differ in two decimals significance. In Table 14-23 it can be seen that in this case it will take 5 iterations.

normalized principal Eigenvector	
1st	5th Iteration
33%	34%
27%	26%
23%	23%
17%	18%

Table 14-23 Normalized principal eigenvector

Relative ranking

The relative ranking needs to be calculated for all the criteria and this can be done by multiplying the ranking of the criteria by the ranking of the control frameworks. The results of this can be seen below in Table 14-24.

	Ranking	Ranking control frameworks	Relative ranking
Market		34%	
Capaciteit	18%		6%
Verspreiding locaties	15%		5%
Interactie met omgeving	18%		6%
Marktpositie	16%		5%
Samenwerken met derden	15%		5%
Locatie	18%		6%
Finance		26%	
Huisvestingskosten	28%		7%
Exploitatiekosten	29%		8%
Omzet	22%		6%
Personeelskosten	21%		6%
Functionality and flexibility		23%	
Functionele kwaliteit	26%		6%
Duurzaamheid	20%		5%
Onbestemdheid	14%		3%
Flxibiliteit	22%		5%
Effectiviteit	17%		4%
Organization		18%	
Imago	21%		4%
Architectuur	17%		3%
Corporate identity	16%		3%
Medewerkerswaarde	23%		4%
Cliëntwaarde	23%		4%

Table 14-24 Relative ranking of the criteria

Consistence check

To check if the results are consistent a consistency check will be performed. To do this first the lambda of each criterion is calculated as can see below.

Market, Lambda	= SUM (market matrix 4x4) * normalized principal Eigenvector = 3 * 0.34 = 1.017
Finance, Lambda	= SUM (finance matrix 4x4) * normalized principal Eigenvector = 4 * 0.26 = 1.035
F&F, Lambda	= SUM (F&F matrix 4x4) * normalized principal Eigenvector = 4 1/2 * 0.23 = 1.025
Organization, Lambda	= SUM (Organization matrix 4x4) * normalized principal Eigenvector = 5 7/8 * 0.18 = 1.032

Then after doing this the consistency ratio can be calculated with the help of the eigenvalue and the Consistency Index. The calculation can be seen below

Principal Eigenvalue	= lambda market + lambda Finance + lambda F&F + lambda organization = 1.017 + 1.035 + 1.025 + 1.032 = 4.109
Consistency Index	= Principal Eigenvalue – amount of criteria (n) = 4.109 – 4 = 0.109
Consistency Ratio	= Consistence Index / Random Index = 0.109/0.90 = 0.04

The consistency Ratio must be below 0.1 to be consistent. As can be seen in the calculation above the outcome is consistent.

Random Index										
n	1	2	3	4	5	6	7	8	9	10
RI	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49

Table 14-25 Random Index for calculation of Consistency Ratio

Appendix 6. Demand for care research

For the demand for care input that will be used in the model a municipal report made by MEE Friesland is used as underlying information. First it is decided what the target group is for the new complex in Sneek. These are the clients from 25 years and older. Then based on the results coming from the municipal report (Table 14-26) an estimation is made about the growth percentage for the growth scenario for the coming 30 years.

The amount of clients is calculated based on the numbers coming from MEE Friesland. Here also a estimation is made based on the total amount of clients and the percentage of people with a mental disability which can be found in Table 14-27.

Prevalence ages	Sudwest Fryslan		
	Population in age category 2009	Number of inhabitants that uses MEE 2009	Prevalence 2009
0-24 year	24.698	427	1,73%
25-39 year	14.396	102	0,71%
40-64 year	29.473	133	0,45%
65 year and older	13.371	34	0,25%
Prevalence ages	Sudwest Fryslan		
	Population in age category 2010	Number of inhabitants that uses MEE 2010	Prevalence 2010
0-24 year	24.739	451	1,82%
25-39 year	13.878	113	0,81%
40-64 year	29.757	159	0,53%
65 year and older	13.876	41	0,30%
Prevalence ages	Sudwest Fryslan		
	Population in age category 2011	Number of inhabitants that uses MEE 2011	Prevalence 2011
0-24 year	24.594	395	1,61%
25-39 year	13.491	101	0,75%
40-64 year	30.024	143	0,48%
65 year and older	14.336	34	0,24%

Table 14-26 Prevalence ages in the region Sudwest Fryslan

Target group clients MEE Friesland	Physically disabled	Psychiatry	Mentally disabled	VTO Early Help 0-7 year olds	Sensory disabilities	Total
Amount of clients	120	151	284	135	8	698
Percentage	17,19%	21,63%	40,69%	19,34%	1,15%	

Table 14-27 Amount of clients in the different target groups

Appendix 7. Optimal run

To conduct the optimal run the basic model is slightly adapted to keep only the variables that influence the housing directly. This means that the income sub model and the expenses sub model are modified the rest of the model has stayed the same.

Income sub model

In the income sub model the only income that is left is the NHC – compensation as can be seen in Figure 14-3. This compensation is split up in three different compensations, for housing of the healthcare organization, the compensation for vacancy and the compensation for housing. This last compensation represents the cash inflow for the organization.

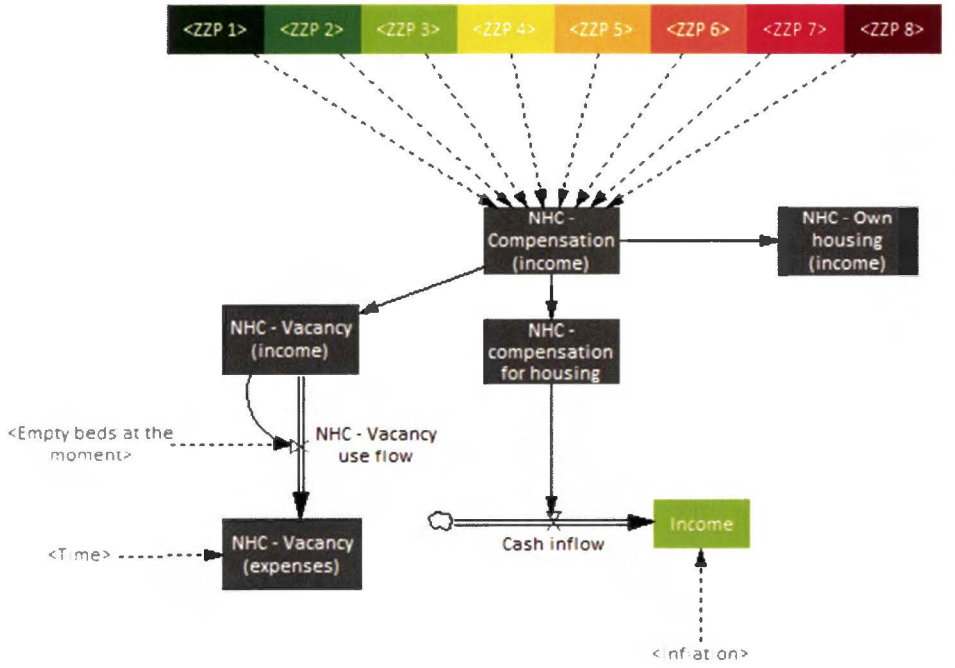


Figure 14-3 Modified income sub model

Expenses sub model

In the modified expenses sub model the overhead costs, stay costs and the personnel costs are eliminated. In Figure 14-4 only the maintenance costs, the energy costs, the cleaning costs and the fixed costs are left. These costs are directly related to the housing of a healthcare organization, and this is why they will be used for the optimal run.

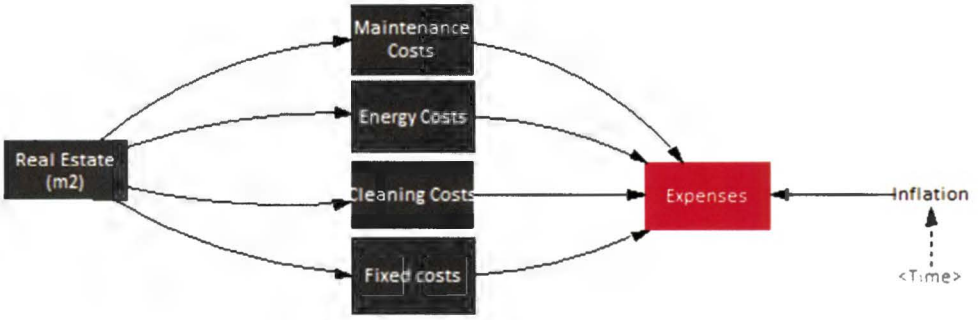


Figure 14-4 Modified expenses sub model

Appendix 8. The RUBIX Hybrid Building concept

In the RUBIX homes the configuration, organization and staging can be modified at any time which may be continuously indented to changing demand. Therefore the RUBIX hybrid building concept is the sustainable solution for reducing the gap between supply and demand in the housing market.

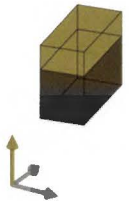
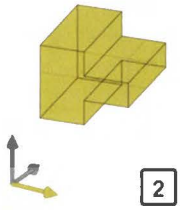
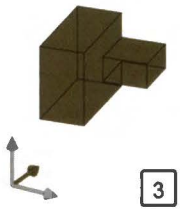
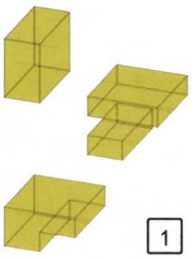
 1	Residential floors in a can easily be disconnected from each other. This separation makes it possible that each housing floor could be independently occupied. Spatial exchanges in the 1st dimension.
 2	Horizontal exchange makes it possible to attract or just to dispose adjacent residential floors of the house. Spatial exchanges in the 2nd dimension.
 3	Split level floors cut the traditional residential floors into two separate residential floors. This allows exchange based on orientation and with this also the exchange rate increases. Spatial exchanges in the 3rd dimension.
 4	Because the exchange in three dimensions can take place at any time, the current housing needs will always be answered. Exchange in the 4th Spatial dimension.

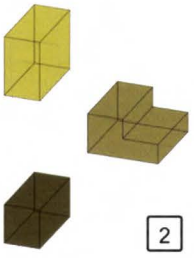
Table 14-28 RUBIX Hybrid Building Concept (Reprint from: http://www.RUBIX-hbc.nl/werking.html)



1

Differentiation of residents

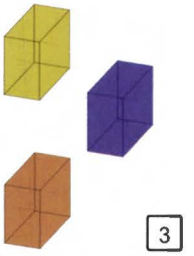
Residential Floors can be linked in many ways so that for the same group of residents, a highly differentiated range of accommodation can be created.



2

Differentiation in resident groups

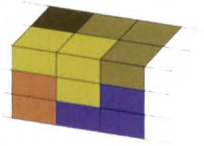
The RUBIX Hybrid Building concept allows different groups to be accommodated. There may be houses for starters, seniors, families, students, etc. created. The possibilities are endless.



3

Differentiation in use functions

The RUBIX Hybrid Building concept is designed to have other functions next to the residential function. Think of office, retail or care spaces. The housing concept thus transforms with this into a building concept.



4

Diversity in use

The exchanges of many different possibilities for habitation and the differentiation in potential uses, makes RUBIX hybrid building concept to a unique building concept with unprecedented accommodating power

Table 14-29 Application of the RUBIX concept (Reprint from: http://www.RUBIX-hbc.nl/toepassingen.html)

Appendix 9. Summary

MANAGING THE REAL ESTATE DEVELOPMENT PROCESS FOR HEALTHCARE
A system dynamics model for the development of strategic real estate for healthcare

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05-07-12

ABSTRACT
From 2012, the compensation for interest and depreciation of the real estate of healthcare organizations is part of the integral rates. The compensation for the real estate costs in the form of the normative housing component (NHC) will be connected to the intensity of the given care packages (Zorg Zwaartepakketten, ZZP). This leads to three major changes. The compensation is dependent on the care that is provided, the compensation is uniform and normative and the moment of investing and reimburse is disconnected. This will give the healthcare organizations the responsibility of their own real estate. The dynamics in the demand for care will create a precarious vision of the future. To overcome this uncertainty a study is conducted into the variables of the real estate development process and how they have an influence on each other so that they can be put into a system dynamics model. Also employees of the healthcare organization Philadelphia are asked to give their opinion about the criteria that influences a real estate development process, with the outcome the system dynamics model can be adapted to the preferences of them. By running the model based on several 'demand for care' scenarios it can be seen when the beds in a complex will be occupied and when vacancy will occur. Based on some financial variables the model will calculated whether a room will be transformed into a new function or if it will stay vacant. The outcomes can be used as a foundation for a strategic real estate strategy and can also be used for setting up a business case.

Keywords: Healthcare, System Dynamics, Analytical Hierarchy Process, Scenario Planning, NHC and ZZP compensations

INTRODUCTION
Since the 1st of January 2012 the compensations for healthcare organizations have changed. Compensations for care and for the housing will only be provided based on the amount of beds that are occupied in a healthcare complex. This means that the healthcare organizations have become responsible for their own budget for housing and with this; their

financial situation has become uncertain because of the dynamics in the demand for care. To get a grip on all those unstable factors it will be necessary to align the supply and demand in a funded way. This means that the demand for care needs to monitored very carefully and a plan need to be set up on how to anticipate on the dynamics. A System Dynamics model will be developed as an integral decision-making tool based on the dynamics in the demand and the changes in the compensations. Based on several scenarios about the developments in the 'demand for care' various different visions of the future can be set up. It will then be possible to anticipate on all these possible future states.

Market: Demand for care

The demand for care will increase in the upcoming years because of changes in the population. The people that need care the most are in general elderly people. Because of the aging of this group they will let the demand for care increase. The sectors that are involved the most with these people will also need to answer this demand.

Not only have the developments in the size and structure of the population effect on the demand for care. There are also some other developments that can be noticed that will influence the demand for care like epidemiological developments as the increase of chronic diseases and socio cultural developments, like the fact that patients get more and more opportunities - especially via the Internet - to access information about care options.

The total amount of users in nursing and care will grow until 2030 with 30%. The largest growth can be found in the care homes, the amount of users is growing with 53%. The nursing homes will grow with 38% and the home care will grow with 30% (SCP, 2012). After this it is expected that the demand for care will decrease.

Finance

The changes in demand directly influence the financial state of a healthcare organization. Before January 2012 care organizations were sure that they could finance their properties. Because of budget cuts of the government the regulation of compensation for performance instead of compensation for the amount of square meters was introduced. The compensation for the housing costs, the normative housing component (NHC), will be connected to the intensity of the given care packages (Zorg Zwaartepakketten, ZZP). This means that a risk is created for the care organizations because they are not sure any more about their income. Though, the government expects that by giving the organizations the benefits and burdens of their own property they will have the intrinsic and economic stimuli to improve their response to the individual care demand of a client.

When the income is becoming a flexible variable it is important to closely monitor the expenses that are made. With the introduction of the NHC, it is becoming important for healthcare organizations to make a clear overview in all the operating costs. These are the fixed costs, energy costs, maintenance costs, administrative management costs and the specific operating costs. Also the NHC will set some boundaries with regards to the amount of square meters of real estate that can be developed.

Real estate: Functionality and flexibility

For every client in the complex a certain amount of square meters is needed for the care that is provided. Based on the performance requirements of several target groups a translation can be made to the amount of square meters per bed. For every accommodation concept the amount of square meters per client are different. Also the building types are different per concept. When this specific information for a new to build complex is known, an estimation can be made about the amount of space that is necessary.

Next to the amount of square meters it is also important to think about the flexibility of real estate. The requirements for real estate are continuously changing because of demographical, economic, political, ecological, socio-cultural and/ or technical influences. By designing a smart building it will be easier to adapt to these changes.

Organization: Strategic real estate strategy

There are a lot of factors that are needed to take into account during the real estate development process and also after this period. To do this in a structured way it will be necessary to set up a strategic real estate strategy. Van Schijndel (2010) developed a model for strategic real estate planning. The first phase is determining the strategy of the company and the goals that are a result of the strategy. The second phase is developing a real estate strategy with the use of the DAS-framework designed by the Technical University of Delft (De Jonge et al. 2006). And the third phase is the execution of the developed policy. This execution can be performed with the help of corporate real estate management (CREM). The purpose of CREM is to contribute through the strategic use of real estate to the primary objective of the company, in this case healthcare.

THE MODEL

To connect all the different variables to each other and making them react to each other in a logical way, a strategic and financial system dynamics model is created. The model can set up a forecast about the demand for care and connect the income and expenses to this. Based on the literature research it is to be expected that the demand for care will change in the coming years by the influence of many different factors. Change in the demand for care will also cause changes in the income and expenses of healthcare organizations.

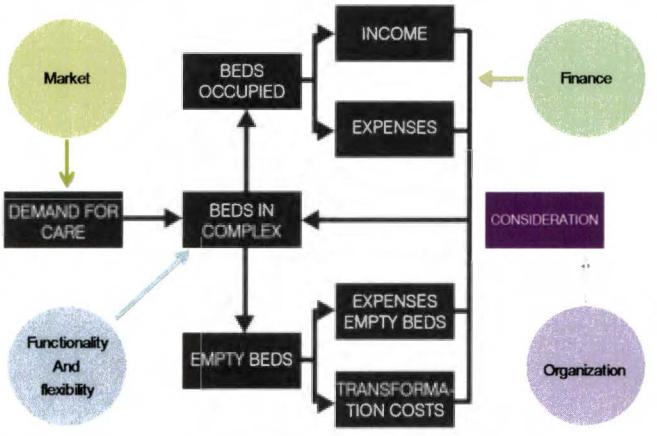

Figure 1: Schematic view of the process

A schematic view of this process can be seen in figure 1. The demand for care will determine how many beds are needed in a complex. These beds can be occupied later on in the process or maybe be empty. The income and expenses are connected to the beds that are occupied. The beds that are vacant also bring certain expenses with them. These are the operating costs that are connected to the real estate. The vacant square meters can also be transformed for another purpose and to this transformation costs are bound. So a healthcare organization needs to make a decision on that specific moment. Is it okay if the bed stays empty or is it important to intervene and transform the vacant square meters on that moment? Based on which criteria will such a decision be made and which consideration needs then to be made?

Analytical Hierarchy Process

The first step in developing a model is finding the criteria that are considered the most important by the healthcare organization in the development of real estate. This is done with the use of the Analytical hierarchy process method. The analytical hierarchy process (AHP) is a general method for measurement. It can develop ratio scales with the help of both discrete and continuous paired comparisons. It is used in many different fields like multi criteria decision making, planning and resource allocation and in conflict resolution. In its general form the AHP is a nonlinear framework for carrying out both deductive and inductive thinking without use of the syllogism by taking several factors into consideration simultaneously and allowing for dependence and for feedback, and making numerical trade-offs to arrive at a synthesis or conclusion (Saaty, 1987). T. L. Saaty developed the AHP in 1971- 1975 at the Wharton School (University of Pennsylvania, Philadelphia, Pa).

The AHP questionnaire was spread under 26 employees of the healthcare organization, Philadelphia. All these employees are involved in the real estate development process and are asked to choose between several criteria which they find the most important in the real estate development process. These criteria will be used in a real life case where a complex is developed with 50 apartments for people with a mental disability. This complex will be built in Sneek and is currently being developed.

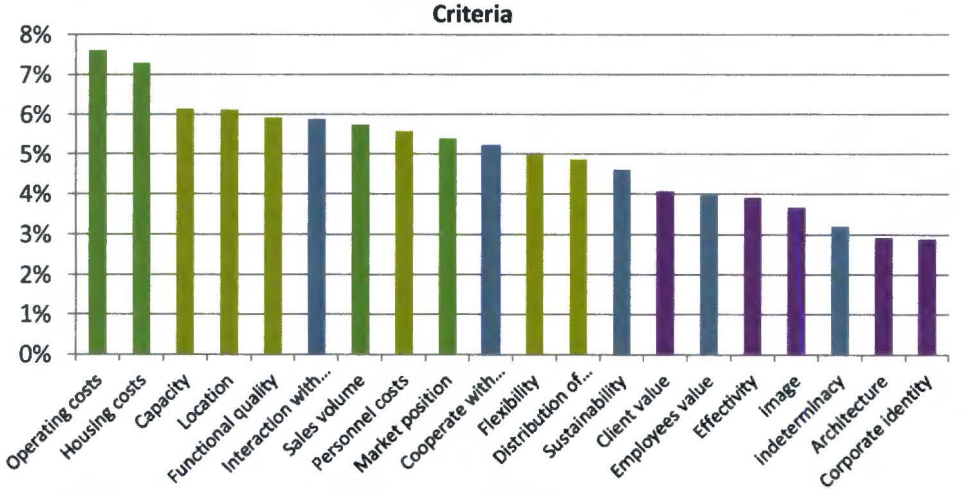

Figure 2: Outcome of the analytical Hierarchy Process

The outcome of the questionnaire showed that the housing costs are considered the most important criteria as can be seen in figure 2. Next to this the operating costs are considered quit important. Both of these criteria are coming from the control framework finance. This means that the financial part of the development process will play an important part in the consideration part of the model.

System Dynamics

The second step in the model development process is the development of causal loop diagrams that are used to visualize the relationships between different variables that influence the real estate development process, these variables are extracted from literature research. It is also used to see how these variables affect each other. The connections between variables can be positive or negative. When a connection is positive then the variables have a reinforcing effect on each other. This means when one variable increases the other one will also increase. When a connection is negative it is the other way around. When one variable increases the other will decrease. For the demand for care and the financing that is related to this, a few causal loops are developed to see what the interdependencies are in this process.

After the development of the causal loops, a translations is made into a stocks and flows model. A stocks and flows model needs to be made to solve complex issues. When setting up a model a distinction is made between quantities that are stocks and those that are flows. The difference between them is the unit of measurement. A stock is something that is measured at one specific time, and it represents a quantity at that point in time. A flow is a variable that is measured for a specific time, for example a year or a week. It can be also named as a rate or a speed. The whole model is build up from 5 sub models that are attached to each other via several variables.

The demand for care sub model

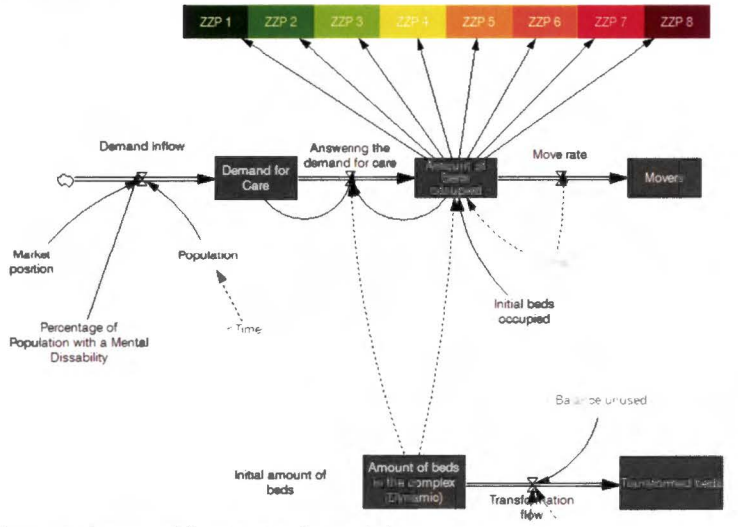

Figure 3: Demand for care sub model

In the demand for care sub model there are three stocks and three rates that influence the outcome as can be seen in figure 3. The "demand for care" stock depends on the demand inflow and the answering the demand for care. The demand inflow depends on the population where the healthcare organization is situated and the percentage of people that have a mental disability and the percentage of these people that will need care. The market position decides how much of people that have a mental disability will be helped by Philadelphia.

Then there is the stock "amount of beds occupied" that is influenced by answering the demand for care and the move rate. Answering the demand for care and the number of beds occupied is restricted by the number of beds in the complex. The number of beds in the complex is a dynamic variable that changes over time by the influence of several kinds of expenses. The initial beds occupied are the amount of beds that already are occupied from t=0. Each bed occupied stands for a patient with a certain ZZP. An assumption is made for the division in ZZPs.

Income sub model

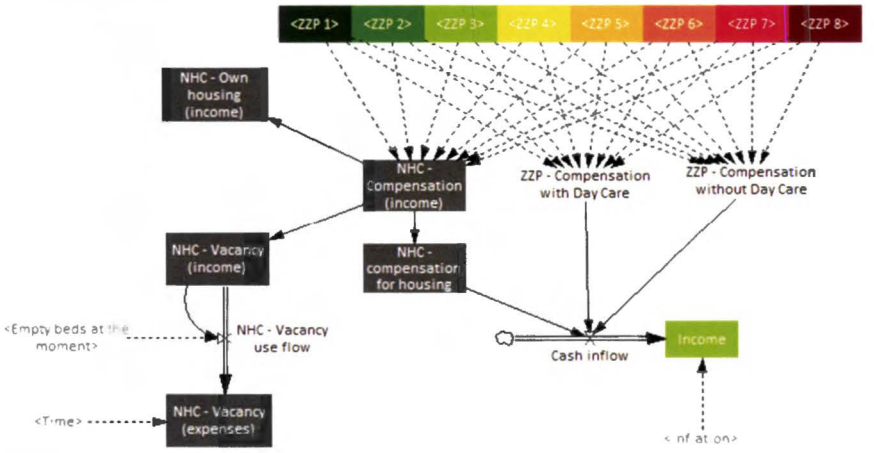

Figure 4: Income sub model

Based on the amount of ZZPs that is set in the demand for care model the income can be calculated. First there is the NHC compensation (income) and the care compensation that is given for each of the ZZPs. Not the whole amount of the NHC compensation is used for the housing of a healthcare organization, 4% of the compensation is reserved for vacancy and 11% is reserved for the housing of the main office of a healthcare organization.

The NHC vacancy compensation is used when a bed is empty. At the moment that it is needed the NHC vacancy use flow is turned on. This means that the savings will decrease and that the expenses for the vacant square meters are compensated by these savings. The other two variables that influence the cash inflow are the ZZP compensations that are given to perform the care that is needed.

Expenses sub model

In the expenses sub model, the costs that are made during the operational phase are calculated. Based on the amount of beds the amount of square meters is real estate is calculated. TNO has performed a research to set some key figures for the construction of healthcare buildings. A distinction is made between residence area, supportive counselling area, supportive services area and treatment and activating guidance area. All these areas are connected to the amount of beds and all these areas summed form the total amount of square meters of a healthcare building.

A distinction is made in the costs that depend on the amount of square meters and the costs that depending on the amount of beds that are occupied. The costs that depend on the amount of square meters are the maintenance costs, the energy costs, the cleaning costs and at last the fixed costs. Then there are the costs that depending on the amount of beds occupied. The stay costs are the costs for food for patients, hotel costs and other accommodation costs. Next to this there are the overhead costs and the personnel costs that are calculated based on policy CA-300-476. All these costs together form the expenses for a healthcare organization. When these costs are calculated over a period of 30 years then they are subject to inflation. The calculation inflation is set to 1.5% that is prescribed by the NZA for the NHC calculation.

Consideration

In this model a financial consideration is made, whether to transform or not, based on the balance of the unused real estate and the transformation costs of these square meters. This means that when the costs of the vacant real estate transcends the transformation costs of that same vacant real estate and that time there is a bed empty, the decision is made to extract a bed from the amount of beds in complex (dynamic).

Amount of beds in the complex (dynamic) = INTEG (INTEGER (-Transformation flow)) (Initial value = initial amount of beds)

Transformation flow= IF THEN ELSE (Balance unused>=Transformation costs: AND: Empty beds at the moment > 1, 1, 0)

When a bed is subtracted from the stock then the whole process can start all over again. The amount of square meters real estate is changed; with this the operating costs are changed. The NHC vacancy (income) will be saved again and there will be no bed empty.

RESULTS

After the completion of the model it will be run based on different scenarios. These scenarios are based on the developments in the demand for care. The underlying information is based on a municipal report set up by MEE Friesland. The first scenario is a growth scenario where the population that ask for care grows with 1.44% each year; the shrink scenario has a decrease in the population of 1.44% each year. At last there is the steady scenario where the demand for care will stay the same for the upcoming 30 year.

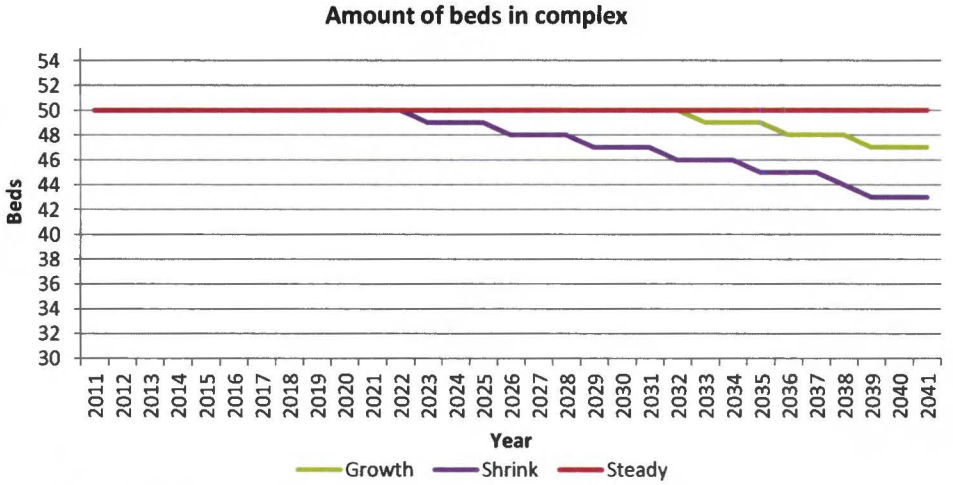

Figure 5: Amount of beds in the complex based on the three scenarios.

The amount of beds in the complex is depending on several variables. The first and most important one is the demand for care. At the beginning in 2011 the demand for care will decide how many beds there will be initially. Then there are the expenses for the vacant beds, these expenses are being compared to the costs for transforming the vacant square meters into another function. When the expenses exceed the transformation costs the decision will be made to remove bed from the stock.

In Figure 9-2 5 the results for the three scenarios can be seen. For the shrink scenario the first bed will be removed from the stock in 2023. This means that in this period the expenses for the vacant square meter exceed the transformation costs. Then after 2023 there will be six more beds removed from the stock so that at the end only 43 beds will be left. In the growth scenario after 2032 the first bed will be removed from the stock. This is a result of the fact that more beds stay occupied for a longer time as can be seen in the previous paragraph. Until 2041 a total of three beds will be removed from the stock. Because in the steady scenario all beds will remain occupied no bed will be removed from the stock. So, in this scenario in 2041 still 50 beds will be present in the complex.

With these result a foundation is created for a decision making tool for the period of 30 years. When will it be necessary to intervene in the process and when can vacancy be expected? The outcome can also be used to set up a business case that is nowadays needed to set up a feasible plan for a healthcare organization.

Optimal run

In the search for the most optimal combination of variables and the values of these variables, an optimal run is conducted. During this run a few variables are changed until the most optimal result is retrieved. The first variable is the percentage of beds occupied; this must be of course as high as possible. Then there is the balance between the housing costs and the NHC – compensation for housing, the most preferable case is that this will be positive or at least around zero.

The lowest percentage of vacancy can be seen in the variation where only one bed at a time is removed. In contrary to the best output for the balance, here the best variation is that of 56.1 m^2 residential area and where three beds are removed at a time. This is also the case for the balance of vacancy. Here the variation of 56.1 m^2 residential area and one bed removed at a time gives the best option.

CONCLUSION

It will be necessary for healthcare organizations, in order responding to the dynamics of the market, to develop functional and flexible real estate. With this functional and flexible real estate the dynamics of the market can be absorbed and the financial balance stays constant as a result. Firstly, this requires a flexible attitude of the organization. The conventional idea that a building will always remain the same function should be abandoned. It must be also be possible to deal with a change of function within a complex in a flexible manner. To change this, it will be important that contractual changes are made in order to succeed.

Flexibility can be seen as the main solution for all the problems in each stated control framework. Flexibility in the organization and flexibly in the real estate will create the possibility to react on the market and as a result the finance will benefit from this. The underlying solution for this can then be seen in the new way of thinking. This will ask a lot of changing from healthcare organizations but in return it will give them a lot of positive results in all the four control frameworks.

RECOMMENDATIONS FOR FURTHER RESEARCH

There are a few recommendations that can be given to make the research more accurate. The first recommendation is about the consideration that is made in the model. When a more accurate consideration is to be made, a study needs to be performed to find the transition costs. This will be something that is quite hard to find because every situation is unique, so, every situation will have different transition costs. It will also be better to base the transformation consideration on more than only the financial side of a project. One option can be the quality of the complex. When this doesn't meet the requirements anymore it can be possible to make another decision based on this outcome. To make the prediction about the demand for care more precise there needs to be a thorough research in the dynamics. More developments that influence the demand for care need to be incorporated into the model. And when for example a simple interface would be created it will be possible for the healthcare organization to use it during the operational phase. Even better would be if the model would be linked to a database on the internet so that on every moment the model is up to date and ready to use.

RECOMMENDATIONS FOR HEALTHCARE ORGANIZATIONS

There are also a few recommendations that can be given for healthcare organizations that are going to develop their real estate. Of course, clear communication is important during each kind of project but it is important to emphasize because it concerns projects that focuses on clients. All parties that are concerned in the project need to be able to give their opinion about the new to build complex. When this is thoroughly done at the beginning of the process, this can give profit in many ways at the end of the project. Next to this, we're all living in a world that is constantly subject to change and because of this we can be sure that change will happen. To react on this in the best way it will be necessary to make a plan on

how to act. The last but not the least recommendation is to ask for help when it is necessary. The new compensations have only been introduced for a couple of months so it will not be a shame to ask if not everything is clear.

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This research is the final part of the master program Construction Management and Urban Development at the Technical University of Eindhoven. The opportunity to conduct this research in a professional environment was given by the housing consultancy agency, draaijer+partners. They gave me the possibility to use their knowledge and contacts. I hope my research will contribute in improving the future developments of real estate in healthcare

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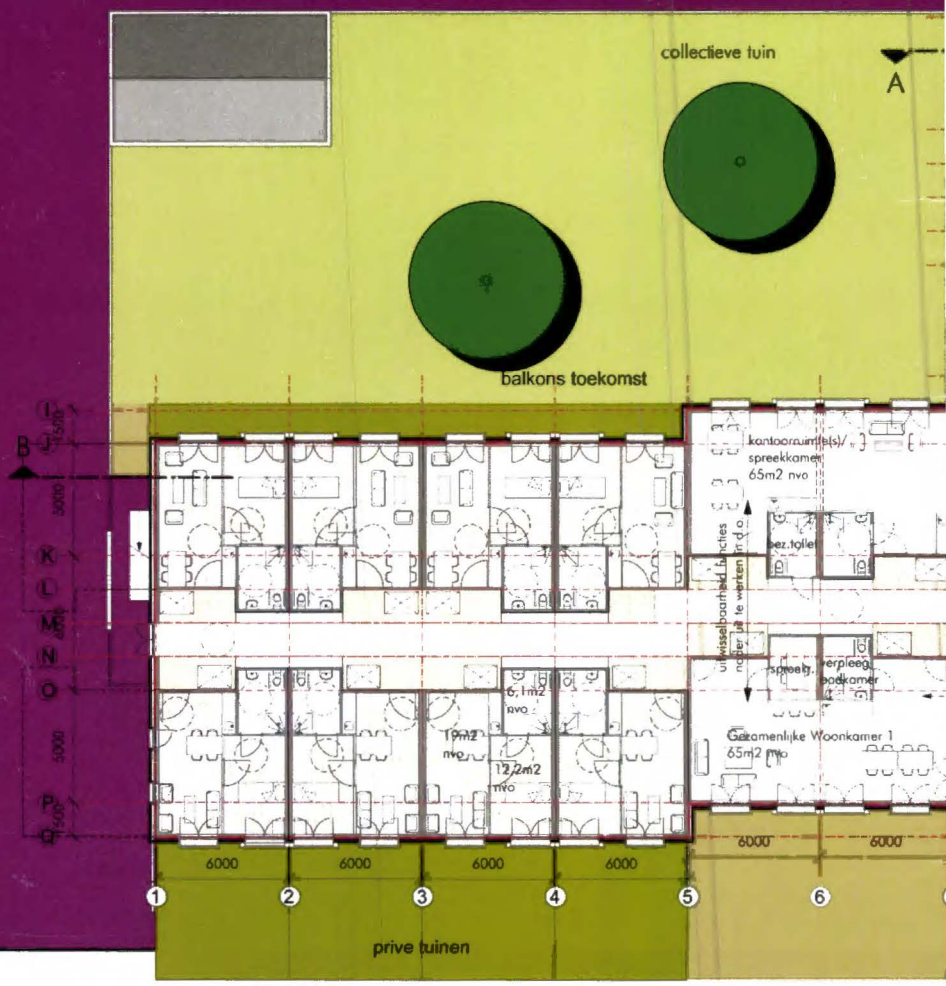

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