CHALMERS
UNIVERSITY OF TECHNOLOGY

An Economic Analysis of Reconstruction Projects at Public Hospitals

A Study within the Swedish Regional Healthcare Sector

Master's thesis in Management and Economics of Innovation

MAX LUND
CARL SVEDBERG

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF ENTREPRENEURSHIP AND STRATEGY

CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2024
www.chalmers.se

An Economic Analysis of Reconstruction Projects at Public Hospitals

A Study within the Swedish Regional Healthcare Sector

MAX LUND
CARL SVEDBERG

Department of Technology Management and Economics
Division of Entrepreneurship and Strategy
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2024

An Economic Analysis of Reconstruction Projects at Public Hospitals
A Study within the Swedish Regional Healthcare Sector
MAX LUND
CARL SVEDBERG

Department of Technology Management and Economics
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone + 46 (0)31-772 1000

Gothenburg, Sweden 2024

An Economic Analysis of Reconstruction Projects at Public Hospitals
A Study within the Swedish Regional Healthcare Sector

MAX LUND
CARL SVEDBERG

Department of Technology Management and Economics
Chalmers University of Technology

SUMMARY
A majority of the hospitals in Sweden were built during the 1960s and 1970s, and their state today entails a need for investments. Current financial deficits across regions, future healthcare requirements, and an increasing dependency ratio together with undeveloped capital budgeting within the hospital sector, call for an economic analysis of these reconstruction projects. Therefore, the purpose of the thesis is to identify and analyze key factors to achieve economically profitable reconstruction projects at public hospitals. This is accomplished through two research studies, where the first quantitatively investigates a single case of the Hospital of Kungälv, and the second qualitatively investigates a multiple case study across Swedish regions with 21 interviews. The first study resulted in a business case model to evaluate how a hospital reconstruction project can become economically profitable. To achieve an economic break-even point productivity must increase and a sensitivity analysis shows that the discount rate, the facility investment cost, increased rent, the facility economic lifetime, and the compensation per surgery and patient are important financial posts to consider. The second research study resulted in a framework including key factors for management to consider when aiming to achieve profitable reconstruction projects in the healthcare sector. These key factors are a comprehensive vision, early planning, communication and cooperation, focus on efficiency, management, efficient facility utilization, and cost consciousness. The presented findings contribute to this research area in the Swedish setting and can be a foundation for future research within the field.

Keywords: Business Case, Economic Profitability, Hospital Management, Key Factors, Public Sector, Reconstruction Projects

Acknowledgments

This study has been conducted at the Department of Technology Management and Economics at the Chalmers University of Technology as a master's thesis within Management and Economics of Innovation. We have collaborated with PwC Public Sector Advisory and have been included in their ongoing pilot study at the Hospital of Kungälv. The authors' workload has been evenly distributed, and the cooperation has worked well between all parties.

We would like to express our gratitude towards several stakeholders for this thesis. Firstly, we would like to thank the administration of Sjukhusen i Väster, for thoughtful discussions and support in gathering data for the thesis. We would also like to thank all of the respondents, for their goodwill and curiosity while taking their time for participation in the study. Furthermore, we are very thankful to PwC and the opportunity to be a part of your project. Especially we want to send gratitude to Hanna Waddington and Sanna Nordberg who have supported us through the project in an exceptional way. Thirdly, we want to express our thankfulness towards our supervisor and examiner Gunnar Wramsby at Chalmers University of Technology for all his academic guidance. Lastly, we are grateful for our families who have always supported us through our academic journey toward our graduation which this thesis concludes.

Max Lund
Gothenburg, May 2024

Carl Svedberg
Gothenburg, May 2024

Abbreviations

DRG – Diagnosis Related Groups
IRR – Internal Rate of Return
NPM – New Public Management
NPV – Net Present Value
ROI – Return on Investment
RQ – Research Question
SEK – Svenska kronor (The Swedish Currency)
SKR – Sveriges Kommuner och Regioner: Member and employer organization for Swedish municipalities and regions
SU – Sahlgrenska Universitetssjukhus: A Swedish hospital located in VGR
SV – Sjukhusen i Väster: Public administration for some hospitals in VGR
VGR – Region of Västra Götaland

Table of Contents

List of Figures

List of Tables

1. Introduction

This chapter contains an introduction to the thesis. First, a background of the sector and the specific case is presented. Secondly, the purpose of the study, derived from a problem formulation, with associated research questions are stated. Lastly, some delimitations of the study are declared and discussed.

1.1 Sectoral Background

The Swedish healthcare sector currently experiences demanding challenges such as changes in population, innovative technology, and new treatment methods (Wallström, 2020). Likewise, the anticipation is that these challenges will be of importance during the upcoming years. Regions across the country confront these challenges with new investments in care facilities which have led to a new hospital boom, similar to the one in the 1960s and 1970s (Cederberg, 2023; Perkiö, 2018; Wallström, 2020). When publications on the subject are reviewed, three main reasons to study this investment phenomenon in Swedish hospitals are mentioned more frequently. The reasons that stand out are the widespread financial problems among Swedish regions, the fact that a majority of the hospitals are outdated, and a rising dependency ratio among the population. All these aspects will be elaborated further on, but first, some general background of the Swedish healthcare system and investments in hospitals are described.

The healthcare of Sweden consists of both public and private actors within the primary and specialized care (Socialstyrelsen, 2020b). Focusing on the public sector, the responsibility of specialized care through hospitals is decentralized and primarily managed by different regions in the country. The local municipalities run primary care and health centers, and for the national specialized care, the governmental authority Socialstyrelsen has responsibility (Wallström, 2020). This implies that regional management is responsible for most of the investments related to the current hospital boom mentioned earlier.

The public hospitals of each region receive revenue from several income sources. The largest portion of this revenue stems from regional income taxes, and other financing comes from patient fees and governmental subsidies (Socialstyrelsen, 2020a). Patient fees are divided into two income streams, one from patients settled in the region where the hospital is located, and another from patients settled in other regions (VGR, 2024). On the cost-side, investments in regional operations will continue to increase and due to lower results, the current financing needs are high, as Figure 1 displays. For example, there will be a huge deficit of approximately 24 billion SEK during 2024 but with a remaining investment forecast of around 25 billion SEK. According to the forecasts, the investment needs in the regional sector, and more specifically towards hospitals, will continue to increase in the upcoming years.

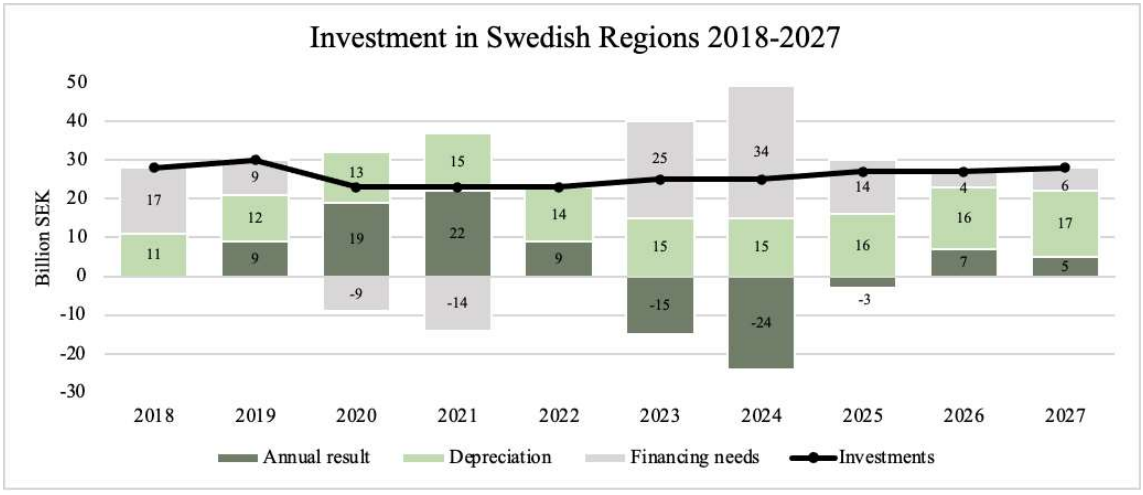

Figure 1. Investments in Swedish regions. (SKR, 2023)

Thus, one of the main reasons to study hospital investments is that the regions in Sweden currently have high financial deficits compared to historical results (SKR, 2023). Mainly, this is due to rising operating costs affected by inflation and pension costs, combined with higher levels of interest rates during the last years. Inflation is likely to subside over time, but the interest rate levels will remain at high levels in the upcoming years (Riksbanken, 2024). Historically, rising costs have led to political decisions with the intent to increase regional taxes to cover the required investment costs in several regions, and the same tendency can be seen today in some regions (Montgomery, 2014; SKR, 2023). However, the core problem is that increased taxes and state subsidies have not increased at the same rate as the investment costs (Wallström, 2020). An effect of this is seen in the indebtedness across regions where total debt has risen from 10 billion SEK in 2009 to 65 billion SEK in 2018 (Wallström, 2020). Another possibility for fronting the financial deficits mentioned earlier is to reconstruct current hospital facilities instead of constructing new ones since it implies a lower project cost (Montgomery, 2014). However, reconstruction projects often lead to complications for ongoing hospital operations, especially in technical advanced facilities.

Another reason to investigate investments in Swedish public hospitals is the future healthcare requirements. These imply higher standards which call for new hospital facilities. It is stated that hospitals from different generations have shifting requirements and that the future will bring new demands on the facilities (Cederberg, 2023). There are several requirements listed by actors within the sector where some examples are single-patient rooms, lower energy consumption, more home care, new medical technologies, adjustments for post-antibiotic healthcare, and new supporting technologies (Fröst & Hammarling, 2017; Hinnersson & Johansson, 2015; Montgomery, 2014). In general, future healthcare will have its foundation in care close to and with a certain focus on the patient's needs (Wallström, 2020).

Lastly, the dependency ratio is interesting from a hospital investment perspective. The dependency ratio is a measurement of youths (0-19 years) and elderly people (65+ years) in relation to professionals working in society (Anderstig, 2012; Hinnersson & Johansson, 2015).

If the ratio is less than 1, there are more people of working age in a population than non-working. Conversely, if the ratio is higher than 1, the opposite is true. In Sweden, the 2022 dependency ratio was 0.77 which implies there are more people of working age in the population than not (SCB, 2022). Compared to neighboring countries in Northern Europe, Sweden's dependency ratio has historically been high and is further predicted to be higher than the average (Anderstig, 2012). Correlated to this, predictions also show that by 2050 the dependency ratio of Sweden will increase to 0.87 (Anderstig, 2012). This means that the need for healthcare generally will increase, including specialized care at hospitals. The reason for this is that the elderly generally require more healthcare services and that there will be fewer healthcare workers per patient. Additionally, there is currently a problem with finding labor among several regions, so competence supply will be one of the main challenges for the sector ahead (SKR, 2023). Combined, these two demography trends call for new investments in hospital facilities.

1.2 Case background: Hospital of Kungälv

Kungälv is a town located on the west coast of Sweden, in the Region of Västra Götaland (VGR), and has nearly 18,000 inhabitants (Kungälvs kommun, 2023). The hospital located in the city has been an institution since 1870 when it opened caretaking possibilities for 30 patients simultaneously and is today one of the hospitals in the administration of *Sjukhusen i Väster* (SV) (VGR, 2021). Since then, the institution has undergone several reconstructions and added new facilities to the hospital area.

The main buildings that the hospital consists of today were built in the 1960s and the latest additions were built and completed in 2020 (VGR, 2022c). The facilities are owned by the public administration *Västfastigheter* and are rented by SV. In the new building additions from 2020, ten new care wards were constructed for urology, medicine, surgery geriatrics, and orthopedics. These investments, estimated to cost 1.2 billion SEK, dealt with some of the future healthcare demands, such as the construction of single rooms for patients and an increased capacity of 280 care places (VGR, 2022c). The increased care capacity has resulted in an amplified patient population that is attributed to the Hospital of Kungälv, stemming from Sahlgrenska University Hospital's (SU) patient population (VGR, 2022b). However, in retrospect, with the newest addition of hospital facilities, the Hospital of Kungälv became separated, and cooperation and functionality between the new and old hospital facilities have been lacking since (VGR, 2023a).

To amend this lack of unity and functionality within the hospital, a decision was taken to initiate a project with the aim of reconstructing the older facilities of the hospital. The scope of this reconstruction includes somatic outpatient care, laboratory medicine, surgeries, endoscopy and gastro center, administration, service and entrance functions, and a technical upgrade of the facilities. An analysis of the needs has been conducted and a pilot study has been initiated by the regional committee in VGR and directed by the consulting firm PwC (VGR, 2023a). With a starting point in the analysis of needs a target vision has been developed. This document highlights future healthcare requirements which are listed in Table 1. The final pilot study will

in turn show possible proposals for the reconstruction project at the Hospital of Kungälv. Furthermore, the audit from 2022 remarks how the board of SV has not completed its task satisfactorily from an economic perspective (VGR, 2022a). This emphasizes how important economic evaluation is in future investment projects for SV.

Table 1. Future healthcare requirements from the target vision. (VGR, 2023b)

Future Healthcare Requirements
The hospital is an attractive workplace
The healthcare environment is healing, safe, and secure
The facilities can meet changes over time
The facilities support good and close care
The hospital stands for safety and robustness
The hospital workflows are secure and effective
The current property is upgraded and modernized

1.3 Problem Formulation

Earlier research describes how capital investment analysis for hospitals traditionally has been rather undeveloped (Bock & Trück, 2011; Call, 2023; Choudhary et al., 2013). For academia, it is relevant to study and apply microeconomic theories in hospital management (Rezapour et al., 2012). In the Swedish setting, this is particularly pertinent due to the reasons declared in the sectoral background, where healthcare faces demanding challenges and has extensive hospital investment plans for the coming years. Three main reasons, namely the region's financial problems, future healthcare requirements, and an increasing dependency ratio are identified as relevant when investigating facility investments at Swedish hospitals. Similar causes are also seen in studies in other parts of the world (Call, 2023; Rezapour et al., 2012; Skirbekk et al., 2022).

All around the world, there is an increase in older populations (Skirbekk et al., 2022). This leads to an increasing dependency ratio and puts pressure on the functionality of healthcare systems including hospitals. This pressure can partly be reduced by preventing diseases through modernized hospitals. Respectively, in North America, there is a growing concern that a majority of hospitals may exceed their useful life during the upcoming years and not meet future healthcare requirements (Call, 2023). The combination of changing demography and new healthcare requirements are for example present in Iran and further shows the relevance of both these aspects (Rezapour et al., 2012). In addition to the new healthcare requirements and rising dependency ratio, the economic situation is precarious for the public healthcare sector and hospitals in Sweden, as the sectoral background described. Possible deficits in governmental services have moreover been pointed out as a key area in earlier research (Rezapour et al., 2012; Vassolo et al., 2021). These examples from other parts of the world further shows the relevance to study this problem.

The economic leeway of publicly owned hospitals is additionally under scrutiny from both Swedish taxpayers and the government. Responsible financial management is even regulated by Swedish law in Chapter 11 of *Kommunallagen* and Swedish regions are forced to use resources with requirements to generate decent yields (SFS 2017:725). Thus, it is important for the reconstruction of hospitals generally to be considered profitable from an economic perspective. Consideration of financial aspects in hospital facility investments is emphasized in the literature for the long-term survival of hospitals (Dran & Campbell, 1981). This is especially interesting since public hospitals traditionally have not executed break-even analyses and similar investment calculations (Choudhary et al., 2013). Limited research has been conducted on facility investments in Swedish hospitals but there are similar examples from abroad (Call, 2023; Sadler et al., 2008). Altogether, the argumentation above sums up the relevance of this thesis.

1.4 Purpose

The purpose of the study is to identify and analyze key factors to achieve economically profitable reconstruction projects at public hospitals.

1.5 Research Questions

With a starting point in the purpose declared above, two research questions are formulated for this thesis. The first question focuses on how a reconstruction project can be economically profitable. By performing an economic analysis of a specific case, a business case can show how profitability can be achieved and key financial posts can be identified. Therefore, the first research question (RQ) is as follows.

> *RQ 1.* How can a reconstruction project of a hospital be economically profitable?

Furthermore, a broader perspective is taken to examine if the specific case, together with other reconstruction cases of Swedish hospitals, can be used as a benchmark for future reconstruction projects in the healthcare sector. From these cases, key factors to achieve profitable investments can be gained on a national level. Therefore, the second question is formulated as follows.

> *RQ 2.* What are the key factors for hospital management to consider when aiming to achieve profitable reconstruction projects and why are they important?

1.6 Delimitations

This thesis is geographically delimited to Sweden and its healthcare system. A single country is investigated because of specific national regulations and prerequisites. Only the publicly owned hospitals in the Swedish healthcare system are included in the scope of the thesis. The reason behind this delimitation is the fact that the cost- and revenue structure of public versus private healthcare differs from each other. To consider future healthcare requirements is another delimitation that is needed to ensure the quality aspect of the hospital investment. Without these considerations, economic profitability can more easily be achieved but at the potential cost of

care quality towards patients. Regarding future healthcare requirements, which is a broad concept, this study relies on requirements formulated by VGR presented in section 1.2. Lastly, the thesis focuses on reconstruction projects rather than investments in completely new facilities.

2. Method

In this chapter, an overview of the method used for this thesis is provided. First, the methodological approach is defined, followed by the methods for the respective research study, and then the section is concluded with some criticism of the methodological choices and ethical considerations.

2.1 Methodology Approach

For this thesis, an abductive approach combined with a mixed method was selected. There are three different research approaches, namely deductive, inductive, and abductive (Ganesha & Aithal, 2022). Like the other two approaches, abductive reasoning attempts to build theories about the world, and it has grown in popularity among business researchers since it overcomes the limitations of deductive respectively inductive reasoning (Bell et al., 2022). A characteristic of abductive reasoning is the ambition to solve a puzzle (Bell et al., 2022; Ganesha & Aithal, 2022). This was the case in this thesis where the management of SV has expressed difficulty reaching the break-even point for hospital facility investments during the thesis's initial meetings. This puzzle is further confirmed in the literature as previously described in section 1.3. With this in mind, it was beneficial to use the pragmatic perspective highlighted in abductive reasoning (Bell et al., 2022). Further, a back-and-forth engagement between theory and the social world was used for this case and supported by abductive reasoning (Awuzie & McDermott, 2017).

A corresponding mindset can be identified in the explanatory sequential method design, which this thesis relied on. This is a type of mixed method design, a research approach that integrates both qualitative and quantitative research within a research project (Bell et al., 2022; Tashakkori & Creswell, 2007). A mixed method was desirable in this case to be able to analyze the problem on a broader scale. Only focusing on a quantitative part with financial numbers would not create a complete analysis of the problem, it could thus further be explained with qualitative terms. Nonetheless, the financial numbers were still of great importance for the first research question Triangulation is another rationale for research with mixed methods which means corroboration between quantitative and qualitative data is established (Bell et al., 2022; Doyle et al., 2009). Practically this was done in the findings and analysis of the second research study to confirm findings from the first one, for example the economic consequences of a reconstruction project. The ability to answer different research questions, illustrate quantitative data with a qualitative approach, and a better overview of the studied phenomenon are other justifications for mixed methods, and were also relevant to this study (Doyle et al., 2009).

Explanatory sequential design starts with a quantitative approach, using numerical data, and continues with a qualitative approach where the phenomenon is explained and elaborated on with qualitative methods, and altogether used to display the study's findings (Bell et al., 2022). In the case of this study, the quantitative part consisted of obtaining quantitative financial data. This data was used to assess the first research question and the specific case at the Hospital of Kungälv. The sequential step was to elaborate on the findings from the first research question

and to build a foundation and understanding for the qualitative phase. Proceeding to the second research question, the study adopted qualitative methods and built on the findings from the first question, and from the elaborative phase. Interviews were conducted with professionals who have been involved in reconstruction projects of hospital facilities in other regions. This was to evaluate if insights from the other cases could generate key factors for reconstruction projects at hospitals. For an overall view of the proposed research methodology see Figure 2.

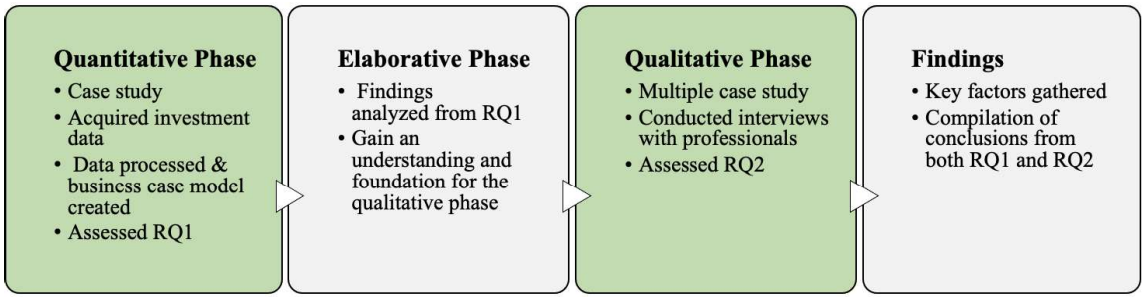

Figure 2. An overview of the thesis's method.

2.2 Method for Research Study 1

A quantitative method approach consists of numerical data, where the relationships between the data are evaluated (Bell et al., 2022). Further, a case study implies a study where a specific geographically located organization or phenomenon is researched. For the first research study, a quantitative approach with the Hospital of Kungälv as a case was chosen. A case study is commonly combined with a mixed method research design and is advantageous when researchers aim to conduct research that includes complexity and a high level of detail (Bell et al., 2022). This was the case in the first research study. However, the findings from a single case study are without further assessment, only relevant to the specific case in question (Bell et al., 2022). In the first research study of the thesis, an assessment of the reconstruction of the Hospital of Kungälv was completed on how the project could be profitable. This study was answered with the assistance of quantitative investment and operational data, and the construction of a business case model based on this data. Financial calculations were made for the facility investment of the Hospital of Kungälv, and relationships between input and output variables were established through a sensitivity analysis.

The data that the quantitative part used was provided by VGR and partly by Kolada which is a public database used by municipalities and regions. This meant that a secondary data analysis was conducted. Access was granted to a team consisting of financial controllers working at VGR, who assisted in providing the relevant data or cross-checking the instances when data from Kolada was used. A secondary analysis is an analysis made on data that other researchers, companies, or organizations have collected (Bell et al., 2022). This type of data analysis is common when the researchers are limited in terms of financial resources and time, which was true for this thesis. Thus, an advantage of using a secondary analysis approach is, for instance, that time on data collection could be diverted to other tasks like data analysis, or search for literature (Bell et al., 2022). Further, the approach made it possible to access high-quality data

as it stemmed from VGR's databases or Kolada, which would have been difficult to achieve with the collection of primary economic data in this case.

2.3 Method for Research Study 2

Rather than numbers, a qualitative method is about words and visuals which suited well for this thesis's second research study (Bell et al., 2022). The creation of theory is highlighted for a qualitative method which also corresponds with an abductive approach and the second research study. Generally, there are six steps to be followed when a qualitative study is conducted (Bell et al., 2022). In this section, it is described how these were applied in this study.

First, a somewhat general research question was composed, based on an initial literature review and the problem formulation in section 1.3. Secondly, relevant sites and subjects should be selected (Bell et al., 2022). For the second research study, a comparative design with a multiple case study was considered to be relevant to get a broader perspective and better understand the influential key factors for hospital facility investments. This design also enabled an in-depth examination of the selected cases to better understand the complexity. These cases are listed in Table 2 together with the corresponding region, the start date of the project (initiation of the pilot study), and an approximated project budget. The cases were chosen based on the delimitations in 1.6 which entailed reconstruction projects at Swedish public hospitals. However, several of the projects were extensive and therefore also included new construction.

Table 2. Cases for the second research study.

Multiple Case Study	**Region**	**Project start**	**Budget**
Östra Hospital (SU)	VGR	2023	~2000 MSEK
The Hospital of Hudiksvall	Gävleborg	2020	~530 MSEK
The Hospital of Karlstad	Värmland	2023	~7000 MSEK
The Hospital of Kungälv	VGR	2023	~1770 MSEK
The Hospital of Värnamo	Jönköping	2015	~500 MSEK
The Hospital of Växjö	Kronoberg	2023	N/A
University Hospital of Umeå	Västerbotten	2016	~200 MSEK
University Hospital of Linköping	Östergötland	2011	N/A

Thirdly, the collection of relevant data is important and was completed with interviews during this study. In total 21 interviews were conducted, and all are listed in Table 3. To enable a greater understanding of the subject and let the interviewees elaborate on complex topics the interview length was in general between 45 and 60 minutes. A qualitative interview is normally less structured but for this study, a semi-structured interview approach was applied (Bell et al., 2022). Since several cases and a lot of interviewees were present, the structure was needed to be able to compare the cases and draw appropriate conclusions. The interview guide used is found in the Attachments section.

Table 3. The conducted interviews with corresponding cases, dates, and duration.

Interview	Region	Case	Date	Time
Interviewee 1	VGR	Östra Hospital	2024-03-13	50 min
Interviewee 2	VGR	The Hospital of Kungälv	2024-03-13	50 min
Interviewee 3	VGR	The Hospital of Kungälv	2024-03-13	45 min
Interviewee 4	VGR	Östra Hospital	2024-03-14	50 min
Interviewee 5	Gävleborg	The Hospital of Hudiksvall	2024-03-14	55 min
Interviewee 6	Västerbotten	University Hospital of Umeå	2024-03-18	50 min
Interviewee 7	Värmland	The Hospital of Karlstad	2024-03-19	50 min
Interviewee 8	Jönköping	The Hospital of Värnamo	2024-03-20	45 min
Interviewee 9	VGR	Östra Hospital	2024-03-20	55 min
Interviewee 10	VGR	Östra Hospital	2024-03-20	60 min
Interviewee 11	Jönköping	The Hospital of Värnamo	2024-03-21	55 min
Interviewee 12	VGR	The Hospital of Kungälv	2024-03-22	50 min
Interviewee 13	Kronoberg	The Hospital of Växjö	2024-03-22	50 min
Interviewee 14	Östergötland	University Hospital of Linköping	2024-03-22	50 min
Interviewee 15	Västerbotten	University Hospital of Umeå	2024-03-26	50 min
Interviewee 16	Gävleborg	The Hospital of Hudiksvall	2024-03-27	30 min
Interviewee 17	Kronoberg	The Hospital of Växjö	2024-03-27	45 min
Interviewee 18	VGR	The Hospital of Kungälv	2024-03-28	50 min
Interviewee 19	Värmland	The Hospital of Karlstad	2024-03-28	50 min
Interviewee 20	Gävleborg	The Hospital of Hudiksvall	2024-04-02	50 min
Interviewee 21	Östergötland	University Hospital of Linköping	2024-04-17	55 min

Regarding sampling, a purposive approach with snowball sampling was used, which meant contacts and recommendations were the basis for the sampling (Bell et al., 2022). Practically, this was done by establishing contacts at SV and PwC and then allowing them to recommend further contacts which were both internal and external. This resulted in an initial selection of 8 interviewees at respective regions and these respondents then recommended colleagues within their region relevant to the study. This sampling technique is used when a sampling frame is not easily accessible and is constantly under change (Bell et al., 2022). This was true for people working with public hospital reconstruction investments. Further, this meant that persons with diverse backgrounds and work roles were present in the study. All the roles are listed in Table 4 and this composition gave a broader understanding of the second research question. The qualitative interviews enabled a greater breadth of data and investigation of unobservable issues, but there could be a risk of overestimating the reliability of the answers (Bell et al., 2022).

Table 4. Work roles for the interviewees in the second research study.

Work Roles
Analyst
Chief Physician
Controller
Coordinator
Facility Manager
Financial Manager
Hospital Director
Production Manager
Project Manager
Property Developer
Strategist
Unit Manager

The fourth step was about analyzing the data. Thematic analysis was applied to the conducted interviews to identify patterns and draw conclusions about the requested key factors. Practically this was done by compilating the answers in a table to compare and analyze them. Repetitions, indigenous typologies, and similarities respectively differences were sought after during the thematic analysis, and general key factors were formulated for each of the interviewees. Where three or more respondents mentioned a theme, it was considered among the most influential and therefore decided to be a key factor. Conceptual and theoretical work was the next step for the qualitative research (Bell et al., 2022). In this thesis, this was done by drawing conclusions based on the frame of reference and the conducted analysis. Writing up findings and conclusions was the sixth and last step carried out in this qualitative study.

2.4 Method Criticism

An argument against mixed methods is that quantitative and qualitative methods have different epistemological commitments (Bell et al., 2022). By applying an abductive approach with a pragmatic starting point this was somewhat overcome. Another criticism is that a cross-sectional design would engender more general findings than a multiple-case study. However, the emphasis in this study was on the individual cases because of limitations in resources to conduct cross-sectional research. Moreover, the distinction between the two designs can be somewhat unclear so it can be argued that both a multiple-case study and cross-sectional design were used in this study. However, as declared previously a multiple-case study was selected. Lastly, there are limitations connected to secondary data analysis such as the complexity of data, the lack of control over quality, and the potential absence of key variables (Bell et al., 2022). This was handled during the study through continuous discussion with representatives from the data provider VGR.

Reliability is synonymous with the consistency of the measurement of a concept (Bell et al., 2022). First and foremost, external reliability which is about stability and correlation between observations, was considered for this thesis. The first research study involved input data retrieved from recent years. These financial numbers have changed historically and will probably do so even in the future. In other words, a similar study examined five years from now would probably not show the same findings because of changes in the economy due to inflation and other factors. For the second research study, the external reliability was handled by implementing semi-structured interviews with detailed interview guides to be able to ask the questions in the same way if the study were replicated. But of course, events can take place between the original and replicated study which affects the findings. It is also stated how a first response almost always affects a second response in a replicated study (Bell et al., 2022). Additionally, internal reliability is about the agreement between researchers (Bell et al., 2022). This was considered for this thesis but was not relevant for the first part of the study which mostly involved financial numbers, and therefore no interpretation was needed. For the second part and the interviews conducted this was encountered by the presence of both researchers during all interview occasions. The interview responses were then reviewed together before they were compiled and composed into a final result.

Validity is related to the concept of reliability but is rather about whether the intended measurement of a concept is captured by the selected indicators (Bell et al., 2022). Further, external validity is about generalization across social settings, and within the scope of this thesis for public hospitals in Sweden. For the first research study, the external validity was low since only a single case of the Hospital of Kungälv was analyzed. Financial numbers were obtained specifically from the hospital operations and therefore it was difficult to draw more general conclusions. However, learnings from this case were brought forward to the second research study where the external validity was significantly higher. This was due to the inclusion of several cases which increased the generalizability of the findings, but it could still be argued that the number of cases was a bit too insufficient. Nonetheless, it was complemented by relatively numerous interviews to secure theoretical saturation. Snowball sampling was used to further increase the validity of the study since the sampling technique lets the researcher access interviewees otherwise difficult to reach (Bell et al., 2022). Furthermore, because of the recommendations from others, the interviewees were able to give suitable insights to the research question. Additionally, it is of interest to distinguish between what the interviewees said and what they had experienced in their projects. Some, but certainly not all, projects followed the decided cost budget. However, this is not the same as counting a profitable investment where increased revenues exceed the project costs. Therefore, it entailed some uncertainty to ask the interviewees about key factors for profitable reconstruction projects.

Furthermore, internal validity is about how the observations from the study connect to the theory (Bell et al., 2022). The first research study heavily relied on the theory of capital budgeting and business cases at hospitals which indicates the importance of theory for this thesis. Especially, the business case model developed was built on a foundation of capital budgeting theory about economic key figures. Additionally, the included theory was extended

during the process of the thesis due to new insights from articles and people within the hospital sector. For the second research study, the internal validity was conversely lower. Since not much research has been conducted about key factors for profitable investment at public hospitals in Sweden, it was difficult to draw connections between the observations and established theory. However, theoretical frameworks about investments in the public sector and productivity and incentives were applied to better understand the interview responses.

2.5 Ethical Considerations

There are ethical principles that are vital to consider when conducting business research. For this thesis, these were especially relevant for the second research study which involved interview respondents. The focal ones are potential harm to participants, prevention of deception, informed consent, and privacy (Bell et al., 2022). However, the first two were not present during this study. Regarding informed consent, the interviewees were sent a general description of the report including background, purpose, and research questions in advance to be able to consider whether they wanted to participate or not. Before the interview, they also received the interview template which was controlled in advance by the supervisor at Chalmers University of Technology.

Further, the interviewees were informed about the audio recording of the interview and gave their consent to this. The interviewees' responses were summarized by the authors based on these recordings. Although, before being included in the report the interviewees' received the summarization to proofread and approve. Privacy is connected to informed consent, if the participant is well informed they surrender some of their privacy within that limited domain (Bell et al., 2022). Nevertheless, the interviewees were kept anonymous except for their organizational role and workplace. The roles were presented to show the participants' relevance for the study and the specific research question to further increase the validity.

Other ethical considerations like data management, copyright, and affiliation are also important (Bell et al., 2022). Collected data can be confidential, but for the first research question, only public data from secondary sources were used. The only relevant data for the business case model was financial numbers, thus no sensitive patient information was present. Considerations about copyright are furthermore central and were handled throughout this study with extensive reference management to avoid plagiarism. Lastly, there were no affiliations present since the thesis was not funded by any stakeholder and therefore the authors could act independently.

3. Theoretical Framework

This chapter provides a theoretical framework to better understand the research questions, the findings, and the analysis. First, a general description of capital budgeting is presented, followed by what investment in the public sector is characterized by. Lastly, literature about revenues and costs of hospitals and more specifically business cases at hospitals are presented.

3.1 Capital Budgeting

Capital budgeting is described as the process of assessing and analyzing future investment opportunities in an organization (Berk & DeMarzo, 2024). The process consists of calculating economic key figures for the investments and then evaluating them. It is common practice in private firms to have several investment opportunities as relevant alternatives simultaneously. Thus, capital budgeting also deals with evaluating different opportunities against each other and deciding on the most suitable investment opportunity for the firm (Berk & DeMarzo, 2024). To perform the capital budgeting process and calculate economic key figures for investment, some projections of potential costs and revenues related to the investment need to be put forward according to the theory. Of these projections, a future cash flow for the different investment opportunities can be calculated (Berk & DeMarzo, 2024).

Even though the capital budgeting process is the most common praxis when analyzing investment opportunities, it is not perfect, and research has put perspective on the flaws of the methods connected to it (Alkaraan & Northcott, 2006). These shortcomings will be elaborated on further down for each of the selected key figures. However, some general critiques are for instance that bias is common towards short-term investments, estimated cash flows are not always accurate, and that capital budgeting fails to capture intangible qualities of investments (Alkaraan & Northcott, 2006).

In the upcoming sections, descriptions of financial evaluation methods and corresponding key figures used in the capital budgeting process are presented. The traditional financial evaluation methods are the Payback model, Net Present Value (NPV), and the Internal Rate of Return (IRR) (Alkaraan & Northcott, 2006; Cooremans, 2011; Renkema & Berghout, 1997). These key figures will be elaborated on, but first, a section describes the process of projecting future revenues and costs related to a potential investment.

3.1.1 Projecting Revenues and Costs

As stated in the previous section, the projection of potential revenues and costs is essential for capital budgeting. On the revenue-side, projections are made on the possible incremental earnings the investment will bring when completed (Berk & DeMarzo, 2024). Similarly, on the cost-side, the projections are made on the potential consequences an investment will entail related to costs. The revenues and costs of a future investment can further be split into two categories, direct and indirect effects (Berk & DeMarzo, 2024). Naturally, direct effects relate to the investment itself, while indirect effects are other costs and revenues in the firm occurring as a result of the investment.

The projections will finally result in a projected cash flow, used in the capital budgeting methods, to attain the economic key figures (Berk & DeMarzo, 2024). Further, it is proposed that cash flows should grow due to inflation. During the last 30 years the inflation in Sweden has on average been 1.73% (SCB, 2024). When a reoccurring payment is of equal cash flows during a fixed period it is called an annuity payment (Berk & DeMarzo, 2024). The length of the period depends on the investment opportunity and the financial parameters connected to it. The period can be the time an organization plans to depreciate a future investment, which decides its useful economic lifetime. Depreciation is not a direct payment in itself, but rather a fraction of the investment cost that the business deducts each year from the income statement (Berk & DeMarzo, 2024). Further, the straight-line method is the simplest method used, which means that the asset is depreciated annually, divided equally over its useful economic lifetime. Naturally, capital-heavy investments, such as hospital reconstruction projects, tend to have longer depreciation periods, to reduce their immediate impact on the income statement. Another factor to reflect on when analyzing an investment opportunity is the sunk costs (Berk & DeMarzo, 2024). Sunk costs are referred to as unrecoverable costs that will be paid regardless of the investment decision, and thus should not be considered when projecting the potential costs. This could for example be a business case included in a pilot study before an investment takes place.

Since projections are always forward-looking, naturally they are related to uncertainty. In earlier research, it has been established that the accuracy of projections is well connected to when in time the projection is made, projections that are closer to the present are more accurate than projections in the far future (Sinha et al., 2010). Related to capital budgeting, investments with a longer economic lifetime are therefore more difficult to give accurate predictions to. However, as stated in the previous section, cash flows of all types of investments can be difficult to estimate accurately (Alkaraan & Northcott, 2006). Nevertheless, there is a greater chance that projections that are in the near future are more accurate than projections in the far future.

3.1.2 Payback Model

The Payback model is a method used to evaluate the time until an investment is recovered, the so-called payback time (Cooremans, 2011; Renkema & Berghout, 1997). Thus, the model deals with the risk rather than the profitability of an investment. Since the Payback model is risk-oriented it is useful to decide how much time, or risk, which can be accepted before calculating the payback time according to the literature. If the calculated payback time exceeds the pre-decided payback time, it is not advised to go further with the investment opportunity (Berk & DeMarzo, 2024).

The calculations for the model consist of projecting a cash flow, commonly annual or monthly, and then using the number to divide the total investment cost, see Equation 1 (Berk & DeMarzo, 2024; Cooremans, 2011; Renkema & Berghout, 1997). However, if the cash flows differ during the periods, then the payback time is the time the investment is fully recovered from the accumulated incoming cash flows (Renkema & Berghout, 1997). If there are several investment

alternatives, the one with the shortest payback time should be picked, when merely relying on the Payback model.

$$Payback\ time = \frac{Total\ investment\ cost}{Cash\ flow}$$

Equation 1. The formula for the calculation of Payback time based on (Berk & DeMarzo, 2024)

Due to its simplicity, the Payback model is a popular method for private companies to use when evaluating investment opportunities (Cooremans, 2011). However, this simplicity is also one of the shortcomings of the model. A critique of the Payback model is that the time value of money is not considered, namely inflation and economic development in society (Cooremans, 2011). Further, another drawback is that the investment regularly goes beyond the payback time which means that cash flows go beyond the payback limit. Irrespective if these cash flows are positive or negative, they are not considered and do not affect the key figure of payback time. Additionally, the method relies on subjective decision criteria for how long the payback time should be (Berk & DeMarzo, 2024).

3.1.3 Net Present Value

Further, the NPV of an investment is calculated by using the predicted cash flows of an investment (Cooremans, 2011; Renkema & Berghout, 1997). The cash flows are discounted with a discount rate, which exemplifies the minimum requirement of return on investment, from the investors' perspective. The discount rate is based on the cost of capital for the business and the risk factor of the investment (Cooremans, 2011; Renkema & Berghout, 1997). The cost of capital depends on the market's best available expected return of a similar investment and is based on the composition of equity and debt within the organization (Berk & DeMarzo, 2024). A higher risk factor leads to an increased discount rate which in turn implies a lower NPV and a less attractive investment (Cooremans, 2011). Because of this additional risk factor, it is problematic to use a general discount rate in an organization since it does not include the project-specific risk. Therefore, to receive a realistic result, the selection of a proper discount rate is of importance (Bock & Trück, 2011).

The discounted cash flows are assessed on the economic lifetime of the project, computing a present value. This can be understood as today's value of all future cash flows concerning inflation and future societal economic development. From this point, the total investment cost is subtracted from the present value to calculate the NPV, see Equation 2 (Berk & DeMarzo, 2024; Dran & Campbell, 1981). Further, the NPV is a profitability measurement of the investment and if the NPV is greater than zero, the investment is considered profitable. When several investment alternatives are under consideration, the one with the highest NPV is chosen, when only the NPV method is used (Berk & DeMarzo, 2024). To determine the consistency and accuracy of NPV calculations, a sensitivity analysis can be executed (Borgonovo & Peccati, 2004). Based on this analysis a ranking of the parameters is set up according to their influence on the NPV which will be elaborated on further in section 3.1.5.

$$NPV = \sum_{t=1}^{T} (Cash\ flow_t \times (1 + discount\ rate)^{-t}) - Total\ investment\ cost$$

Equation 2. The formula for the calculation of NPV (Berk & DeMarzo, 2024; Dran & Campbell, 1981)

To get a sense of the potential value for money that the investment will create, the profitability index can be used (Berk & DeMarzo, 2024). This index measures the NPV in relation to the resources consumed by the investment, as seen in Equation 3, and is commonly used to rank investment opportunities against each other. A return-on-investment (ROI) measurement is a ratio that relates the net value of the investment to the cost of the investment (Appel-Meulenbroek & Danivska, 2023). Thus, the profitability index can be seen as an ROI measurement for the investment.

$$Profitability\ index\ (ROI) = \frac{NPV}{Resources\ Consumed}$$

Equation 3. The formula for the calculation of the Profitability index based on (Berk & DeMarzo, 2024)

External influences in society can potentially have a great impact on the calculated NPV (Bock & Trück, 2011). Relevant factors that affect the NPV are changes in economic growth, currency exchange rates, inflation, and interest rates. Furthermore, a problematic aspect is that the projected input values are estimated on past data and therefore not automatically relevant for the future. A calculation of these values is not always enough to make well-informed decisions, and therefore a risk analysis could be conducted (Bock & Trück, 2011). This can be done with a sensitivity analysis as stated previously.

3.1.4 Internal Rate of Return

Lastly, the IRR is equal to the discount rate at which the NPV of an investment is zero (Cooremans, 2011; Fisher & Mcgowan, 1983; Hartman & Schafrick, 2004). Thus, the IRR is related to the NPV and along with it, an additional profitability measurement of an investment. The IRR can be seen as the maximal error in the cost of capital, which means that the rate needs to exceed the cost of capital for the investment to be considered profitable (Berk & DeMarzo, 2024; Hartman & Schafrick, 2004; Renkema & Berghout, 1997). Equation 4 shows the calculation of the IRR and is derived from Equation 2. Further, the IRR can algebraically be extracted from the equation. However, due to its complex mathematical nature, the IRR is often solved numerically, by examining different rates, approaching an NPV that equals zero, or with the assistance of a computer program (Hartman & Schafrick, 2004; Renkema & Berghout, 1997).

When assessing several potential investments, relying on the IRR as a comparative instrument can be misleading (Berk & DeMarzo, 2024). Furthermore, it might seem logical to choose the investment opportunity with the highest IRR, but this is not consistent. Due to potential differences in parameters such as the scale of the investment, risk, and timing of cash flows,

one cannot rely on comparing the respective IRRs (Berk & DeMarzo, 2024). Financial research has further established the drawbacks of the IRR method (Magni & Peasnell, 2012). For instance, circumstances can occur when the IRR is undefined completely, or several values for the rate occur simultaneously. This happens when there are multiple sign changes in the predicted cash flows of the investment opportunity. Another drawback, as mentioned briefly, the method does not consider the scale of the investment (Magni & Peasnell, 2012). For example, a high IRR on a small-scale investment opportunity might appear superior to a low IRR on a large-scale investment, according to the method. However, it is not necessarily the case that a high IRR yields a higher return in absolute numbers, and thus the investment opportunity with a lower IRR could still be a superior investment opportunity.

$$NPV=0=\sum_{t=1}^{T}(Cash\ flow_t\times(1+IRR)^{-t})\ -Total\ investment\ cost$$

Equation 4. The formula for the calculation of IRR based on (Berk & DeMarzo, 2024)

Similar to the IRR, a break-even analysis is correlated to examining when the NPV of an investment is equal to zero (Berk & DeMarzo, 2024). Based on the initial projections of the cash flows, the break-even analysis is used to examine the input variables of the NPV when it is equal to zero. This is often useful when there is uncertainty regarding the projections of an investment decision.

3.1.5 Economic Key Figures & Sensitivity Analysis

With the starting point in the sections about capital budgeting above, a summary of the key figures is presented in Table 5. In the left column, the economic key figures with the corresponding units are listed. In the right column, a desired outcome for each of these is displayed based on the theory presented earlier. As elaborated on earlier, each of these key figures has its benefits and limitations but can accordingly jointly serve as a foundation for a financial evaluation of an investment.

Table 5. Summary of key figures for capital budgeting based on section 3.1.

Capital Budgeting Key Figures	Unit	Desired Outcome
Profitability Index (ROI)	%	≥0
Payback time	Years	≤Predetermined Payback
Net Present Value (NPV)	SEK	≥0
Internal Rate of Return (IRR)	%	≥Cost of capital

Furthermore, a sensitivity analysis can be executed to assess the uncertainties in an investment evaluation by breaking down the NPV and other profitability key figures into its components (Berk & DeMarzo, 2024; Bock & Trück, 2011). The main purpose of a sensitivity analysis is to identify the critical and most sensitive variables affecting key figures like NPV and IRR early in the process (Bock & Trück, 2011). This is due to the uncertainty of the input variables and how the variation of these can result in inaccurate final estimations of the key figures. Practically, this can be performed by assuming a best respectively worst-case scenario for each

input variable (Berk & DeMarzo, 2024). Based on these approximations the key figures can be recalculated to outline which variables have the vastest impact.

Moreover, it is useful to show these results graphically, either by a plot graph or a range chart (Berk & DeMarzo, 2024; Bock & Trück, 2011). The graphical representation shows the input variables with the greatest impact in an easy and comprehensible manner. By examining the input variables with a sensitivity analysis, a greater understanding of how these affect the key figures can be gained (Berk & DeMarzo, 2024).

3.2 Characteristics for Investments in Public Sector

Concerning investments in the public sector there are several resemblances to the procedure in the private sector. The nature of an investment is to receive benefits over a period of time with an initial economic sacrifice relevant to both sectors (Brealey et al., 1997). According to the literature, another similarity between the sectors is how they are externally monitored. In a private company the shareholders control and have the power to remove the board, and likewise, citizens could replace politicians during elections (Brealey et al., 1997). However, there are also several characteristic alterations between investment in the private and public sectors, which will be elaborated on further in the subsections ahead.

3.2.1 Different Purpose

In the private sector, the goal of investment is to increase the financial value of the firm (Berk & DeMarzo, 2024). Within the public sector, however, it is often argued that non-financial objectives are of higher importance (Dran & Campbell, 1981). There are simply other reasons for governments to intervene and invest than purely financial gains. Mainly three reasons for government intervention are declared in the literature, which are the presence of public goods, monopolies, or externalities (Brealey et al., 1997). Public goods can be used by additional customers at no extra cost, for example, a public park. This means, there is a possibility to free ride when the initial investment is made (Brealey et al., 1997). Therefore, a private company would not have any customers willing to pay for public goods and that is why the public sector intervene to establish these.

A natural monopoly, like the power grid, is another reason for governments to intervene (Brealey et al., 1997). This is due to high fixed costs which reduces the potential profit margin. This discourages private companies from investing since they do not have the incentives to provide these services for the anticipated price. Externalities that can affect a third party, like improved healthcare leading to higher societal productivity, also call for governmental intervention (Brealey et al., 1997). An externality is not considered when an actor makes a decision but still has consequences for other parties. Related to externalities, another complex factor for the public sector is the fact that benefits and costs are not shared proportionally among citizens (Brealey et al., 1997). For example, only the patients benefit from a hospital, but all taxpayers share the costs. In other words, the externalities in varying degrees affect different population segments.

A common rule for governments to use is to conduct investments with the greatest net benefits when evaluating potential costs and benefits, called the Hicks-Caldor criterion (Brealey et al., 1997). For the government to undertake a project according to this logic, those who suffer from the investment should be compensated by those who benefit from it. This is also relevant for the management of hospitals which do not only have a profit-vision as other businesses (Lennerts et al., 2003). Further, a hospital has to operate under unique conditions when it is expected to handle people's health and lives and additionally offer this service around the clock. Moreover, the citizens expect to take part in hospital services for a low price but still with the highest available quality delivered (Lennerts et al., 2003). To summarize, economic profitability is not the sole reason for public sector management to invest.

3.2.2 Legal Regulations

Responsible financial management is regulated by Swedish law, as briefly introduced in section 1.3. Chapter 11 of *Kommunallagen* regulates Swedish regions to have good financial management (SFS 2017:725). Further, they are forced to use resources with requirements to generate decent yields. However, as elaborated on in section 3.2.1, public administrations have other incentives to invest than solely the economic perspective. A concretization of the law is the balance requirement, which entails that the revenues should exceed the costs in the established budget for the administration (SFS 2017:725). There are exceptions if extraordinary reasons occur but generally, this means public activities cannot include investments that exceed the budget.

In other words, budget restrictions are present which management in the public sector must consider (Svensson & Hultkrantz, 2014). It is common with budget restrictions for large investments since they will increase future operating costs. This becomes especially problematic when decisions are taken sequentially based on forecasts (Svensson & Hultkrantz, 2014). Subsequently, the decision maker must already at the beginning of the budget period appraise the size of the resources available at the end of the project, which can be difficult.

3.2.3 Net Present Value Considerations

Further, the reasonings about NPV are somewhat different for the public sector than the private. Regarding the time perspective, there are limitations to the NPV assessment in the public sector due to the normally long-time horizon in their projects (Kula, 1981). Costs and benefits are often separated by several years and the discount rate makes distant figures irrelevant for the final result. NPV calculations can based on this logic also be argued to deprioritize future generations (Kula, 1981). Less weight of benefits and costs is given to future citizens because of additional years in the calculations, understood as a greater t in Equation 2.

Furthermore, projects are usually undertaken in private firms if the NPV is positive (Dran & Campbell, 1981). However, the case is not necessarily the same for decisions inside the public sector. Rather, an entire set of projects should have an NPV greater than or equal to zero, so the total economic value of the public administration is retained over time (Dran & Campbell, 1981). With this logic, an investment carried out by a public administration can potentially have

a negative NPV if subsidized by other projects. However, there are not always alternatives to choose from in the public sector. As earlier described an investment can be motivated by externalities or the presence of public goods (Brealey et al., 1997). For example, suppose increased hospital operations are needed due to demographic changes and population demand. In that case, the regional management has no choice but to invest even if it implies a negative NPV.

3.2.4 Discount Rate Considerations

There are additionally some implications for the discount rate in the public sector. A common interval for discount rates in the public sector in Sweden is between 3-4% (Svensson & Hultkrantz, 2014). There are also general guidelines from Swedish authorities regarding the discount rate, and in recent years, it has been in this interval (Finansinspektionen, 2024). The societal discount rate is used to recalculate future benefits and costs to a present value within the public sector, exactly as in the private sector (Svensson & Hultkrantz, 2014). However, a discussion is also ongoing on whether health effects should have a lower discount rate than costs. This arises from the fact that increasing future incomes will enhance the valuation of health.

Furthermore, the importance of the project's exposure to risk and how the discount rate should vary with it is also pointed out (Brealey et al., 1997). Some research suggests that the risk-free interest rate should be used directly as a discount rate (Bock & Trück, 2011). However, then no appraisal of the project's exposure to risk is considered. Therefore, the discount rate often includes a risk premium which entails a projected difference between the project and the risk-free rate (Bock & Trück, 2011). This risk-premium similarly affects the taxpayers as shareholders are affected by risk adversity in a private company (Brealey et al., 1997).

Nevertheless, there are reasons that argue for a lower discount rate used for public investments. These are the risk sharing among the population, how governmental ownership diversifies the risk, and how this diversification is cheaper than in financial markets (Brealey et al., 1997). But these arguments can be nuanced by the reasoning mentioned about hospitals and other similar investments within the public sector in section 3.2.1, only a small segment shares the uncertainty of the potential benefits.

3.2.5 New Public Management

New Public Management (NPM) is one of the great trends in public administration historically (Hood, 1991). This management trend affects the public sector in general and also investments within it. NPM is a rather loose group of ideas but 7 doctrines were specified in the literature during the 1990s (Hood, 1991). The first one is hands-on professional management in the public sector followed by explicit standards and measures of performance. These standards are preferably described with quantitative terms and serve as indicators of success. This is linked with the third doctrine which puts greater emphasis on output controls. Fourthly, a shift to disaggregation of units in the public sector is associated with NPM which enables a decentralized work more around products. Greater competition in the public sector is also a shift that has taken place and is the fifth doctrine. The sixth doctrine stresses private-sector styles of management practice and implies a better public service ethic. Lastly, the seventh doctrine entails pressure on greater discipline and parsimony in resource use with a focus on cost-cutting and labor discipline.

The concept of NPM stems from two different streams of ideas with new institutional economics on one hand and business-type managerialism on the other (Hood, 1991). It is connected to a development seen mainly in Britain but also internationally between the 1970s and 1990s. When the Swedish debate was influenced by the NPM theory it affected healthcare and education immensely and fast during the 1990s with several reforms (Blomqvist, 2016). It appeared that NPM could solve problems with low influence from citizens and ineffective administrations at the same time. With NPM the idea of a welfare society could remain but still be modernized to fulfill the overall purpose (Blomqvist, 2016). Within the healthcare sector, a lot of reforms have been about cutting costs and economic efficiency. Concretely, the reforms have been about privatization, implementing competition, and decentralization of budget responsibility (Blomqvist, 2016). However, it is pointed out that these initiatives have not reached their full potential even though some productivity improvements can be identified.

Even though several doctrines have shown a positive impact on the management of the public sector, there are some criticisms present. In Sweden, the degree of universalism and equal treatment of all citizens has diminished (Blomqvist, 2016). Concretely this is seen in undesirable side effects as segregation and non-appearance of positive effects like cost reductions and quality improvements. Already when NPM was launched as a concept some initial criticisms were brought forward (Hood, 1991). First, it is described as a concept with no real content. Moreover, NPM is claimed to not lower the costs and has instead damaged the public sector. Thirdly it is assumed to prefer only a particular group of citizens instead of delivering a public good. Lastly, in line with the trend observed in Sweden, there is a diminishment of universality as a consequence of the NPM doctrines (Blomqvist, 2016; Hood, 1991). Nonetheless, there are counter-arguments for this criticism which suggests that there is no natural opposition between efficiency and equity (Hood, 1991)

3.3 Business Cases at Hospitals

As discussed in previous sections, projects should be profitable for the organization that undertakes them, whether the project is handled by a public administration or by a private firm. In the hospital sector, this is even more important since investment analysis is relatively undeveloped due to a lack of information to make a business case (Call, 2023). Within such a project, a business case serves as a basis for investment as well as a gauge of the project's feasibility (Appel-Meulenbroek & Danivska, 2023). A business case is explained as a project document that generally includes entailed potential benefits and costs. To be able to make a recommendation and justify the investment for management, some type of ROI should be included (Appel-Meulenbroek & Danivska, 2023). Commonly this key figure is economical like the profitability index described previously in section 3.1.3. Business cases thus play an important role in the project, assessing the type of results that are considered successful.

Further, three sequential phases are suggested when a business case is formulated and the second is about economic calculations (Appel-Meulenbroek & Danivska, 2023). The appraisal of relevant benefits and costs is the foundation for this phase, followed by financial calculations and sensitivity analysis to finally build a report to be able to decide on the viability of the investments. The key figure proposed to use here is an ROI (Appel-Meulenbroek & Danivska, 2023). These steps are like the process suggested in section 3.1 about capital budgeting and the economic key figures of payback time, NPV, and IRR elaborated on can be used to complement this analysis to include a time perspective.

To assess such results at hospitals specifically, a break-even analysis can be performed (Choudhary et al., 2013). The break-even point is where projected revenues equal total costs which contain fixed and variable costs. From a time perspective, the break-even point is when the NPV is equal to zero (Berk & DeMarzo, 2024). As elaborated on in the problem statement this type of business case is not at least important for reconstruction projects of hospitals. In the following subsections, the revenue-side and then the cost-side of the business case will be explained and put into the context of facility investments at hospitals. Lastly, it is concluded with a business case model that relates the revenues to the costs to perform the proposed break-even analysis.

3.3.1 Revenue-side

Connected to business cases at hospitals, the compensation model that the hospital uses plays an important role in revenue projections. Generally, there are two perspectives used to describe compensation and how it can create revenue; time and activity (Lindgren, 2014). Further, the structure of the compensation can have a foundation in an activity perspective where the supplier is compensated based on the activity that takes place, or with a time perspective where the supplier is compensated on a time basis.

The two perspectives can additionally be divided into subcategories (Lindgren, 2014). Taking the time perspective, compensation can be divided into prospective and retrospective, which have different incentives for the supplier. Prospective means that the supplier receives a fixed

compensation without taking costs that occur during the activity into consideration, which has incentives for the supplier to work as efficiently as possible (Lindgren, 2014). Retrospective means that costs will influence the final price of the performed activity, which has the incentive for the supplier to work as much as possible. The activity perspective also has two subcategories, fixed and variable (Lindgren, 2014). If the compensation is fixed, the amount of an activity does not affect the compensation, contrary to if the compensation is based on a mindset that includes variables. Further, the two perspectives can also be combined and altered to create a compensation structure that is best suited for the organization.

Regarding compensation at Swedish hospitals, which is constructed on the reasoning in the previous paragraph, several models are commonly used to decide how the compensation should be structured, and subsequently how much revenue can be generated (Lindgren, 2014). Table 6 lists the compensation models that Swedish hospitals commonly use, and how the compensation is structured.

Table 6. Compensation Models in the Swedish Healthcare System (Lindgren, 2014)

Model	**Compensation Structure**
Appropriation	Fixed, Prospective
Capitation	Fixed, Prospective
Compensation per Product Group	Variable, Prospective
Fee For Service	Variable, Retrospective
Performance-based Compensation	Combinations of mentioned subcategories

The compensation in the appropriation model is structured with a foundation in costs, or the budget (Lindgren, 2014). The healthcare provider is compensated with an amount that should be able to cover the cost for a period, usually annually. Therefore, this model is not linked to the amount of healthcare that is provided by the hospital in question. Next, the capitation model is similar to the appropriation model since it is fixed and prospective (Lindgren,2014). However, the difference between them is, that unlike the appropriation model, the capitation model is not based on costs. The compensation structure in this model is based on the population that the hospital is responsible for, where metrics such as the size and the demographics of the population affect the reimbursement gained.

In the category "Compensation per Product Group", there are two different compensation models, the Diagnosis Related Groups (DRG) system and the bundled payment system (Lindgren, 2014). Starting with the former model, DRG is a system that bundles care occasions into different groups depending on how many resources they use and their medical similarities. The compensation the hospital receives is based on care production and a price per DRG point (Lindgren,2014). The price per DRG point can be collected from a national database provided by *Sveriges Kommuner och Regioner* (SKR) or from local price-lists (Lindgren, 2014). The total compensation is awarded based on how many DRG points the hospital has produced.
Next, the bundled payment system is based on the cost of care for a diagnosis or intervention,

the bundled payment is a fixed prospective compensation that the hospital receives to cover these costs (Lindgren, 2014). With the bundled payment, compensation for several care providers (or hospitals) can be integrated. It is common that one of the care providers has the main responsibility for the planned care of the patient and needs to set up contracts or settlements with the other actors in the care supply chain (Lindgren, 2014). In some cases, the main care provider is financially responsible for eventual complications during the treatments of patients, independent of where in the care supply chain the patient has been treated. These costs are normally covered by a warranty, however later, which means that capital is tied up during that period.

The fee for service, is a retrospective variable compensation that hospitals acquire for the activity completed at the hospital (Lindgren, 2014). An activity can be tests, patients visit, or interventions. How the activities are compensated can be based on tariff or depend on which personnel the patient occupies during the visit. Lastly, performance-based compensation is a model used as a complement to the other compensation models (Lindgren, 2014). The purpose of the model is to deal with the drawbacks and undesirable effects of the traditional models. The model introduces control measures to deal with the undesirable effects and can generally be described with three factors: what is compensated, how is it compensated, and who is compensated (Lindgren, 2014). The compensation is based on different result indexes of the hospital. For instance, these can be clinical quality, patient satisfaction, access to care (waiting times), or financial measures.

Returning to a business case perspective, revenue projections at hospitals can be put forward, stemming from the hypothetical number of patients that will be treated (Guo, 2023). However, this is only relevant if the compensation model is variable according to the explanations above. If so, regarding business cases related to hospital facility reconstructions, an analysis can be made with treated patients as a basis for a potential revenue increase. To make such an assessment, a generic price per patient can be approximated, inspired by earlier research, and used in the business case (Tan et al., 2009).

3.3.2 Cost-side

Associated with business cases at hospitals, the cost structure that the hospital has is important in the cost projections of the facility investment. Earlier research suggests that hospital costs are mainly affected by two categories of factors, contextual factors and operational factors (Stock & McDermott, 2011). Furthermore, contextual factors are related to variables that are difficult for the hospital to change and thus can be considered fixed costs. These can for instance be the location of the hospital, the physical size of the facilities, if the hospital is a public or private institution, or if the hospital is related to a university that conducts teaching regularly in connection to providing care. Regarding the fixed costs these are independent of produced volume, and in the context of hospitals, treated patients (Choudhary et al., 2013).

Connecting fixed costs to a business case and facility investments in hospitals, several factors need to be considered. These are capital for the new facilities, facility rent, and facility

utilization (Choudhary et al., 2013; Sadler et al., 2008; Stock & McDermott, 2011). If the hospital facilities are not owned by the hospital, then an investment in new facilities implies increased rent, so that the owner of the new facilities can recoup a return on the capital invested, which will increase fixed costs for the hospital. In the context of the Swedish publicly owned hospitals, this is most commonly enforced with an internal rent within the region (Lind & Hellström, 2012). Further, the reason behind the internal rent is to create an incentive to not use more facilities or areas than needed. Contrary, if the hospital owns the facilities, then a loan from a bank, government, or other financial institute is most often needed, which will increase interest payments and fixed costs. During these considerations, it is important to distinguish between depreciation, which is a non-cash expense, and the actual payments for the investment (Berk & DeMarzo, 2024).

However, regarding fixed costs, an optimization in facility utilization and processes can be a major cost-saving factor at hospitals (Lennerts et al., 2003). If the business case analysis demonstrates that the hospital can be more efficient and provide the same amount of care with less area, then rents and interest payments can be decreased. This implies that the facility utilization rate increases at the hospital (Gül & Guneri, 2012). In practice, this could mean that the waiting times at the hospital are reduced due to a more efficient utilization by the facilities, which would reduce the patient length of stay at the hospital and reduce costs further. Thus, hospitals need to have effective facility utilization since a portion of these fixed costs can be removed if the facility area decreases. There is initially also a capital cost due to the investment to consider (Sadler et al., 2008). Further, these capital costs can include equipment and can be significantly vast (Vassolo et al., 2021). However, savings in operational costs can also be significant which will be elaborated on below (Sadler et al., 2008).

The operational factors are connected to the operational performance at the hospital and the efficiency with which the performance is carried out with (Stock & McDermott, 2011). These can be seen as variable and operational costs. Thus, the operational factors are costs that can be reduced at hospitals. Related to the facilities, variable costs can for example be the potential reduced operating costs that the investment in new buildings would convey (Sadler et al., 2008). Further, metrics that can be used for reduced operating costs related to new facilities are for instance reduced energy consumption, reduced accidents, and infections at the hospital, shortened length of stay for patients, reduced need for patient transfers, and reduced work-related injuries.

Economies of scale can be achieved for the fixed costs, which conceptually means that the more patients the hospital can treat the lower the cost is per patient (Stock & McDermott, 2011). However, economies of scale can only be achieved at hospitals if the operations can withstand the amount of volume needed to achieve it. Increasing the patient volume might have a contrary effect, creating diseconomies of scale, and increasing cost per patient due to inefficiencies in the operations.
Even though contextual factors can have a large effect on the total costs of the hospital, there are possibilities for management to reduce operational costs (Stock & McDermott, 2011). The

research suggests that the average length of stay is a substantial driver of costs, which is related to the operational performance efficiency and a factor that management can address. Management can for instance implement lean systems or improve the flow of patients in the hospital to reduce this cost, however, it is important to keep the quality of care intact when making these improvements (Stock & McDermott, 2011). To conclude, there are several costs of both fixed and variable types, to consider when conducting a business case for facility investments in hospitals, summarized in Table 7.

Table 7. Summary of costs related to facility investments at hospitals.

Costs	**Type**
Capital for the New Facilities (Equipment included)	Fixed
Facility Rent	Fixed
Facility Utilization	Fixed/Variable
Operating Costs	Variable
Energy Costs	Variable

3.3.3 Business Case Model

Altogether, these reasonings from sections 3.3.1 and 3.3.2 can serve as a foundation for a business case model developed for facility investments at hospitals and summarized in Figure 3. In short, an investment in facility reconstruction leads to both cost increases and savings due to contextual or operational factors, which in turn are fixed or variable. As described in previous sections these costs can be of different characteristics. If the increased costs exceed the entailed cost savings, increased revenues must occur if the investment should be considered profitable. Depending on which compensation model is used, as discussed in section 3.3.1, different perspectives are applied on how to increase revenue. If the compensation relies on capitation, only an increased population that the hospital is responsible for will increase the compensation. On the contrary, if an action-based or compensation by product group is used, an amplified patient volume and flow must be accomplished to achieve higher revenues.

The required future volume of patient visits needed to break even with total costs can then be assessed (Choudhary et al., 2013). This increased volume can for example arise from an extended responsibility for a larger patient population which would imply an increased productivity at the hospital. The break-even point is achieved when the NPV for the investment is equal to 0 and the ROI in terms of a profitability index for the investment subsequently is 0% (Berk & DeMarzo, 2024). Important to notice is that this break-even point includes a time perspective as it is based on NPV calculations. Therefore, a break-even point is not achieved for every single year but for the overall investment.

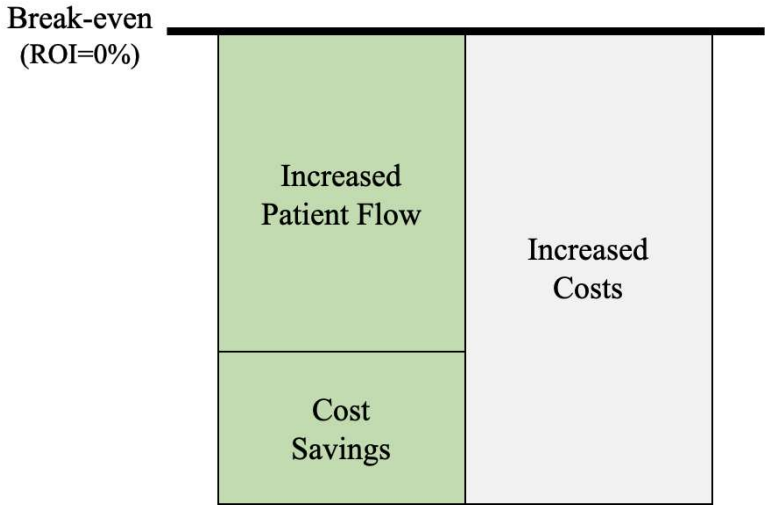

Figure 3. A simplified business case model for facility investment at hospitals.

3.4 Productivity and Incentives

Productivity in the simplest form can be defined as the ratio of output to input for an entity's specific situation (Rogers, 1998). An entity can be described from different economic perspectives and levels, for instance on a macro level as a society or country, a meso level as a firm or hospital, or a micro level as an individual (Dopfer et al., 2004). The productivity of an entity is closely related to its efficiency, in other words, achieving the best operating practices of an entity (Rogers, 1998). Further, an increase in productivity thus suggests an increase in efficiency as well. This implies more output with the same amount of input or the same output with a lower amount of input. Even though the notion that a high level of productivity is naturally seen as superior to low levels, it is important to understand the underlying factors of why an entity needs to perform at said level of productivity. The reasoning about incentive theory can be argued to fill a part of this gap in the scientific literature and is an interesting perspective to take when related to hospital productivity and efficiency.

3.4.1 Micro–Incentives for Hospital Employees

Historically, on a micro level, there have been two main assumptions regarding incentive theory. The first, Theory X entails that employees' natural instinct is that they do not like to work (Ellingsen & Johannesson, 2008). Thus, this theory suggests managerial control and material compensation to the employees as a form of incentive to reach productivity targets. However, this type of incentive structure has been shown to generate employees who are uncooperative, antagonistic, and resistant, which are the unwanted behaviors the incentives are supposed to suppress. On the other hand, Theory Y is more optimistic about employee behavior, which is materialized into the belief that employees view their work as a source of social value and self-fulfillment (Ellingsen & Johannesson, 2008). Further, this may create employees who voluntarily pursue the act of achieving the goals of the organization.

Related to hospitals, factors on the micro level that affect productivity are linked to the employees working in the operations. For instance, it was previously believed that physicians

would perform better if they were compensated according to a performance-based model, but research has shown that this is necessarily not the case (Green, 2014). Further, a retrospective payment structure on the individual level was shown to increase the productivity of the hospital employees, however, with a lower level of received quality of care for patients when compared to other compensation models. Thus, the incentives created are to do as many compensated activities as possible, establishing a lack of emphasis on the quality of care for patients. However, this notion could be of less effect, relying on the reasoning from Theory Y (Ellingsen & Johannesson, 2008). Since the theory is grounded in employees viewing their work as a form of social value and self-fulfillment, it does not necessarily mean that higher produced volume is a factor that employees working in hospital operations take much into consideration. The focus in this case would be on the perspective of the patients and their perceived stewardship.

On the contrary, some research also suggests that a compensation model based on a prospective mindset creates strong incentives for low productivity, it could also bring a lack of service mindset and low quality of care (Lindgren, 2014). However, drawing a parallel to Theory Y again and a micro perspective, providing high-quality care and having a service mindset could be seen as a social value and a source of self-realization for employees working in the hospital's operations.

3.4.2 Meso – Incentives for Swedish Hospital Management

Taking the meso perspective of hospital management in Sweden, the incentives of reaching certain levels of productivity are dependent on which type of revenue structure the hospital has (Lindgren, 2014). For instance, if the compensation is prospective and decided without taking the outcome of costs into account, then the incentive is to work as resource-efficient as possible for the hospital in question. Since the compensation is not grounded in what the costs are over the period, it does not matter how productive the hospital is, but the emphasis is put on using the given resources as efficiently as possible (Lindgren, 2014). However, if the compensation is retrospective, the cost of operations and consumption of resources is considered in the level of compensation the hospital is granted (Lindgren, 2014). This gives incentives to produce as much as possible since that is what the hospital is compensated for.

For instance, if the hospital is compensated with a Fee-For-Service perspective as explained in section 3.3.1, it creates strong incentives for the hospital to produce a higher volume of healthcare (Conrad, 2015). Further, an additional incentive effect is the focus on the procedures and services with higher net income margins. Taking a value perspective, the services that would allow for high compensation should be based on the produced health outcome of the patient (Conrad, 2015). In theory, this could affect the type of healthcare and procedures that the hospital is willing to offer to patients, and thus increase the risk for patient selection (Lindgren, 2014).

On the other side of the compensation spectrum, appropriation uses a fixed prospective payment system as elaborated on in section 3.3.1. With this type of compensation structure, there are low incentives to increase productivity (Lindgren, 2014). Additionally, there is also a risk of

overturning patients which implies that the hospital cannot take care of the total patient population efficiently which creates queues and longer waiting times.

Another important financial incentive for hospitals is the ownership structure, simplified if the hospital is privately or publicly owned (Conrad, 2015). The implications for the different ownership structures are that privately owned hospitals have stronger incentives to hold out for prices exceeding the competitive benchmark. Generally, private hospital institutions have stricter budget restrictions since these organizations cannot expect governmental intervention if the budget is overdrawn (Lindgren, 2014). For public administrations, this is necessarily not the case since, as discussed above, it depends on what compensation structure the hospital organization has and what incentives it creates, on top of the fact that regions can cover if budget deficits occur.

3.4.3 Macro – Incentives for Politicians and Policymakers

Based on the previous sections, the incentives for politicians and policymakers at the macro level to achieve high productivity and efficiency in hospitals differ from the micro and meso levels, since they are not directly connected to the daily operations. Health emergencies such as the COVID-19 pandemic showed that the healthcare system, which hospitals are a vital part of, needs to be rigid for society to keep functioning (Chen et al., 2021). Furthermore, other challenges such as the aging population and increasing dependency ratio are reasons for efficient, well-functioning hospitals. Thus, one incentive for reaching high productivity and efficiency at hospitals for politicians is to keep society intact when health emergencies occur or to withstand new demographic demands. However, when discussing politics, one must also take into consideration politicians' agenda and how that can create incentives for their political gain. Unusually, the public will agree on the moral or social principles that should guide decisions regarding healthcare limit-setting (Stafinski et al., 2011). Thus, high expenditure on healthcare might be seen as a highly virtuous act that could create incentives for spending tax money in that sector, for example on hospital facilities. However, a high net spend without improvement in shortened queues, waiting times, and the patient's overall experience could upset and shift the opinions of the public, which could be seen as another incentive for politicians wanting to increase productivity (Stafinski et al., 2011). Lastly, an overall healthier population can achieve a higher output per capita (Chen et al., 2021). Thus, from an economic development standpoint, there are incentives for politicians to have productive and efficient hospitals which reduce the length of stay for patients, making patients able to contribute economically to society more quickly.

3.5 Summary of Theoretical Framework

In this section, the theoretical framework is summarized to receive an overview of the literature presented. Firstly, capital budgeting is essential for the thesis as it deals with the assessment and analysis of future investment opportunities (Berk & DeMarzo, 2024). A fundamental part of this process is the projection of revenues and costs which entails predicted cash flows which are the foundation for the capital budgeting economic key figures. The key figures presented are the Payback model, Net Present Value (NPV), Profitability Index, and the Internal Rate of

Return (IRR) (Berk & DeMarzo, 2024; Cooremans, 2011). All of these have their benefits and drawbacks but together they paint a more complete picture of an investment opportunity. To reduce the uncertainties a sensitive analysis with a belonging graphical representation can show the input variables with the vastest impact on the chosen key figures (Berk & DeMarzo, 2024).

Secondly, there are some special characteristics for investments in the public sector in contrast to the private. For the public sector, non-financial objectives are argued to be of higher importance (Dran & Campbell, 1981). Therefore other reasons to intervene are present for decision-makers within the public sector (Brealey et al., 1997). Another characteristic is that the public sector's financial management is regulated by law which impacts the budget restrictions (SFS 2017:725). Furthermore, considerations about NPV are somewhat different in the public sector. For instance, future generations are deprioritized, and a set of projects instead of every single project preferably should achieve a positive NPV (Dran & Campbell, 1981; Kula, 1981). However, there is not always any alternative than to invest for management within the public sector. Regarding the discount rate the potential exposure to risk is of importance and the risk-premium similarly affects the taxpayers as the shareholders in a private company (Brealey et al., 1997). Conversely, public investments could also be based on a lower discount rate according to some arguments. Furthermore, it is interesting to view investments in the public sector from a New Public Management (NPM) perspective. There are seven doctrines defined for NPM and mainly they have raised from business-type managerialism and institutional economics (Hood, 1991).

For the third, a business case focusing on hospitals has some specific implications. The underlying purpose of a business case is to serve as a gauge for the project's feasibility (Appel-Meulenbroek & Danivska, 2023). Structurally, a business case includes potential benefits and costs. Concerning the benefits the revenue-side plays an important role. The compensation models for revenues at hospitals in Sweden can be divided into fixed versus variable and prospective versus retrospective structures (Lindgren, 2014). On the cost-side, both increased costs and cost savings can be the consequences of facility investments at hospitals. Mainly these costs are divided into fixed and variable costs (Stock & McDermott, 2011). Altogether, this can serve as a foundation for a business case model presented in Figure 3 and based on a break-even analysis (Choudhary et al., 2013).

Lastly, the output of productivity a hospital creates is dependent on the compensation structure and the incentives that the structure gives (Lindgren, 2014). Firstly, on the micro level, the incentives of the compensation structure affect employee behavior. Research has shown a difference between behavior when compensation is given retrospectively or prospectively. In short, retrospective compensation on the individual level creates incentives to be as productive as possible, but also with less emphasis on quality (Green, 2014). On the meso level, if compensation is prospective the incentive is to work as resource efficient as possible for the hospital (Lindgren, 2014). Contrary, if the compensation is retrospective the incentive is to produce as much as possible. The risk correlated to a prospective compensation model is the overturning of patients which can create queues. Further, it could also create a lack of service

and quality mindset at the hospital (Lindgren, 2014). The risk related to a retrospective model on the meso level is the risk for patient selection based on the net income of procedures, which could affect the type of care and procedures that are available for patients. Lastly, on the macro level, the incentives for politicians to achieve high productivity in hospitals are partly because a healthier population can contribute more to the economic development of society, and a higher output per capita (Chen et al., 2021).

4. Research Study 1

In this chapter, the findings of the thesis's first study are presented with a starting point in the first formulated research question. The quantitative findings are displayed and elaborated on in section 4.1 and then analyzed in section 4.2.

4.1 Findings from Research Study 1

To answer the first research question of how a reconstruction project of a hospital can be economically profitable, a business case model was developed. The model used can be found in the Attachments section. As explained in the method section 2.2 this was performed on a single case of the Hospital of Kungälv. The model itself was based on the theoretical framework presented in Chapter 3 and input from people in the administration of SV. Concretely, increased costs due to the investment were compared to potential revenues in the form of increased surgeries and an increased patient flow and cost savings from the investment in line with Figure 3. The main level of analysis has been on the administration of SV and how the operations are affected by the investment. The calculations were made on the complete investment and all parts included in the pilot study. So, translated to the operations at the Hospital of Kungälv several financial posts, as seen in Figure 4, were relevant to the business case. These changing financial posts led to an annual cash flow for the 30 years of prognosticated economic lifetime which furthermore was the foundation for the economic key figures presented in sections 4.1.1 and 4.1.2.

Revenue-side
Increased Surgeries
Increased Patient Flow
Cost-side
Increased Payments
Equipment Investment Payment
Increased Rent Payment
Reduced Payments
Efficient Facility Utilization
Reduced Energy Costs
Reduced Operating Costs
Reduced Sick Leave Costs

Figure 4. The financial posts in the business case model.

As the method declared in section 2.2 the calculations were based on input values collected from VGR, relevant to SV and the Hospital of Kungälv, and the specific values used in this case are listed in Table 8. However, some specific circumstances worth mentioning were present for these input values. First, the SV administration had no determined discount rate. Therefore, it was approximated based on the theoretical framework to be 3.5 %. This was used as a nominal discount rate since the cash flows in the model were nominal and inflation was considered. The cash flows were adjusted with an inflation rate of 1.73% as mentioned in the

theoretical framework. However, a limitation was that the same inflation rate was applied on all financial posts. Further, the investment costs were only approximates used in the phase of the pilot study. However, the economic lifetime synonymous with the depreciation time are definite numbers used by the administration for both the facility and the equipment.

For the input value of increased surgeries and productivity, estimations were based on internal price lists and forecasts of the future from the administration. Furthermore, the size of the increased rent was approximated based on a calculation from an internal template used by the facility owner Västfastigheter. This calculation had its foundation in the reconstruction area, facility type, age of facilities, total investment cost, and depreciation time. Another interesting aspect was that the central regional administration could cover some of the increased rent if it exceeds the cost of ownership. The calculations of increased rent further included both interest and depreciation costs for Västfastigheter and implied an annual payment to the Hospital of Kungälv. The increased rent was consequently incorporated as an annuity payment during the economic lifetime of the facility in the business case model. Therefore, no separate financial post with depreciation or capital costs for the facility was included in the business case model as seen in Figure 4.

Contrarily, the equipment cost was adopted to a straight-line depreciation over seven years. An assumption was made that the payment plan followed this straight-line approach and further affected the cash flow during these years with -40 714 KSEK/year. This was calculated as an annuity during the first seven years of the investment. The number for efficient facility utilization was collected from the current rental cost for external modules which will be removed due to the reconstruction project. Included in this number was also the reduced cleaning cost for the external module. Moreover, the reduction of energy and operating costs was based on a comparison of the numbers for the new care facilities built at the Hospital of Kungälv and the old facilities. The size of reduced sick leave costs was an approximation, but this uncertainty was dealt with in the sensitivity analysis presented further ahead. Lastly, it can be argued that increased personnel costs should be included in Table 8. However, when the calculations for the increased productivity were done it was based on the current workforce and how much the productivity should increase to break even.

Table 8. List of input values used in the business case model. **Two different scenarios of origin state and break-even state were used*

Description	Value	Unit
Discount Rate	3.5	%
Inflation Rate	1.73	%
Facility Investment Cost	1 485 000	KSEK
Facility Economic Lifetime	30	Years
Equipment Investment Cost	285 000	KSEK
Equipment Economic Lifetime	7	Years
Current Patient Volume	43 136	Patients/year
Patient Compensation	5.022	KSEK
Surgery Compensation	19.008	KSEK
Increased Surgeries	0 / 2 720*	Surgeries/year
Increased Patients	0 / 6.98*	%
Increased Rent	71 775	KSEK/year
Efficient Facility Utilization	3 700	KSEK/year
Reduced Energy Costs	3 751	KSEK/year
Reduced Operating Costs	7 508	KSEK/year
Reduced Sick Leave Costs	1 285	KSEK/year

In the business case model, the choice to start equipment payments in year 0 was made. This was built upon the reasoning that it is logical to pay some of the incurred equipment costs before the investment can be used fully. It was believed that the reconstruction would be done in stages because the hospital operations still needed to fully function during the reconstruction. This implies that the administration would see some cost savings and increased costs come into play in both earlier and later stages in the economic lifetime of the investment. The business case model did not take this into account and thus, this was a limitation of the model that was built. Further, another limitation in this specific case was the fact that the Hospital of Kungälv did not have its own income statement or balance sheet. The economic figures of the Hospital of Kungälv were compiled with other hospitals of the SV administration into a joint annual report. This made the data collection for the specific hospital more difficult.

In the following subsections, findings from the first research study based on the reasoning and input values above are described. First, findings of the origin state without increased productivity of the number of surgeries and other patients are presented. Secondly, an increased productivity derived from a break-even analysis was included and the findings with these prerequisites are presented. Finally, the findings are analyzed.

4.1.1 Findings from Origin State

Foremost, the predicted cash flows for the origin state are displayed in Figure 5. Across the economic lifetime of 30 years, these are negative which implies that the increased costs exceeded the theoretical positive cash flows from increased cost savings. In year 0 only the equipment cost was present, and this cost was also the reason why the cash flows were of greater amplitude between years 1-6. During years 7-30, the cash flows only increased by the inflation rate since the equipment was fully paid and no changes in the input variables were present. A change was also identified in the present values of the cash flows as shown in Figure 6. This was due to the discount rate and depended on its size, which will be elaborated on further ahead.

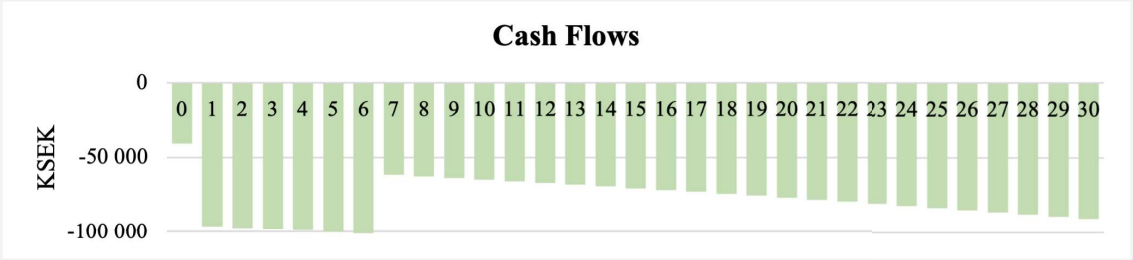

Figure 5. Predicted cash flows between years 0-30 in the origin state.

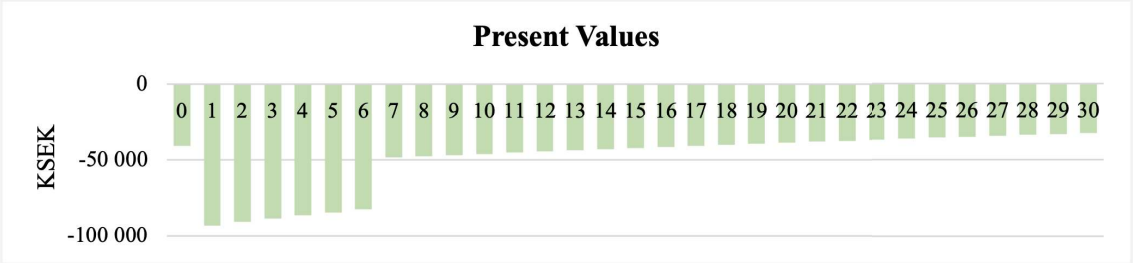

Figure 6. Predicted present values between years 0-30 in the origin state.

With the cash flows and present values described above as a foundation, the key economic figures in Table 9 were calculated for the investment at the Hospital of Kungälv. The payback time could not be calculated due to constant negative cash flows throughout the economic lifetime. In other words, the accumulated cash flow never turned positive, and therefore a payback time was never achieved. The constant negative cash flows likewise affect the calculation of IRR and make it nonapplicable in this specific case. For an IRR to be present a NPV of 0 is needed and the only discount rate that discounts only negative cash flows to zero is infinity. However, with infinity as a discount rate, all future cash flows become worthless and then there would be nothing left to analyze.

Table 9. Key economic figures for origin state.

Capital Budgeting Key Figures	Value	Unit
Profitability Index (ROI)	-86.13	%
Payback time	N/A	Years
Net Present Value (NPV)	-1 524 563	KSEK
Internal Rate of Return (IRR)	N/A	%

Furthermore, as explained in the method and theoretical framework, a sensitivity analysis of the input values and their impact on the economic key figures was executed. Practically, this was done with a variation of ± 10% on the input values except for the discount rate which was between 3-4%. Since there was no payback time and IRR present for this origin state no sensitivity analysis of these were executed. Nonetheless, the sensitivity analysis for the NPV is seen in Figure 7 below. Further, since the ROI is directly correlated to the NPV it is not further analyzed with a sensitivity analysis. On the left side, the red bars visualize the worst-case scenario, and the green bars show the best-case. The black line separating these two demonstrates the origin state of the NPV value of -1 524 563 KSEK.

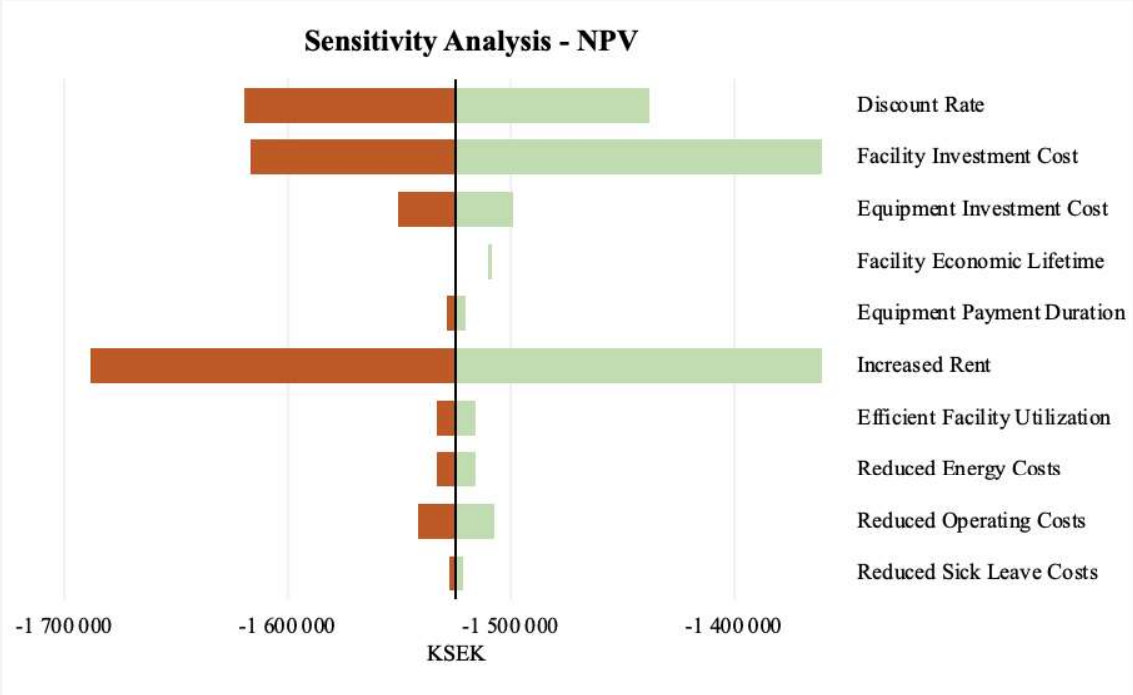

Figure 7. Sensitivity analysis of NPV for origin state.

As seen in Figure 7, the financial posts had different impacts on the NPV for the investment. The chosen discount rate was shown to have a relatively vast influence on the NPV result. This is logical because the rate affects all cashflows during the facility's economic lifetime, and since the cashflows were relatively large it had a vast effect. Further, since the facility investment cost was substantially larger than any other post, and affected the increased rent, a ±10% adjustment had a large effect on the NPV. However, with the template used to calculate the

internal increased rent a ±10% adjustment of the facility investment cost did not adjust the rent ±10%, as shown in Figure 7. This is due to the rent model used by Västfastigheter. If the facility investment cost increases by 10%, the rent model will apply coverage for some of the increased rent, subsequently displayed as less negative amplitude in the figure. The equipment investment cost affected the NPV moderately. The facility's economic lifetime is another post that had an interesting effect on the NPV. As displayed in Figure 7, both a decrease and increase of 10% affected the NPV positively. Since the cash flows were constantly negative it is intuitive that a shorter economic lifetime results in a positive effect. With the same logic, a longer economic lifetime should imply a negative effect. However, the internal rent was lowered due to the increased economic lifetime. This is the same effect as described earlier about the rent model used by Västfastigheter and the potential for rent coverage. As earlier mentioned, the increased rent also had a large impact on the resulting NPV according to the performed sensitivity analysis. This is logical since the increased rent from the start was relatively large.

Lastly, some limitations were also considered regarding sick leave costs. In practice, a calculation of reduced sick leave costs could only be done with an approximation since no data on its potential impact was found. Therefore, this approximation was set pessimistically low to have an effect of 5% on the current sick leave costs. Additionally, to evaluate this post further and to create some margin for error, a scenario of zero reduction in sick leave costs was created. This scenario showed an NPV of -1 553 875 KSEK which meant that a 0% reduction in sick leave costs would have a moderate effect on the NPV compared to the other posts in Figure 7. The remaining financial posts had a modest impact on the projected NPV and therefore not further commented on. Conclusively, the facility investment cost and the increased rent were the financial posts that affected the NPV for the origin state the most followed by the discount rate.

4.1.2 Findings from Break-Even State

The break-even analysis was performed in line with the theoretical framework presented in section 3.3. In the business case model that was created, the origin state of the facility investment could be altered with a revenue increase diffused over the economic lifetime. The basis of the increased revenue stemmed from a fictive increase in productivity. The productivity increase had a foundation in the amount of healthcare the hospital could produce and was separated into two compensation groups. These compensation groups were increased surgeries that the hospital will perform and an increased patient flow at the somatic planned outpatient care receptions. These receptions include surgery and orthopedy, medicine together with geriatric, rehabilitation, and neurology at the Hospital of Kungälv. Based on this, two different generic compensations per patient were calculated. For the surgery compensation, the DRG-weight for inpatient care surgeries was used as a basis. In this DRG-weight, care before and after, as well as the actual surgery are included. This could potentially increase the compensation and become an error source. Therefore, the calculations in the model were based on planned outpatient care since this represents the most realistic value for the DRG-weight. Furthermore, the number of increased surgeries was an approximation from the analysis of needs therefore leading to some uncertainty in the results. The patient compensation was

derived from an average compiled by internal prices for patient treatment performed at the Hospital of Kungälv. This was based on old documents and consequently, this calculated compensation was somewhat of a theoretical reasoning.

Practically, the break-even analysis was done by first calculating the expected increase in surgeries for the hospital after the reconstruction and then adding an increased patient flow in the somatic planned outpatient care receptions to break even. This was done to understand how many more patients needed to be treated each year to reach the break-even point and achieve an NPV of zero. In the data obtained from VGR, an expected increase in productivity of 10% per year was attributed to reconstruction when compared to current productivity. This percentage was used as a benchmark to observe if, with the capital budgeting calculations based on the investment's cash flows, a 10% increase in productivity per year would suffice for reaching the break-even point and be considered profitable. The break-even analysis resulted in an increase of 3 011 patients per year compared to today's volume of 43 136 patients per year for the somatic planned outpatient care. This corresponds to an increased productivity of 6.98% per year, which means that a 10% increase in productivity would be enough to reach a break-even point. The following text outlines the cash flows, present values, the key economic figures, and the sensitivity analysis calculated for the break-even state.

The predicted cash flows with an 6.98% productivity increase per year are displayed in Figure 8. Observing the cash flows, the shift from negative to positive cash flows occurred after year 6 since the value of the equipment portion of the investment was fully paid. After this point, the cash flows only increased by the inflation rate. The same pattern was identified in the present values seen in Figure 9 along with the impact of the discount rate. Similarly, as in the origin state, the discount rate affects cash flows in the future and especially in the more distant years.

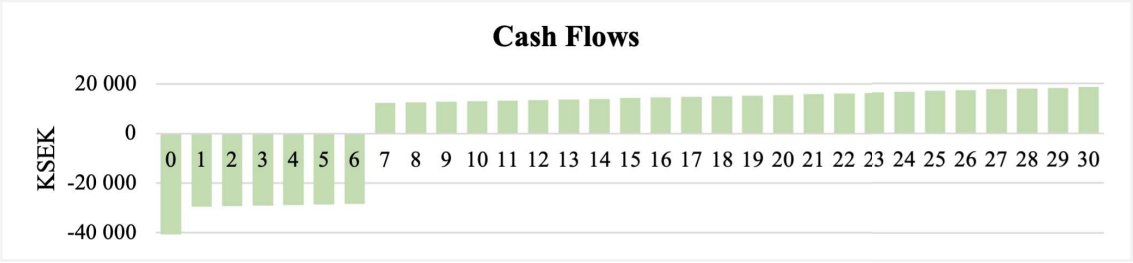

Figure 8. Predicted cash flows between years 0-30 in break-even state.

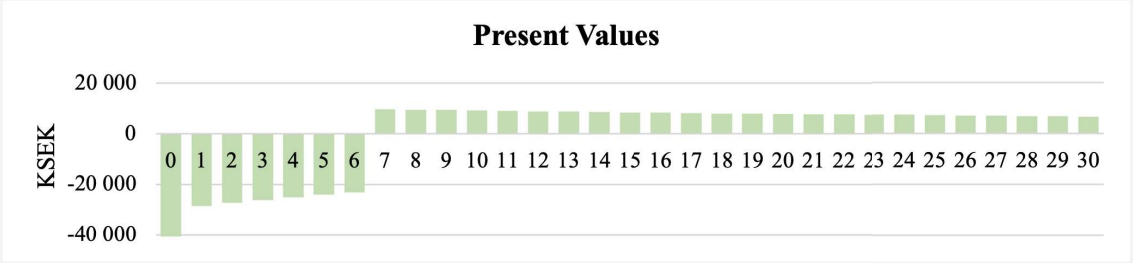

Figure 9. Predicted present values between years 0-30 in break-even state.

Further on, key economic figures for the break-even state were computed and are displayed in Table 10. Logically the NPV and consequently the ROI was 0 since the calculations were performed to break even. Subsequently, since the revenue increase met an NPV of 0 with the discount rate of 3.5%, the IRR was equal to this rate. In this case, the payback time was however present since the cash flows turned positive from year 7 and accumulated the investment cost after 21 years.

Table 10. Key economic figures for break-even state.

Capital Budgeting Key Figures	**Value**	**Unit**
Profitability Index (ROI)	0	%
Payback time	21	Years
Net Present Value (NPV)	0	KSEK
Internal Rate of Return (IRR)	3.5	%

So overall, the break-even state pointed out that improved productivity by the increased number of surgeries and patient flow was needed. A relevant question to ask then was where these patient records should be derived from. There are mainly two answers to this, either an extended patient population, since the compensation model used by the administration has a foundation in capitation, or a change in bought and sold care from other hospitals. The attributed patient population for the Hospital of Kungälv and SV is decided by the regional board and changed annually. For this specific case, there was a replacement from SU with 13 450 patients decided from 2022 which the suggested increased patient flow of 3 011 patients undershoots. This means that the revenues could be derived from this patient population. The other alternative was to produce the bought care internally instead. In 2023, 1 438 patient visits were bought from other operators and the suggested increase of 3 011 patients was above this number. Consequently, there was no possibility for the investment to break even only with patients derived from this patient population.

However, these reasonings can be argued to be a zero-sum game if the total population on a regional or national level remains the same. If the productivity is increased in one hospital this can be at the expense of another hospital where the patients are derived from. But arguably, these patients can possibly be derived from a care queue at the other hospital and therefore affect the healthcare system positively. Nevertheless, as the background explained there are demographic changes in Sweden right now with an increasing population and dependency ratio. A perspective between privately and publicly performed care can also be taken where some of the privately performed care can be transferred to public hospitals if their productivity increases.

Moreover, to deliver a fair image of the findings outlined above, a sensitivity analysis for the payback time, NPV, and IRR was conducted in the same manner as for the NPV of the origin state. No analysis was performed for the ROI since the profitability index is directly correlated to the NPV value. In Figure 10 the sensitivity analysis for the NPV is displayed, followed by

the payback time in Figure 11 and the IRR in Figure 12. The design follows the same logic as explained for Figure 7 except for the payback time where the best and worst cases with corresponding colors are inverted.

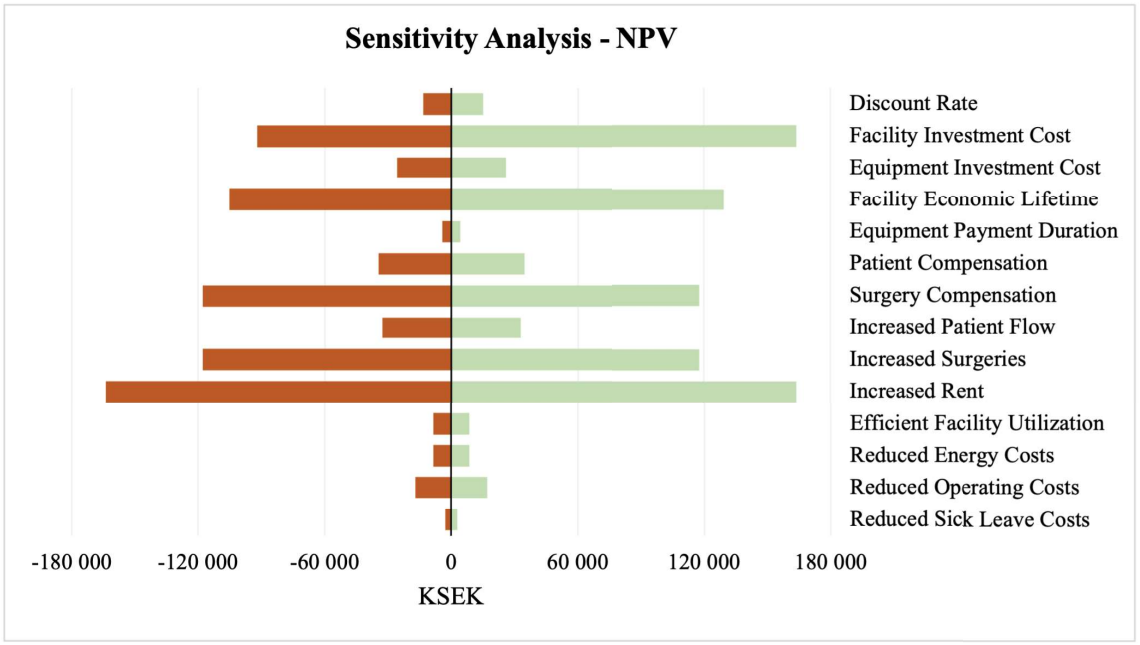

Figure 10. Sensitivity analysis of NPV for break-even state.

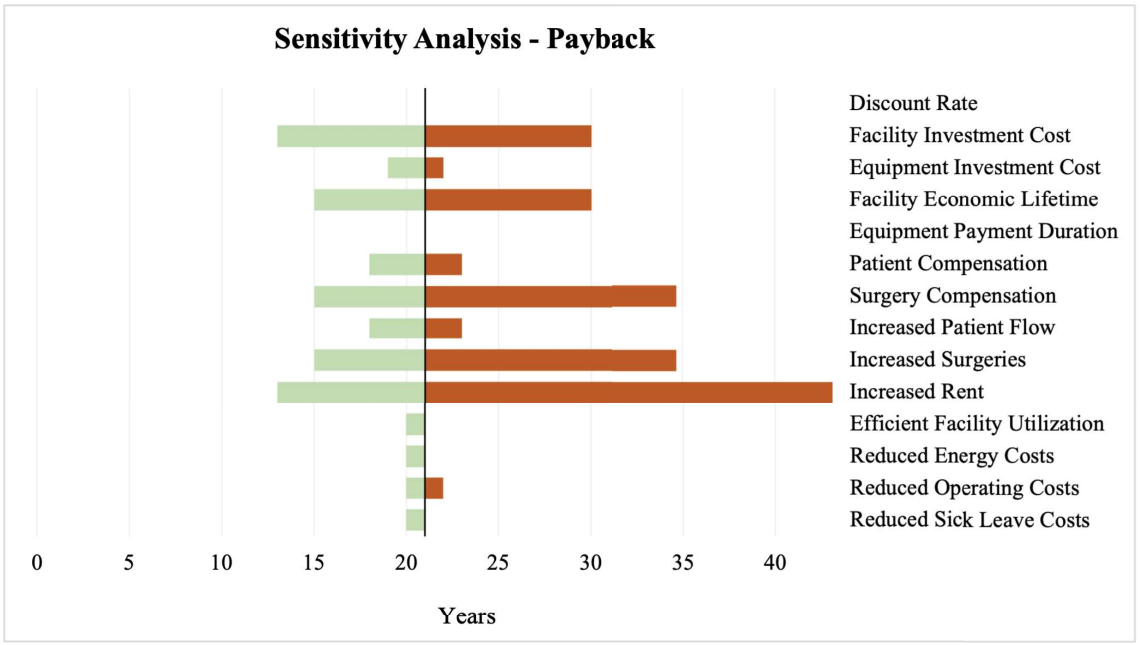

Figure 11. Sensitivity analysis of payback time for break-even state.

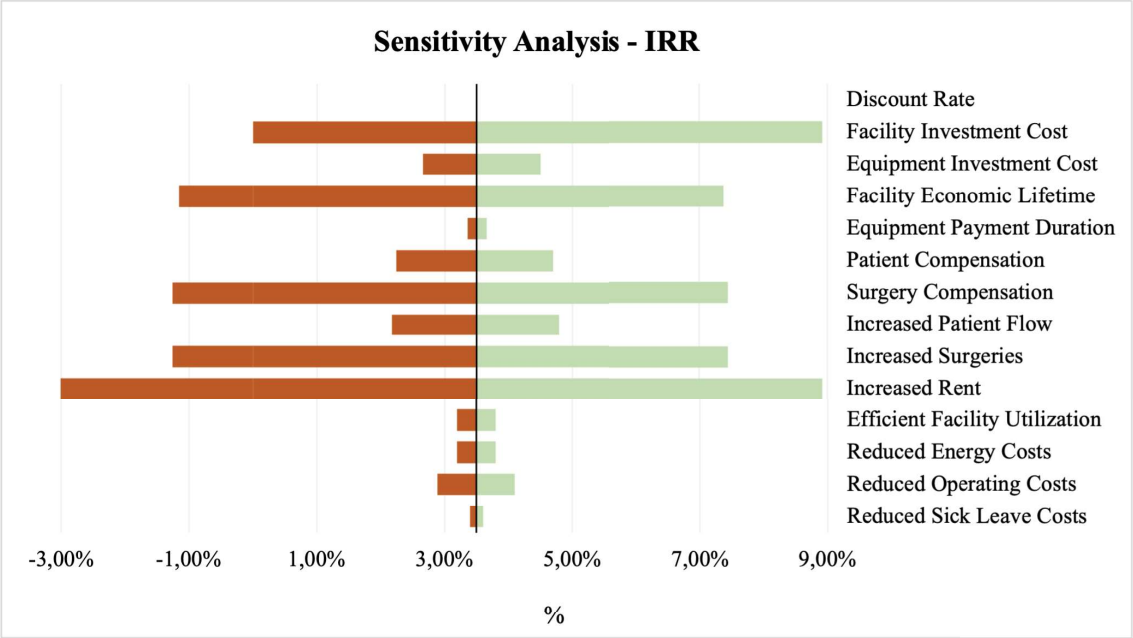

Figure 12. Sensitivity analysis of IRR for break-even state.

The discount rate affected the key figures only minor or nothing at all. Of course, it had no effect on the payback time since there is no discount rate included in Equation 1. An explanation for why the discount rate had a greater impact in the origin state when comparing Figures 7 and 10 is that the cash flows were of smaller size in the break-even state. The facility investment cost had a big impact on all key figures as seen in Figures 10,11 and 12. However, it is worth noting how the best cases were of greater amplitude for both the NPV and the IRR than the worst cases, implying more focus on keeping down the total costs for the facility investment. However, the rent models used in the region can affect the incentives to achieve this and is worth noting before reconstruction takes place.

Moving over to equipment investment costs it had a lower impact in comparison with the facility investment costs because of its relatively smaller amount. A reduced economic lifetime of 10% provided more impact than an increase of 10% for both the NPV and the IRR as seen in Figures 10 and 12. Further, this post had a relatively large impact on all the key figures. The impact of the included revenues from increased surgeries and increased patient flow was furthermore interesting. The two approximated compensation numbers are in Figures 10, 11, and 12 shown to have a relatively vast impact which emphasizes the importance of the composure of these. Furthermore, the influence of increased surgeries and patient flow highlights the importance of the productivity increase followed by the reconstruction. The break-even analysis resulted in an increased productivity of 6.98% which is below the expected productivity increase of 10% stated by SV in the analysis of needs. However, if the worst-case scenario of increased surgeries occurs a productivity increase of 9.37% is needed which is close to the prognosticated improvement. In contrast, the best-case only requires a 4.59% improvement which could be achievable according to the analysis of the needs. Furthermore, as seen in Figures 10, 11, and 12 the best and worst cases have the same amplitude for the

increased patient compensation and increased patient flow, respectively increased surgery compensation and increased surgeries. This is because the increased revenues are the multiplication product of the compensation and the increased number of surgeries, respectively patients.

Finally, in line with the origin state, the increased rent also had an excessive influence on all key figures. This further emphasizes the focus on the increased rent and the facility investment costs and depreciation which was the foundation for the increased rents for the hospital operations. For regions that employ internal rent, it is therefore important to have a good understanding of the underlying factors affecting the internal rent. In the case of SV, capital cost, facility area, depreciation time, and facility type. For all the key figures the economic posts of equipment payment duration, efficient facility utilization, reduced energy costs, reduced operating costs, and reduced sick leave costs all had relatively little impact on the key figures and therefore not worth commenting further. However, based on the discussion above, facility investment cost, facility economic lifetime, increased rent, and compensation for surgeries and patients are the most important financial posts to consider.

4.2 Analysis of Research Study 1

In this section, the findings presented in section 4.1 are analyzed against the theoretical framework in the same order as Chapter 3 is structured.

Starting with the first section of the theoretical framework regarding capital budgeting and the analysis of investment opportunities, there were differences between the theory and the study. The theory declared that it is common to have several investment opportunities under evaluation simultaneously and that these are used to compare against each other, to see which alternative that is most suited (Berk & DeMarzo, 2024). This was not present in the case of the study, since only one investment opportunity was analyzed. However, since it is a facility investment one could have analyzed alternative layouts and how it would have affected costs, cost savings, increased revenues, and the different economic key figures. These layout alternatives were not present in the analysis of the needs or pilot study and could therefore not be considered during the study. If several alternatives had been present, reasonings about choosing among alternatives from the capital budgeting theory would have been relevant. For example, how IRR is not reliable when comparing investment alternatives (Berk & DeMarzo, 2024).

Furthermore, some of the flaws presented in the theory of capital budgeting were present in the studied case. For instance, capital budgeting fails to capture intangible qualities of investments (Alkaraan & Northcott, 2006). In the case of the study, it could for instance be the patients' experience at the hospital and if the patients were satisfied with the care experience. New facilities could affect these perceptions, both negatively and positively, but cannot be considered in monetary terms with capital budgeting methods. According to the theory, projections of cashflows can be hard to estimate (Alkaraan & Northcott, 2006). Additionally, projections that are closer to the present are more accurate than projections into the far future (Sinha et al., 2010). Since the projections are made futuristically, it cannot be said if they were

accurate or not. However, since the economic lifetime of the investment was 30 years, the projections went far into the future. There is a possibility that during these 30 years the economy, inflation, and rates have changed considerably, and thus the projections made in the case can be argued to be uncertain. Connected to the theory, the maximal accepted payback time of a potential investment should be decided beforehand and compared against the calculations (Berk & DeMarzo, 2024). In this case, there was no predetermined payback to compare against and thus this analysis was not made.

According to the theory, the interval for a discount rate that is most commonly used in the Swedish public sector is between 3-4% (Svensson & Hultkrantz, 2014). Thus, this interval was used during the best- and worst-case scenarios. In the sensitivity analysis for the origin state, the best case for the discount rate was the higher rate since the investment only generated negative cash flows. According to the theory, a higher discount rate suggests a lower NPV and a less attractive investment (Cooremans, 2011). However, this notion is based on an investment logic that produces positive cash flows and therefore was opposite in the origin state since both the cash flows and the NPV were negative. For the break-even state, the results were although in line with the theory. Moreover, the choice of discount rate is according to the theory a bit unclear (Svensson & Hultkrantz, 2014). It could be argued for both a lower and higher discount rate than the use of 3,5%. This was to some extent handled with the sensitivity analysis, which displayed that the origin state is affected by the discount rate to a large extent while it does not affect the break-even state similarly. To account for this even further, calculations were made with a discount rate of 2% respectively 5% in the model, and this result showed that the reasonings and overall conclusions still applied.

Further, in this specific investment case, the depreciation time had a direct effect on the internal rent payments that the administration obtained, which to some extent departs from the theoretical framework that suggested depreciation is not a direct payment (Berk & DeMarzo, 2024). This still holds since depreciation itself is not an actual payment, but in the presented investment case, it directly affects the payments through an increased internal rent for the administration.

Moreover, it is of interest to analyze the findings from the perspectives brought up in section 3.2 and the characteristics of investments in the public sector. For the public sector, an entire set of projects should preferably have an NPV greater than zero (Dran & Campbell, 1981). With this mindset a break-even analysis could be argued to be superfluous. However, if this specific project is considered profitable the emancipated resources could be used elsewhere in other projects. This should furthermore create incentives to achieve profitability for each project in the public sector. As the theoretical framework described, the public sector often prioritizes non-financial objectives and can for instance intervene to establish public goods (Brealey et al., 1997). So, with a positive NPV from a reconstruction of a hospital, this positive result can be used as a buffer for another investment in a project with a negative NPV. Furthermore, in the theoretical framework, a discussion about a lower discount rate used for health effects should be used (Svensson & Hultkrantz, 2014). For this specific case, it would entail a lower discount

rate for the reduced sick leave costs which is a health effect, further leading to a greater NPV. The discount rate and the resulting NPV could however also be argued to deprioritize future generations (Kula, 1981). With the chosen discount rate, the cost savings during the initial economic lifetime are higher prioritized than the effects during the last years.

A business case can serve as a gauge of a project's feasibility (Appel-Meulenbroek & Danivska, 2023). This was true for the business case model developed for this thesis but only with a focus on the economic calculations and not the other two phases mentioned in the theory. Moving over to the revenue side, capitation is one of the compensation models in the Swedish Healthcare System (Lindgren, 2014). Based on the theoretical framework it is evident that SV and the Hospital of Kungälv use a capitation compensation model for their revenue structure. However, in the business case model compensations per surgery and patient were used to be able to make reasonable calculations. This is somewhat contradictory to a pure capitation approach, but the resulting increase in patients correlates to an enumerated patient population. Regarding the cost side, the theory affirmed and presented reductions in accidents, infections, and work-related injuries (Sadler et al., 2008). Due to this fact reduced sick leave costs were included in the business case model. However, as briefly mentioned earlier, no theory about the numerical impact of this was found and therefore dealt with by presenting several different scenarios. The theoretical framework also brought forward reduced operating and energy costs when a hospital is reconstructed (Sadler et al., 2008). This was evident in the specific case of the Hospital of Kungälv and based on calculations comparing new facilities on the plot with the old ones.

A potential implication of the internal rent model in this case is that it does not create incentives to keep construction costs as low as possible. As explained in the theoretical framework, the reason behind having an internal rent is to create incentives to be as efficient with current facilities and not use more area than needed (Lind & Hellström, 2012). If some of the increased internal rent is covered as it was displayed in the sensitivity analysis of the case, the hospital in question might afford to have a larger area of facilities and a question one could ask is if the incentives still hold intact. Moreover, the compensation model and the incentives it entails are essential. As explained earlier in the analysis the Hospital of Kungälv has a capitation model which affects the creation of a business case. This compensation model is fixed and prospective which entails a focus on being as resource efficient as possible (Lindgren, 2014). This does not create incentives for increasing productivity since the hospital is compensated based on their patient population and not how much healthcare the hospital produces. It could therefore be argued that a retrospective compensation would be better suited when making a business case.

The efficient facility utilization cost reduction explained earlier meant that the rent of the external modules could be removed. This reduction is affirmed in the theory as a possibility to reduce actual payments due to an increased utilization of the facilities and decreased facility area (Gül & Guneri, 2012; Lennerts et al., 2003). This notion is also connected to the internal rent and what incentives it creates. Therefore, in a region that does not apply an internal rent, increased utilization and removal of facility area would not imply a lower cost.

5. Research Study 2

In this chapter, the findings from Research Study 2 based on the qualitative interviews are explained and further analyzed to receive key factors for hospital management to achieve profitable reconstruction projects.

5.1 Findings from Research Study 2

In the upcoming sections, the findings from the interviews to answer the second research question are listed and elaborated on with a basis in a thematic analysis. To be able to answer the question satisfactorily and to triangulate against the first research study, the findings start with the respondent's view on business case models and if they had been applied to this type of tool in the respective reconstruction cases. Secondly, findings about what economic consequences an investment in hospital facilities generates are listed in conjunction with some reasoning about how the compensation model affects these consequences. Thirdly, the findings of the interviewees' answers on whether a reconstruction project of a hospital can be economically profitable or not are presented. Lastly, findings about which key factors are important to reaching economically profitable reconstruction projects are listed. From the citation below it is evident that this study is inquired for by the sector today.

> *"Purely speaking, there is a reason that all hospital administrations run a deficit, they are focused on other things. Of course, they should, but cost awareness needs to increase because of the economic situation! Focus is needed on these issues, and we have been asking for that for a long time. Is it reasonable to spend so much money on different projects in terms of what you get in operational benefit?"*
> *(Interviewee 10)*

5.1.1 Findings about Business Case Models

When asked about the use of business case models and how it was applied in a hospital facility reconstruction project, the answers from the interviewees were alike. A business case model was commonly not used with traditional capital budgeting methods when analyzing a potential investment. However, when asked about what other types of calculations or tools were used during the initial phases of a project there were several similarities and differences among the respondents. A common denominator among the interviews was a focus on the cost-side, and how the project could avoid overspending on the budget that was given. The differences occurred regarding what specific cost factor the project did focus on. Interviewees 2, 5, 7, 10, 15, and 19 all said that a cost factor that was considered during the project was the construction cost per square meter.

> *"We have a lot of figures that are based on our old projects and national key figures, that is, e.g. SEK per square meter. It is used to produce a total cost for the project, quick, rough, and simple."*
> *(Interviewee 15)*

"We have target prices with what it may cost per square meter, we produce a price for this for different businesses."
(Interviewee 10)

Another factor that was considered during hospital facility projects was the utilization rate of the facilities according to Interviewees 2 and 3. Further, a common answer the interviewees gave was that a calculation or analysis was put forward with the potential benefits of the facility investment. Interviewees 1, 3, 11, 12, 13, 14, 17, and 19 did state that this had been present during projects.

"...we have been careful to address any possible benefits linked to an investment. What is to be achieved, what should it lead to, and who is responsible for it happening?"
(Interviewee 1)

"In smaller reconstruction projects, we use a simplified Excel template to examine the calculation of what it costs to build, the freed-up time, or other efficiency opportunities. This is based on the real estate investment and compares it with benefits in the hospital operations and can be used as a basis for the investment."
(Interviewee 13)

When asked about how important the economic factors and profitability had been during these facility investment projects there were differences between the responses. Interviewees 1, 2, 4, 8, 10, 12, 13, 16, 19, and 21 indicated that economic factors were something that they focused on during the construction projects. However, the term profitability was not commonly used by the respondents.

"It is a question that is always interesting. If we have a manufacturing industry, we don't have an investment project that goes through if you don't see the benefit of it. But for us, we don't know how to calculate it. For us, it's about reaching the attributed level of care duty and not the other benefits that a better facility brings."
(Interviewee 19)

"There has always been a certain focus on savings, you have to think about finances all the time. We are not a for-profit private company and should not waste tax money but make wise choices."
(Interviewee 16)

Another interesting aspect that was retrieved from this question was the time perspective. Interviewees 5, 9, 14, 15, and 20 did not say that economic factors were important during their

respective projects, however, they all said that it had become a greater focus on economic factors in the latest years.

> *"It has changed mainly in the last 1.5 years. Actually, it started in 2020, but then Covid came and support packages from the state started coming in, which caused the focus on the economy to disappear. Inflation has been a major factor there, as well as the fact that there was a deficit and that the pandemic caused us to incur a health care debt that remains."*
> *(Interviewee 20)*

> *"We did a calculation that showed what it would cost, then demanded money from the politicians. Back then there was no focus on the money like now, if it costs half a billion then that is what it costs."*
> *(Interviewee 5)*

To summarize, a business case model with capital budgeting methods were not used in the reconstruction projects according to the interviewees. While the term of profitability was not commonly used, there was still a focus on costs and utilization rate in the new facilities. Some of the interviewees also concurred that the economical perspective had been more present in the latest years.

5.1.2 Findings about Economic Consequences

In this section, the respondents' answers about the economic consequences of the investment, how it affected the operations, and if the compensation model had any effect on these consequences are discussed. For this question, differences in perspective were dependent on the respondent's work role and regional affiliation since different regions have different financial arrangements affecting compensation models and internal rents for example. The most common and vastest economic consequence that was put forward by the interviewees was the cost of depreciation of the new facilities, which is linked to the total capital cost of the investment. These types of answers were put forward by interviewees 1, 2, 5, 7, 8, 9, 11, 13, 17, 19, and 21.

> *"...depreciation during the first 30 years for real estate and 7 years for the equipment. Which means it is frighteningly expensive for the first 7 years!"*
> *(Interviewee 2)*

> *"The resulting financial costs are depreciation. But we don't borrow so we have no interest."*
> *(Interviewee 11)*

> *"Above all, it is about increased depreciation costs."*
> *(Interviewee 13)*

Another common consequence that was explained by the interviewees was that savings could be made due to new facilities. Interviewees 2, 3, 4, 10, 11, 12, 13, 15, 17, and 20 brought up that cost savings could be made in hospital operations attributed to new facilities. The types of savings could differ but were all connected to the reduction of energy costs, more efficient hospital operations, staffing, and lowered costs for maintenance of facilities. However, one interviewee did say that the region had not seen lowered energy costs due to the new facilities.

"Productivity on the staff side, new working methods, and new technology to reduce staffing numbers. That is a greater value for patients with lower efforts. We are generally bad at making healthcare more efficient. Working methods and work organization need to change, to divide between care work and service work."
(Interviewee 2)

"It is about streamlining operations in the form of increased production. Another big part is that operating costs and energy costs are lower with more modern premises."
(Interviewee 13)

"Then there is also ongoing maintenance that you avoid. In terms of energy, we also see a big saving, we have an example in the region where we reduced energy consumption by 50%, which is a lot of money."
(Interviewee 15)

"In other regions, it has been seen that the premises save energy when they are new, but in our region, we have not seen that effect. Yes, we do not need to heat the properties in the same way, but they will need to cool instead."
(Interviewee 19)

Moving over to the question if the financial arrangements like internal rent and compensation model affects these consequences there were scattered replies from the interviewees. What could be noted was that the most common compensation model was a prospective model, either with a basis in appropriation or capitation. Some regions also had a performance-based model with partly prospective and retrospective compensation. Additionally, the respondents' answers matched in that the compensation model affects the investment and how it is assessed from an economic standpoint.

"Yes, in a way, because it is impossible to avoid asking the question: how are we going to financially bear the increased costs? We don't have a compensation model that takes account of all changes, plus and minus, but we are still working on it at an early stage."
(Interviewee 3)

"This [compensation model] can affect the investment, for example, there is a difference in the private sector where you get paid per patient as a care provider. On the other hand, there is a risk that it creates an incentive to only treat those patients who are easy to treat if economic profitability is the driving force. It is partly possible to get around this by setting a higher price for difficult patients, but it is complex."
(Interviewee 13)

"There is always a discussion about the compensation model and what kind of incentive it gives to the hospital operation. There can be a positive incentive to have a variable compensation model, especially in our planned operations, but there must still be relatively constant care duties because the organization is relatively sluggish both structurally and culturally."
(Interviewee 18)

Regarding internal rent, it was not present in all the regions included in the study. Interviewees said that the internal rent affects the incentives of the operations at the hospital. For instance, a problem was brought up regarding the cost of ownership for facilities. If there is no internal rent, then there is no cost consciousness within the hospital regarding the use of the facilities. However, some interviewees did say that the internal rent did not affect these incentives.

"It is difficult to know whether this [internal rent] system is positive or not but there is a lot of debate going on. A problem can be that excessively large premises are requested."
(Interviewee 13)

"In our region, we pay no internal rent on hospital facilities, these costs are managed at an administrative level and centrally in the region to reduce administration. A disadvantage is that it is difficult to manage financially as there is no incentive to reduce premises costs through, for example, open office landscapes, instead, they swell out and take up unnecessary space."
(Interviewee 6)

"If you only look at construction projects, we know that the cost becomes an internal rent that is added to the operations, which affects their budget. It is important to keep costs down so that the operations can use money for other things, such as hiring more people."
(Interviewee 21)

To conclude, the vastest economical consequence gathered from the interviewees were the cost of depreciation after the reconstruction. When cost savings were brought up it was connected to energy costs, more efficient hospital operations, staffing, and lowered costs for maintenance

of facilities. Lastly, the internal rent creates incentives for cost consciousness for the hospital according to some of the interviewees.

5.1.3 Findings about Economic Profitability

This section brings up the discussion about whether a reconstruction project of a hospital can be economically profitable or not. When the interviewees were asked the question "Do you think that reconstruction of a hospital can be financially viable?" the answers were quite dispersed. However, the received answers could roughly be categorized into affirmative, negative, and doubtful characters toward economic profitability for reconstruction projects, and these will be elaborated on further ahead.

First off, a negative approach toward profitable reconstruction projects was given by Interviewees 1, 4, 5, 7, 9, 10, 11, 14, 15, 20, and 21. Among these respondents, there was a consensus about the difficulty of breaking even or reaching a positive result with the investments. It was brought forward how new and modernized premises per definition imply increased depreciation and therefore also higher costs. From a facility perspective, the purpose is not to increase the value to be able to sell it in the future. However, something brought up by a majority of these respondents was the fact that other values are more important than the economic perspective. It was stated that a public hospital does not have profit interest as its highest prioritization. As one interviewee explained, an investment in public hospitals rather shows social values and what society aspires to be, and these values are difficult to quantify and calculate. Some examples of other values with a reconstruction project were a better working environment, sustainability aspects, shortened queues, a growth engine for the construction sector, improved patient safety and integrity, and facilities customized for modern healthcare. Several of the interviewees stated that the investment could be socioeconomically profitable based on this, but as said it is difficult to show this in an Excel sheet or similar.

"Strictly speaking, I think it will be very difficult."
(Interviewee 1)

" So, it can be socially profitable, but not purely economically profitable on the bottom line, so to speak."
(Interviewee 9)

"After all, it is about other things, that citizens should have the right to safe and good care."
(Interviewee 5)

"There is a difference between new construction and reconstruction, based on all sustainability perspectives. It is more sustainable to rebuild than to build new."
(Interviewee 9)

Furthermore, four respondents namely Interviewees 3, 12, 13, and 19 were a bit doubtful about the possibility of profitable projects. A majority of these raised a concern about what economic profitability is and how there are several perspectives on this. Even within this category, it was discussed how difficult it is to quantify benefits from the reconstruction and make the correct calculations. At the same time, one interviewee expressed that economics guides everything and is important in society today. Another respondent stated that profitability can be achieved theoretically but in reality, a reconstruction project almost always implies a cost increase. Furthermore, in line with earlier reasoning, these respondents also expressed that other values are more important than pure economics.

" It depends on what economic profitability is?"
(Interviewee 12)

"It depends on a little because you can check different parts of it."
(Interviewee 3)

Lastly, Interviewees 2, 6, 8, 16, 17, and 18 thought that a reconstruction project of a public hospital could be economically profitable. Although, it was also mentioned that the majority of the projects today are unprofitable. What united these respondents were the advantages they identified from the reconstruction of a hospital. Some examples mentioned were the reduction of care-related infections, improved working environment leading to decreased sick leave costs, smarter material selection, better patient flows, efficiency improvements, and improved facility utilization. However, the importance of viewing it on a longer timescale was mentioned and not expecting profitability during the first years. It was also underlined that the surrounding conditions must be right to achieve profitability.

"Yes, I think we can build hospitals and premises that we use fully and with efficient flows."
(Interviewee 18)

"Absolutely! The very concept of investment essence is to achieve profitability, not create unprofitability."
(Interviewee 2)

" Of course, if the conditions are right. There must be a plan from the healthcare operations that is realistic and long-term. It requires good cooperation between the real estate side and the healthcare business.
(Interviewee 17)

To summarize this section about economic profitability for reconstruction projects, there are different perspectives. However, a vast majority of the respondents were negative or at least doubtful about the possibility of achieving profitability and proclaimed other values to be central.

5.1.4 Findings about Key Factors

The previous section elaborated on the possibility of profitable reconstruction and the interviews gave a mixed picture of this. However, the interesting follow-up question was then how a project eventually can be profitable. Therefore, in this section, themes for profitable reconstruction projects are brought forward based on responses from the interviewees. During the interviews, the following question was asked: "Which key factors do you identify to achieve an economically profitable reconstruction project, or as profitable as possible, while attaining the care requirements of the future?" to be able to answer the second research question. During the thematic analysis, some themes stood out and are listed in Table 11. These themes are further elaborated on below.

Table 11. The most common themes during the interviews.

Themes	Description	Frequency
1	Holistic View	11
2	Early Planning	10
3	Communication	7
4	Focus on Efficiency	6
5	Vision	6
6	Management	4
7	Cost Consciousness	4
8	Efficient Facility Utilization	4
9	Listen to Operations	3
10	Incentives	2
11	Implement Work Routines	2
12	Build Correct	1
13	Culture	1
14	Follow-up on Decisions	1
15	Standardized Work	1
16	Flexibility	1

The first theme that appeared was about implementing a holistic view in the project and was pointed out in Interviews 3, 5, 7, 9, 10, 13, 17, 18, 19, 20 and 21. From the statements below it was obvious that the holistic view has been important for the profitability of reconstruction projects, and some different perspectives were mentioned.

"You have to include the possibilities for all stakeholders and implement a holistic perspective."
(Interviewee 3)

"The key is that you have to have the overall plan ready for yourself, you cannot handle the project as a solitary but must look at the context."
(Interviewee 10)

An underlined aspect of the holistic view was the importance of viewing the project from a regional perspective. It was further declared how each separate administration was dependent on the assigned mission from the regional board and how the reconstruction project must be put in a regional context. Something brought up connected to this was that the politicians have the regional overview. This was problematized, and it was explained how a decision can be politically controversial even though the civil servants are very clear about the situation. In the same direction, politicians should preferably see the higher purpose and not only the possibility of gaining political points during their term in office. However, this could somewhat be overcome by showing a clear business case for the politicians or presenting the project visually for them according to another interviewee. The holistic perspective could also be taken one step further and it was discussed on a cross-regional and national level during some interviews. Connected to this, a relevant question can be asked if all care is needed internally in the region or if collaboration instead can be done on a national level.

"As an individual administration, we must have a sufficiently large mission to fill our premises and capacity."
(Interviewee 18)

"Everyone wants to have everything and be the best in the class, I think it's enough that someone is the best in the class and then we help each other".
(Interviewee 20)

Another aspect of the holistic view was more centered around the project. The importance of a common vision to know what to do and why to understand each other was discussed and how all stakeholders must be involved early in the process. One of the respondents explained how they had a meeting structure that involved the healthcare side. To create this holistic view, one interviewee commented on how this can be achieved by smaller decisions and standpoints along the way. Connected to this the question "Is it worth it?" should be asked frequently when a decision must be taken. However, it was also declared how difficult this holistic mindset can be to implement but on the other hand how crucial it is for all the investments made in the public sector. A slightly different angle of how a systematic and holistic approach was needed for efficient facility utilization was also brought forward, which will be elaborated on further ahead.

"The key is that you have to have the overall plan ready for yourself, you cannot manage the project as a solitary but must look at the context."
(Interviewee 10)

Secondly, early planning was a theme brought up by Interviewees 1, 2, 3, 5, 6, 13, 14, 16, 17, and 18. It was stated that the work done in early phases, such as the pilot study and program work, is crucial. Accordingly, some respondents also mentioned the lack of it in many projects executed today. The importance of early planning is well summarized in the citation below and elaborated on in the next paragraph.

"It is the early phases and the analysis executed there."
(Interviewee 14)

Several interviewees explained the significance of an early dialogue with the operations. It was underlined how all stakeholders early on should be included to be able to continue with the investment. Further, one respondent also said that an initial dialogue must be initiated with the persons who prepare the investment cases. However, another interviewee problematized this and expressed how too many stakeholders in an early stage could create a too demanding requirement set. Another perspective of early planning is that this early dialogue is mainly about the flexibility incorporated in the hospitals and how hospitals need to be adjusted for future requirements. During the interviews, it was raised how early planning for future healthcare requirements concretely could have improved their projects' economic results. One interviewee gave an example of this and said that if they had waited some years everything could have been renovated at the same time to improve the economic profitability. Related to this it was also discussed the importance of including key figures in an early stage.

"It is problematic that our assignments change faster than the duration of our projects. We are trying to introduce perspectives around flexibility in the premises given changing care and assignments."
(Interviewee 18)

"Spending a lot of time in the initial stage, that you understand each other, that all instances understand each other and what we want to achieve."
(Interviewee 5)

"Regarding investments, I think it is important to work with key figures at an early stage."
(Interviewee 1)

"In retrospect, we would have waited and rebuilt everything at once five years later, it would have been more economically viable in the 15-year term."
(Interviewee 6)

For the third, communication was mentioned as a theme by Interviewees 3, 5, 8, 9, 12, 16, and 21. This perspective was brought up generally and the importance of involving all stakeholders and having a dialogue was pointed out. One of the respondents emphasized cooperation and

synchronizing the operations with the construction phase. However, a challenge with this mindset can be poor staffing and current challenges in the daily operations which implies insufficient time for the change management. As Interviewee 12 mentioned, a lot of time is needed for the operational teams to understand and discuss the implications of reconstruction projects. Some interviewees had more focus on the project group and the internal communication among them. To synchronize between the members of the project group and find a joint way forward was crucial and the importance of the ability to understand each other and know what to do and why.

"I believe that cooperation in the construction projects is a key factor."
(Interviewee 21)

"Sometimes we talk about the same thing, but we still talk past each other - so it is super important to have people who act as bridges between different people with different backgrounds."
(Interviewee 5)

"It will be economically profitable if you can cooperate."
(Interviewee 16)

"Everyone had to sit in the boat for the boat to go forward."
(Interviewee 8)

A fourth theme identified during the interviews was to focus on efficiency according to Interviewees 1, 12, 15, 18, 19, and 20. The increase in patient flows and how the reconstruction should support the operations to become more efficient were highlighted during the interviews. It was also declared how showing the intended savings and improvements in efficiency is crucial. In the same direction, the importance of efficient flows and leaving no stone unturned was also mentioned. A slightly different aspect of this and how logistical connections, for example between the emergency department and the diagnostics, must be handled through efficient flows was also discussed. To view efficiency from the perspective of facility utilization was done by another interviewee and this will be discussed as a separate theme further ahead. Lastly, it was also discussed the meaning of including a perspective of efficiency when listening to the operational needs.

"It is important to map so that you can increase patient flows and efficiency."
(Interviewee 1)

Interviewees 5, 9, 13, 14, 17, and 18 associated a common vision for the project to achieve a profitable reconstruction project and this was considered as a fifth theme. An interviewee explained how the vision and what to achieve is the "alpha and omega" in projects like these. It was discussed how the operations in these projects need to implement future thinking and

establish a direction for the project and the need for general but also clear guidelines for the projects. However, some interviewees also enforced the importance of letting the vision impact the decisions taken. Further, one of the respondents elaborated on the difficulty with this and how an external analysis could be advantageous. As earlier enlightened, some respondents stated that the most important key factor is a clear vision and to align the project with this.

"The most important is to have a clear vision and to plan very carefully – it is important that the decisions during the project align with the vision."
(Interviewee 17)

"Not only focus on the administration here and now but also focus forward and create a direction."
(Interviewee 18)

"To direct toward the objectives affirmed by the politics, which is to deliver good healthcare for the citizens."
(Interviewee 14)

The sixth theme was about management for the projects and was brought up during Interviews 1, 2, 16, and 17. One of the interviewees pinpointed this with the answer to the question of which key factor was considered most relevant, see citation from Interviewee 2 below. The respondent developed this further and said that the most essential when an investment decision has been taken is to keep time, cost, and content for the project and explained how organization and management are keys for this. To work actively with the management was something underlined by other respondents as well, so the relevant questions are dealt with. The ability to make decisions aligning with the overall vision as elaborated on earlier was also emphasized as important for management. On the same topic, it was stated how important the appointment of the right skills within the project organization is. An additional perspective was the significance of the management of the personnel from the daily operations and getting them in the same direction as the project´s objectives. To conclude this discussion about management, it was stated that the reason behind the low success rate of publicly financed projects is poor management and organization.

"A successful project!"
(Interviewee 2)

The seventh theme was cost consciousness according to answers from Interviewees 8, 10, 20, and 21. One of the respondents elaborated on this and said it was both about construction and personnel costs related to the project. Furthermore, the importance of keeping down the costs as much as possible to stay within the budget was stated. This was in one of the projects done by thorough work with procurements and comparison of quotes. Another interviewee discussed in the same direction the importance of diligent investigation to create efficient flows. An

additional perspective brought forward and emphasized was to show the costs to the politicians so they can make uncomfortable decisions when needed.

"To build as cheaply as possible to the highest possible quality."
(Interviewee 20)

"We need to be on our toes when it comes to financial follow-up in the projects."
(Interviewee 21)

Eighthly, efficient facility utilization was identified as a theme for profitable reconstruction projects based on responses from Interviewees 9, 11, 16, and 19. Reconstruction projects require heavy investments in facilities and equipment but according to the respondents, the use of the equipment and the premises is crucial. It was also explained how the premises of the hospital often are empty, and still more rooms are desired. If the premises are used correctly a greater flow of patients can be achieved according to one of the respondents. Another perspective of this was brought forward and the advantage of usage of old facilities instead of building new ones was discussed and how this is advantageous both from an economical and sustainability point of view. A question raised during the interviews of how empty premises can be used can conclude this discussion about efficient facility utilization and is cited below.

"The single most important issue to solve is the degree of utilization in the operations."
(Interviewee 19)

"We have to get at this utilization rate thing."
(Interviewee 11)

"How can we use the premises that are otherwise empty?"
(Interviewee 19)

To listen to operations also appeared in the thematic analysis as a ninth theme. Interviewees 7, 12, and 18 all brought this forward in somewhat different variants. It was emphasized working concretely with the operational teams who know the conditions best and one respondent claimed that the healthcare operations should be included in all phases of the project. To achieve this, they have had coordination meetings together with the healthcare operations during the project. It was also mentioned how important it is to listen to and accommodate the healthcare teams and their suggestions since they are the ones who will use the facilities. One interviewee also talked about a dialogue with the operational teams and listening to their requests and how the patient should be met. Another input on this subject was to work actively with visualization of the project for the operational teams to better understand the situation.

"Not just work with management but actually, those who work in the operations!"
(Interviewee 12)

"But there is one key factor that is important, working close to the healthcare operations. You work together, arm in arm, and help each other."
(Interviewee 7)

Themes mentioned by only one or two respondents are elaborated on briefly further ahead to get a sense of some of the content. Interviewee 2 talked about incentives and stated that there are no real consequences for underperforming in the public sector which is considered problematic. Economic incentives were brought forward also by Interviewee 11 who compared with primary and dental care. This interviewee claimed that these organizations succeed economically since they have economic incentives for it. Another topic was about implementing work routines and how these can lead to more efficient operations. Interviewee 4 elaborated on this and emphasized how the new work routines should be tested and implemented already before the move to new premises. This is to attain efficiency in the new facilities and the respondent talked about how they do this in similar but already existing premises at other hospitals in the region.

"We have to work with the way of working in the operation to create more efficiency."
(Interviewee 11)

Culture was another theme mentioned by Interviewee 13 and the importance of management implementing these principles early in the project. Currently, people often work silo-based but another mindset with a common thinking is critical to succeed. Interviewee 4 talked about how building correctly from the beginning is vital. Otherwise, there can be consequences of vast and additional evacuation and reconstruction costs. A further theme brought forward by Interviewee 15 was to work with accepted methods and standardize the work. Lastly, Interviewee 15 also emphasized follow-up on decisions made to be able to succeed. The respondent believed it was essential to frequently ask the question cited below.

"We are working on documents and that it is built correctly is quite important."
(Interviewee 4)

"What should the focus be?"
(Interviewee 15)

Regarding the identified themes above, they can be further examined in line with the purpose of this thesis. There were similarities between the third and ninth themes about communication respectively the importance of listening to the operations. Both these themes included the importance of dialogues and coordination meetings. However, the third theme was more about listening to the persons who will work in the premises and not only the management. Anyway, there were many similarities and therefore these were summarized in one key factor called communication and cooperation. Parallels between a common vision and a holistic view can also be drawn. When enabling a holistic view from a project perspective the need for a common vision was emphasized. Further, a common vision can be argued to indirectly apply a holistic view to the project, so they relate to each other. Therefore, these themes were also combined into a joint key factor called comprehensive vision. Another resemblance could be acknowledged between the focus on efficiency and efficient facility utilization which were the fourth and the eighth key theme. However, the fourth theme was more about the general streamlining of flows whilst the eighth had a specific focus on efficient facility utilization and therefore they were not merged.

Based on the answers from the respondents and the discussion about the themes above, key factors could be brought forward. As described in the method, the themes mentioned by three or more respondents were considered to be key factors. However, as elaborated on above some themes were alike and therefore combined into one key factor. This was the case for themes 3 and 9 respectively 1 and 5. The key factors for profitable reconstruction projects at hospitals gathered for this thesis are summarized in Figure 13.

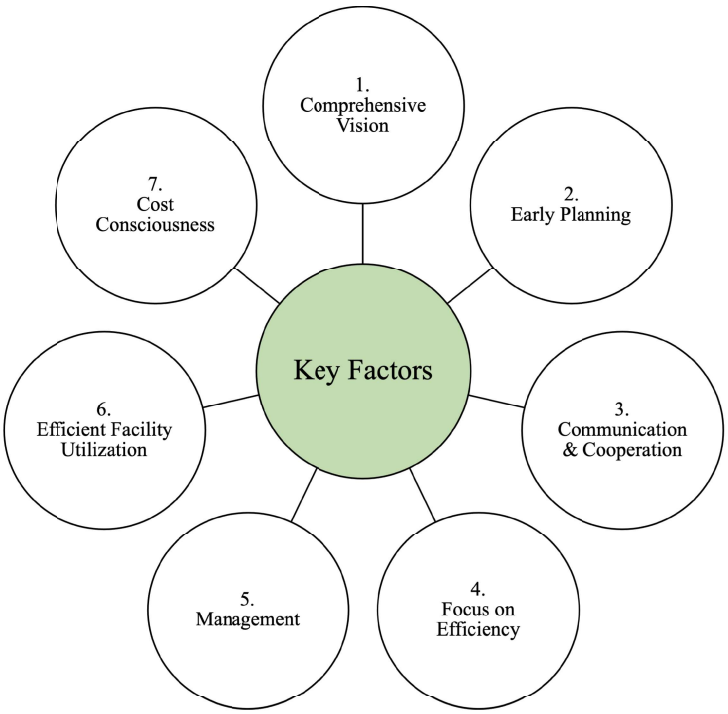

Figure 13. A framework of key factors to achieve profitable reconstruction projects at public hospitals.

Moreover, some relationships between the key factors can be further examined. A functioning management can have a positive impact on other key factors like early planning and a comprehensive vision, communication and cooperation, and cost consciousness. The interviewees who brought up management as a key factor also discussed costs, a common vision, and the importance of including people in daily operations which indicates there is a connection amongst those. Furthermore, factors like communication and implying a comprehensive vision indirectly presuppose a functioning management. With this argumentation, management can be considered as an even more important key factor than the frequency rate in Table 11 and the rank order in Figure 13 shows. Another key factor worth some extra focus is the comprehensive vision of the project. As earlier declared, this was the highest-ranked key factor based on the interviews, and it can also be argued to have an impact on the other key factors. In a comprehensive vision, the routines about communication, the inclusion of daily operations, cost consciousness, and others can be acknowledged and set the tone for the project. However, it then relies on management to communicate and implement the vision of the project.

5.2 Analysis of Research Study 2

In this section, an analysis is presented on the findings from research study 2. The section is divided into subsections in corresponding order to the previous section 5.1. Thus, the analysis starts with an analysis of business case models in the sector and then moves over to an analysis of the economic consequences of a facility investment. Thirdly, the economic profitability of facility investment is analyzed. Lastly, the established key factors are connected to the theoretical framework.

5.2.1 Analysis of Business Case Models

To start the analysis, the use of business cases and capital budgeting methods in the healthcare sector is analyzed. All the respondents concurred that capital budgeting methods were not used during their respective projects, and thus further analysis was not necessary. However, it may be worth analyzing possible reasons why it is not used, since the first research study and the theoretical framework showed that the doctrines of capital budgeting can be applied to these types of investment projects, to establish a business case.

One factor that might have played a part is the mere fact that projections in the far future correlate to higher levels of uncertainties (Sinha et al., 2010). These types of projects, as listed in Table 2, were all capital-heavy investments and thus also incurred many years of depreciation. Thus, such projections would imply a long economic lifetime and high insecurity in the projections when using capital budgeting, as discussed in the first research study as well. Further, another factor that might have contributed to this lack of use was knowledge. The comparison between investment logic in a manufacturing firm versus the healthcare sector and the fact that they did not know how to calculate the benefits from the investment was gathered from some interviews. This was affirmed in the theory which suggests that investment analysis in the hospital sector is undeveloped due to a lack of information to make a business case (Call, 2023). This could be information about input data or, as described by the interviewee,

information on how to create a business case. Purely financially, it can be argued that capital budgeting and creating a business case could solve at least some of this puzzle. With this background, it is furthermore important for management to consider data accessibility, recruitment, and further education within this area to enhance the competence about this type of question.

5.2.2 Analysis of Economic Consequences

The interviews displayed that the largest economic consequence the different facility investments generated was the cost of depreciation. In some regions, this depreciation was included in the increased internal rent. Even though this was not found in the theoretical framework explicitly, the depreciation cost is directly tied to the total investment cost of the facilities which was brought up by the theory (Sadler et al., 2008). Further, since the cash outlay of the hospital facility investments is vast, the depreciation times are often prolonged to minimize the immediate impact on the income statement which could be seen in the cases.

Next, the findings displayed what type of cost savings an investment in facilities could generate. The answers showed some differences between them but were generally in accordance with the cost reductions in the theory. These were reduced energy consumption, reduced accidents, and infections at the hospital, shortened length of stay for patients, reduced need for patient transfers, and reduced work-related injuries (Sadler et al., 2008). However, one thing that the interviewees did not bring up as a cost reduction as clearly as theory was reduced work-related injuries. Often during the interviews, the working environment was suggested as a benefit and something that could reduce sick leave, but no interviewee suggested that physical work-related injuries could be reduced. However, it might not have been brought up since physical work-related injuries were already low before the investments, and they have not experienced a large difference before and after the introduction of new facilities.

Lastly, the answers regarding the effects of the financial arrangements, such as compensation model and internal rent, were scattered. However, some similarities between the theoretical framework and the answers could be found on the topic of incentives. Interviewees 2 and 13 brought up the potential incentives that a retrospective compensation model could create, which were to create economies of scale and the risk of only conducting care to patients that are easy to treat. In the theory, it was stated that on the meso level, there is a risk of patient selection when relying on retrospective compensation (Lindgren, 2014). However, this was not based on how easy it is to treat a patient but rather on the net income of procedures. A similar mindset regarding incentives can be applied on the cost-side, and more specifically internal rent. As some of the respondents discussed, the incentives for cost management connected to facility investments can differ depending on whether the hospital operations need to carry the cost of increased rent or not. This is in line with what the theory suggests, that the underlying cause behind the internal rent is to form incentives to minimize the number of facilities or area that are needed (Lind & Hellström, 2012).

5.2.3 Analysis of Economic Profitability

As elaborated on in 5.1.3 there were a spectrum of answers regarding economic profitability for a reconstruction project which can be analyzed. But first, it is interesting to discuss why the question itself is relevant today. An explanation of this focus can be derived from the trend of NPM explained in section 3.2.5 and how the NPM doctrines put emphasis on economic aspects and output (Hood, 1991). Several interviewees also mentioned how the emphasis on economic aspects has grown during the last few years. Of course, it could be explained by several factors, but factors such as the regions financial problems, a growing dependency ratio, and future healthcare requirements which were expounded in section 1.1 were also mentioned during the interviews. However, a couple of interviewees discussed the complexity of applying the NPM doctrines in the public sector since the perfect market does not exist within this sector and therefore it is difficult to apply it. NPM reasonings can be applied to calculation models but not in reality according to one of the interviewees.

A theme throughout the answers presented in section 5.1.3 was that other values than purely economic ones are relevant for reconstruction projects at hospitals. This is in line with the literature which summarized that economic profitability is not the sole reason for public sector management to invest (Dran & Campbell, 1981). From the theory, positive externalities is one reason for public sector to intervene (Brealey et al., 1997). This was the reason best corresponding with the findings from the interviews. Several interviewees brought up the societal value of modernizing a hospital which is in line with the reasoning about externalities. However, these externalities are not automatically fairly distributed among citizens. On the other hand, the Hicks-Caldor criterion which evaluates the net benefits of an investment can be applied (Brealey et al., 1997). Based on the findings most of the respondents considered this to be fulfilled since they all were positive about the reconstruction projects, for economical or other reasons. When discussing other social values, it was further interesting to apply incentive theory and more specifically the reasonings from a macro perspective elaborated on in section 3.4.3. A focus on economic values and efficiency was not prioritized by many respondents. However, a consequence of efficiency and economic profitability is that more care is produced, and money can be invested in other areas. This is in line with the discussion about rigid healthcare systems and how a healthier population can produce a higher output per capita (Chen et al., 2021). With this argumentation, an economic focus can be combined with other societal values.

Furthermore, the legal regulations specified and discussed in section 3.2.2 were not mentioned specifically during the interviews. No respondent discussed the balance requirement or anything from Chapter 11 of *Kommunallagen* at all (SFS 2017:725). However, indirectly they talked about budget restrictions with raising costs due to the investments made. Additionally, in line with earlier analysis, the respondents brought up problems with the forecasting of these costs. This was discussed in the theory where it was stated how appraisal of resources can be difficult in the beginning of the budget period (Svensson & Hultkrantz, 2014).

5.2.4 Analysis of Key Factors for Profitability

During the initial literature search, no specific theory about key factors for profitable reconstruction projects was found and this thesis aims to contribute to fill that gap. However, some parallels could be drawn between the identified key factors and the theory elaborated on in Chapter 3. A focus on efficiency was considered as the fourth key factor and discussed in section 3.3.2 about the cost-side of a business case model. Improved efficiency is a cost-saving factor in hospitals and economies of scale can be achieved (Stock & McDermott, 2011). This was also pointed out by several interviewees. The sixth key factor, efficient facility utilization was another key factor elaborated on in the theory in section 3.3.2. An optimization of this can be a major cost-saving factor at hospitals (Lennerts et al., 2003). So, the theory supports the importance of efficient facility utilization.

Moreover, parallels between NPM and the key factors can be drawn. According to the theoretical framework, NPM is a broad management trend, but 7 doctrines have although been specified in the literature (Hood, 1991). When reviewing the identified key factors for profitable reconstruction projects these thoughts can be seen in key factors as focus on efficiency, management, efficient facility utilization, and cost consciousness. Concretely, this is present in the Swedish healthcare sector where a lot of focus has been on economic efficiency and cutting costs during the last decades (Blomqvist, 2016). This corresponds well with the recently mentioned key factors and it is evident that the NPM mindset affected the respondents' answers. However, the other societal values stressed by the respondents in the interviews is somehow a sign that there are other trends present except NPM within the sector.

Further, some of the interviewees problematized the impact of politics in large reconstruction projects. It was explained how it is important for politicians to understand the higher purpose in such projects, and not try to gain political points during their terms in office, which correspond to the key factors of both comprehensive vision and management. This is somewhat in line with the theory where it is stated that not only a high net spend from politicians would suffice to please the public (Stafinski et al., 2011). This refers to the notion mentioned earlier, politicians need to understand what is important for societal development and which initiatives that contributes to this goal. The key factor of comprehensive vision implies that all stakeholders, including politicians, need to be included in the reconstruction project, so that everyone is working against the same goal and understands the purpose. Further, the key factor of management is a facilitator for this to happen, by constructing processes and venues with all relevant stakeholders of the projects.

Additionally, incentives were brought up during the interviews but were not considered as a key factor. However, parallels can be drawn to section 3.4 and incentives on both a micro and meso level which make it interesting anyway. Theory X implies managerial control with a compensation structure to motivate employees (Ellingsen & Johannesson, 2008). This was implicitly discussed in one of the interviews when it was stated that when underperforming in the public sector as a coworker there are no real consequences. On the meso level, the incentives for economic profitability depend on which revenue structure is used at the hospital (Lindgren,

2014). During the interviews, this was discussed, and one respondent explained how there are other incentives in Swedish primary and dental care to achieve economic profitability. Further, it is important to be cost-conscious if the hospital wants to achieve profitability with the reconstruction. Therefore, incentives must be in place that call for such consciousness. If there are no such incentives, there is a risk of transferring responsibility away from the hospital operations. When employed, the internal rent can act as a tool to create incentives and awareness for cost consciousness, since the hospital acquires an increased rent after the reconstruction (Lind & Hellström, 2012).

6. Conclusions

In this chapter, some concluding thoughts from the thesis are put forward. Firstly, conclusions of the findings are stated. Recommendations for practitioners are then presented and lastly, recommendations for future research are proposed.

6.1 Conclusion of Findings

As declared in the introduction, the purpose of this study is to identify and analyze key factors to achieve economically profitable reconstruction projects at public hospitals. Creating business cases for hospital reconstruction projects is not common within the sector today. However, the first research study showed that this is possible and an investment can be considered profitable. The second research study explained what key factors management needs to consider making such reconstruction projects profitable. Below, this is further developed and the two research questions are brought forward and answered separately.

RQ1: How can a reconstruction project of a hospital be economically profitable?

The first research study aimed to answer how a reconstruction project of a hospital can be economically profitable. Based on the theoretical framework and operational numbers from the case object, the Hospital of Kungälv, a business case model was created to answer this. The model aimed to construct a break-even state where the NPV of the investment equals zero. On top of cost savings related to the investment, this is possible if the productivity and number of surgeries and patients treated increase. Further, the existing compensation model is therefore important. Based on the findings the most important financial posts to consider in achieving an economically profitable reconstruction project are the discount rate, the facility investment cost, the facility economic lifetime, the increased rent, and the compensation per surgery and patient.

RQ2: What are the key factors for hospital management to consider when aiming to achieve profitable reconstruction projects and why are they important?

The second research study aimed to identify the key factors for management to consider when aiming to achieve profitable reconstruction projects and why they are important. A produced framework brings up the key factors that are important for management to consider and they are a comprehensive vision, early planning, communication and cooperation, focus on efficiency, management, efficient facility utilization, and cost consciousness. These factors are important because they are crucial when aiming to achieve profitability according to people within the sector and substantiated by the conducted analysis. However, based on the findings, management and a comprehensive vision permeate several other key factors and could therefore be even more important to consider.

6.2 Recommendations for Practitioners

For practitioners conducting similar business case analyses with capital budgeting methods, the recommendations are several. Firstly, it is important to have access to relevant data of the hospital that will be reconstructed. In the case of this study, this was a hurdle since the administration of SV had several hospitals jointly on the income statement. Thus, generally, it is important to have data accessible in a database or similar before the process of analysis can be started. However, it can be difficult to translate benefits from a reconstruction project of a hospital in monetary terms. Further, since reconstructions in hospitals often occur in stages, it could be beneficial to create a business case model to consider that. This is to have a more complete picture when in time certain costs occur along with savings and would give the investors a better understanding of the cashflows for the investment. Thirdly, the choice of discount rate can be unclear but it is important to decide on one and use it in the projects. Lastly, since this type of analysis is not common within the sector it is a further recommendation to incur knowledge about capital budgeting and business case models by either new employment or further education of the personnel.

6.3 Recommendations for Future Research

For future research, the recommendation is to further investigate this relevant and present subject in the Swedish context. Another study with a greater focus on generalization can use this thesis as inspiration. Especially it would be interesting with a multiple-case study for the first research question where only a single case was examined in this thesis. Another recommendation is to compare public projects to privately carried out reconstruction projects to learn from their mindset and their practices. As explained in the findings, several respondents mentioned that there are not many examples of economically profitable reconstruction projects within the public sector, and some also suggested to therefore study private hospitals and their routines of hospital facility investments.

References

Alkaraan, F., & Northcott, D. (2006). Strategic capital investment decision-making: A role for emergent analysis tools? *The British Accounting Review*, *38*(2), 149–173. https://doi.org/10.1016/j.bar.2005.10.003

Anderstig, C. (2012). *Försörjningskvoten i olika delar av Sverige - scenarier år 2050: Underlagsrapport 8 till Framtidskommissionen*. Statsrådsberedningen.

Appel-Meulenbroek, R., & Danivska, V. (2023). Steps and theories towards more effective business case processes within existing organisations: An inter-disciplinary systematic literature review. *Business Process Management Journal*, *29*(8), 75–100. https://doi.org/10.1108/BPMJ-10-2022-0532

Awuzie, B., & McDermott, P. (2017). An abductive approach to qualitative built environment research: A viable system methodological exposé. *Qualitative Research Journal*, *17*(4), 356–372. https://doi.org/10.1108/QRJ-08-2016-0048

Bell, E., Bryman, A., & Harley, B. (2022). *Business research methods* (Sixth edition). Oxford University Press.

Berk, J. B., & DeMarzo, P. M. (2024). *Corporate finance* (Sixth edition, global edition). Pearson.

Blomqvist, P. (2016). NPM i välfärdsstaten: Hotas universalismen? *Statsvetenskaplig tidskrift*, *118*(1). https://journals.lub.lu.se/st/article/view/15955

Bock, K., & Trück, S. (2011). Assessing Uncertainty and Risk in Public Sector Investment Projects. *Technology and Investment*, *02*(02), 105–123. https://doi.org/10.4236/ti.2011.22011

Borgonovo, E., & Peccati, L. (2004). Sensitivity analysis in investment project evaluation. *International Journal of Production Economics*, *90*(1), 17–25. https://doi.org/10.1016/S0925-5273(03)00213-5

Brealey, R. A., Cooper, I. A., & Habib, M. A. (1997). Investment appraisal in the public sector. *Oxford Review of Economic Policy*, *13*(4), 12–28.

Call, S. (2023). Infrastructure recapitalization cost savings from facility operations investments in Washington State hospitals. *Journal of Hospital Management and Health Policy*, *7*, 5–5. https://doi.org/10.21037/jhmhp-22-128

Cederberg, J. (2023, April 5). *Byggboom med utmaningar*. Läkartidningen. https://lakartidningen.se/aktuellt/nyheter/2023/04/byggboom-med-utmaningar/

Chen, S., Kuhn, M., Prettner, K., Bloom, D. E., & Wang, C. (2021). Macro-level efficiency of health expenditure: Estimates for 15 major economies. *Social Science & Medicine*, *287*, 114270. https://doi.org/10.1016/j.socscimed.2021.114270

Choudhary, P., Patnaik, S., Singh Ph.D, M., & Kaushal, G. (2013). Break-Even Analysis in Healthcare Setup. *International Journal of Research Foundation of Hospital and Health Care Administration*, *1*, 29–32. https://doi.org/10.5005/jp-journals-10035-1006

Conrad, D. A. (2015). The Theory of Value-Based Payment Incentives and Their Application to Health Care. *Health Services Research*, *50*(S2), 2057–2089. https://doi.org/10.1111/1475-6773.12408

Cooremans, C. (2011). Make it strategic! Financial investment logic is not enough. *Energy Efficiency*, *4*(4), 473–492. https://doi.org/10.1007/s12053-011-9125-7

Dopfer, K., Foster, J., & Potts, J. (2004). Micro-meso-macro. *Journal of Evolutionary Economics*, *14*(3), 263–279. https://doi.org/10.1007/s00191-004-0193-0

Doyle, L., Brady, A.-M., & Byrne, G. (2009). An overview of mixed methods research. *Journal of Research in Nursing*, *14*(2), 175–185. https://doi.org/10.1177/1744987108093962

Dran, J. J., & Campbell, B. E. (1981). HOSPITAL INVESTMENT AND MEDICARE REIMBURSEMENT. *Journal of Financial Research*, *4*(2), 147–160. https://doi.org/10.1111/j.1475-6803.1981.tb00617.x

Ellingsen, T., & Johannesson, M. (2008). Pride and Prejudice: The Human Side of Incentive Theory. *American Economic Review*, *98*(3), 990–1008. https://doi.org/10.1257/aer.98.3.990

Finansinspektionen. (2024). *Diskonteringsräntekurvor, december 2023*. https://www.fi.se/sv/publicerat/statistik/diskonteringsrantekurvor/2024/diskonteringsrantekurvor-december-2023/

Fisher, F. M., & Mcgowan, J. J. (1983). On the Misuse of Accounting Rates of Return to Infer Monopoly Profits. *The American Economic Review*, *73*(1), 82–97.

Fröst, P., & Hammarling, C. (2017). *Framtidens vårdbyggnader*. SKL. https://skr.se/skr/tjanster/rapporterochskrifter/publikationer/framtidensvardbyggnader.64866.html

Ganesha, H. R., & Aithal, P. S. (2022). Approaching Research in Different Ways. How to Choose an Appropriate Research Approach/Reasoning During Ph.D. Program in India? *SSRN Electronic Journal*, *1*, 59–74. https://doi.org/10.2139/ssrn.4263413

Green, E. P. (2014). Payment systems in the healthcare industry: An experimental study of physician incentives. *Journal of Economic Behavior & Organization*, *106*, 367–378. https://doi.org/10.1016/j.jebo.2014.05.009

Gül, M., & Guneri, A. (2012). A computer simulation model to reduce patient length of stay and to improve resource utilization rate in an emergency department service system. *The International Journal of Industrial Engineering: Theory, Applications and Practice*, *19*, 221–231.

Guo, X. (2023). An analysis of a rural hospital's investment decision under different payment systems. *Health Economics*, n/a-n/a. https://doi.org/10.1002/hec.4786

Hartman, J. C., & Schafrick, I. C. (2004). THE RELEVANT INTERNAL RATE OF RETURN. *The Engineering Economist*, *49*(2), 139–158. https://doi.org/10.1080/00137910490453419

Hinnersson, J., & Johansson, R. (2015). *Fastighets-utvecklingsplanen- Planering för morgondagens sjukhusområde*. SKL. https://skr.se/skr/tjanster/rapporterochskrifter/publikationer/fastighetsutvecklingsplanenplaneringformorgondagenssjukhusomrade.64829.html

Hood, C. (1991). A PUBLIC MANAGEMENT FOR ALL SEASONS? *Public Administration*, *69*(1), 3–19. https://doi.org/10.1111/j.1467-9299.1991.tb00779.x

Kula, E. (1981). Future Generations and Discounting Rules in Public Sector Investment Appraisal. *Environment and Planning A: Economy and Space*, *13*(7), 899–910. https://doi.org/10.1068/a130899

Kungälvs kommun. (2023, March 16). *Kommunfakta*. Kommunfakta. https://www.kungalv.se/kommun--politik/kommunfakta/

Lennerts, K., Abel, J., Pfründer, U., & Sharma, V. (2003). Reducing health care costs through optimised facility management-related processes. *Journal of Facilities Management*, *2*(2), 192–206. https://doi.org/10.1108/14725960410808203

Lind, H., & Hellström, A. (2012). *Internhyra: Rätt incitament för effektiva lokaler*. Sveriges kommuner och landsting.

Lindgren, P. (2014). *Ersättning i sjukvården: Modeller, effekter, rekommendationer*. SNS Förl.

Magni, C. A., & Peasnell, K. V. (2012). Economic Profitability and the Accounting Rate of Return. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2027607

Montgomery, A. (2014). *Fastighetsinvesteringar i landstingen—Generationsskiftet av sjukhus*. SKL. https://skr.se/download/18.3c9f9e1e17db3f33e522970/1639426889671/7585-196-9.pdf

Perkiö, H. (2018, November 22). *Landets sjukhus rustas för miljarder*. Dagens Samhälle. https://www.dagenssamhalle.se/samhalle-och-valfard/stadsbyggnad/landets-sjukhus-rustas-for-miljarder/

Renkema, T. J. W., & Berghout, E. W. (1997). Methodologies for information systems investment evaluation at the proposal stage: A comparative review. *Information and Software Technology*, *39*(1), 1–13. https://doi.org/10.1016/0950-5849(96)85006-3

Rezapour, A., Arabloo, J., Soleimani, M., Ebadi Fard Azar, F., & Safari, H. (2012). Microeconomic Analysis of Healthcare Services in Bou Ali Sina University Hospital. *Journal of Hospital Librarianship*, *1*, 51–40.

Riksbanken. (2024). *Penningpolitisk rapport—Mars 2024*. https://www.riksbank.se/sv/penningpolitik/penningpolitisk-rapport/2024/penningpolitiskt-beslut-mars-2024/

Rogers, M. (1998). The Definition and Measurement of Productivity. *Melbourne Institute Working Paper*, *9*(98).

Sadler, B. L., DuBose, J., & Zimring, C. (2008). The Business Case for Building Better Hospitals through Evidence-Based Design. *HERD: Health Environments Research & Design Journal*, *1*(3), 22–39. https://doi.org/10.1177/193758670800100304

SCB. (2022, December 27). *Befolkningspyramid för Sverige*. Statistiska Centralbyrån. https://www.scb.se/hitta-statistik/sverige-i-siffror/manniskorna-i-sverige/befolkningspyramid-for-sverige/

SCB. (2024, January 15). *Inflation i Sverige 1830–2023.* Statistiska Centralbyrån. https://www.scb.se/hitta-statistik/statistik-efter-amne/priser-och-konsumtion/konsumentprisindex/konsumentprisindex-kpi/pong/tabell-och-diagram/konsumentprisindex-kpi/inflation-i-sverige/

SFS 2017:725 Kommunallag, § Chapter 11 (2017). https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/kommunallag-2017725_sfs-2017-725/

Sinha, P., Brown, L., & Das, S. (2010). A Re-Examination of Financial Analysts' Differential Earnings Forecast Accuracy*. *Contemporary Accounting Research*, *14*, 1–42. https://doi.org/10.1111/j.1911-3846.1997.tb00518.x

Skirbekk, V., Dieleman, J. L., Stonawski, M., Fejkiel, K., Tyrovolas, S., & Chang, A. Y. (2022). The health-adjusted dependency ratio as a new global measure of the burden of ageing: A population-based study. *The Lancet Healthy Longevity*, *3*(5), e332–e338. https://doi.org/10.1016/S2666-7568(22)00075-7

SKR. (2023). *Ekonomirapporten, oktober 2023*. SKR. https://skr.se/skr/tjanster/rapporterochskrifter/publikationer/ekonomirapportenoktober2023.75603.html

Socialstyrelsen. (2020a). *Sex frågor om Vården*. https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/oppna-jamforelser/2020-1-6544.pdf

Socialstyrelsen. (2020b, September 1). *About the Swedish healthcare system*. Socialstyrelsen. https://www.socialstyrelsen.se/en/about-us/healthcare-for-visitors-to-sweden/about-the-swedish-healthcare-system/

Stafinski, T., Menon, D., Marshall, D., & Caulfield, T. (2011). Societal Values in the Allocation of Healthcare Resources: Is it All About the Health Gain? *The Patient: Patient-Centered Outcomes Research*, *4*(4), 207–225. https://doi.org/10.2165/11588880-000000000-00000

Stock, G. N., & McDermott, C. (2011). Operational and contextual drivers of hospital costs. *Journal of Health Organization and Management*, *25*(2), 142–158. https://doi.org/10.1108/14777261111134392

Svensson, M., & Hultkrantz, L. (2014). Ekonomiska utvärderingar i svensk offentlig sektor – likheter och skillnader. *Ekonomisk Debatt*, *43*, 40–50.

Tan, S. S., Rutten, F. F. H., Van Ineveld, B. M., Redekop, W. K., & Hakkaart-van Roijen, L. (2009). Comparing methodologies for the cost estimation of hospital services. *The European Journal of Health Economics*, *10*(1), 39–45. https://doi.org/10.1007/s10198-008-0101-x

Tashakkori, A., & Creswell, J. W. (2007). Editorial: The New Era of Mixed Methods. *Journal of Mixed Methods Research*, *1*(1), 3–7. https://doi.org/10.1177/2345678906293042

Vassolo, R. S., Cawley, A. F. M., Tortorella, G. L., Fogliatto, F. S., Tlapa, D., & Narayanamurthy, G. (2021). Hospital Investment Decisions in Healthcare 4.0 Technologies: Scoping Review and Framework for Exploring Challenges, Trends, and Research Directions. *Journal of Medical Internet Research*, *23*(8), e27571. https://doi.org/10.2196/27571

VGR. (2021, May 10). *Om Kungälvs Sjukhus*. Om Kungälvs Sjukhus. https://www.vgregion.se/s/kungalvs-sjukhus/om-kungalvs-sjukhus/historik/

VGR. (2022a). *Årsredovisning 2022*. VGR. https://www.vgregion.se/om-vgr/organisation-och-verksamhet/ekonomi/arsredovisning/

VGR. (2022b). *Behovsanalys, Anmälan om att få påbörja förstudie för investeringsidéer om ägarstyrda investeringar i fastigheter, fordon eller allmän utrustning*.

VGR. (2022c, February 9). *Kungälvs sjukhus nya vårdbyggnad*. https://www.vgregion.se/s/kungalvs-sjukhus/om-kungalvs-sjukhus/nya-kungalvs-sjukhus/

VGR. (2023a). *Projektdirektiv förstudie—Framtidens Kungälvs sjukhus*. VGR.

VGR. (2023b). *Framtidens Kungälvs sjukhus—En målbild för utveckling av sjukhusets fysiska miljö*.

VGR. (2024). *Årsredovisning—2023 Sjukhusen i väster*.

Wallström, S. (2020). *Strukturförändring och investering i hälso- och sjukvården (SOU 2020:15)*. SOU. https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2020/04/sou-202015/

Attachments

Business Case Model – Origin State

Business Case Model

Summary (kSEK)

Input values	**Value**	**Unit**
Financial Investment Data		
Discount Rate	3,50%	
Inflation Rate	1,73%	
Facility Investment Cost	1 485 000	kSEK
Facility Economic Lifetime (Depreciation)	30	years
Equipment Investment Cost	285 000	kSEK
Equipment Economic Lifetime (Depreciation)	7	years
Equipment Payment Duration	7	years
Operational Data		
Current Local Utilization	28%	
Operating Costs	11 550	kSEK/year
Energy Costs (electricity, water etc)	6 580	kSEK/year
Facility Rent	56 526	kSEK/year
Patients	43 136	patients/year
Patient Compensation	5,022	kSEK
Surgery Compensation	19,008	kSEK
Sick Leave Costs	25 696	kSEK
Increased revenue		
Increased patients (surgeries)	0	surgeries/year
Increased surgeries/year (best)	0	
Inreased patients (other care)	0	patients/year
	0,00%	%/year
Increased Patients (other care) revenue	0	
Increased Costs		
Increased Rent	71 775	kSEK/year
Cost Savings, [F] = Fixed Costs [V] = Variable Costs	**Value**	**Unit**
Efficient Facility Utilization (Removal of External Modules)	3 700	kSEK/year
Reduced Energy Costs [V]	57%	%/year
Reduced Operating Costs [V]	65%	%/year
Increased Productivity	10%	%/year
Reduced Sick Leave Costs [V]	5%	%/year

Business Case Model

Data (kSEK)

Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Revenue-side		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Increased Patient Flow		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Increased Surgeries		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-side, [F] = Fixed Costs [V] = Variable Costs	**-40 714**	**-96 246**	**-97 205**	**-98 181**	**-99 173**	**-100 183**	**-101 210**	**-61 541**	**-62 603**	**-63 685**	**-64 784**	**-65 903**	**-67 041**	**-68 199**	**-69 377**	**-70 575**
Increased Payments																
Facility Investment Payment [F]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Investment Payment [F]	-40 714	-40 714	-40 714	-40 714	-40 714	-40 714	-40 714	0	0	0	0	0	0	0	0	0
Increased Rent Payment [F]		-71 775	-73 015	-74 276	-75 558	-76 863	-78 191	-79 541	-80 915	-82 312	-83 734	-85 180	-86 651	-88 147	-89 669	-91 218
Reduced Payments																
Efficient Facility Utilization (Removal of External Modules) [F]		3 700	3 764	3 829	3 895	3 962	4 031	4 100	4 171	4 243	4 316	4 391	4 467	4 544	4 622	4 702
Reduced Energy Costs [V]		3 751	3 815	3 881	3 948	4 016	4 086	4 156	4 228	4 301	4 375	4 451	4 528	4 606	4 686	4 767
Reduced Operating Costs [V]		7 508	7 637	7 769	7 903	8 040	8 179	8 320	8 463	8 610	8 758	8 910	9 063	9 220	9 379	9 541
Reduced Sick Leave Costs [V]		1 285	1 307	1 330	1 353	1 376	1 400	1 424	1 448	1 473	1 499	1 525	1 551	1 578	1 605	1 633
CF	**-40 714**	**-96 246**	**-97 205**	**-98 181**	**-99 173**	**-100 183**	**-101 210**	**-61 541**	**-62 603**	**-63 685**	**-64 784**	**-65 903**	**-67 041**	**-68 199**	**-69 377**	**-70 575**
Cumulative CF	-40 714	-136 961	-234 166	-332 347	-431 521	-531 704	-632 914	-694 454	-757 058	-820 742	-885 527	-951 430	-1 018 471	-1 086 670	-1 156 047	-1 226 622
PV	**-40 714**	**-92 992**	**-90 742**	**-88 554**	**-86 424**	**-84 351**	**-82 334**	**-48 370**	**-47 542**	**-46 727**	**-45 927**	**-45 140**	**-44 367**	**-43 607**	**-42 860**	**-42 126**
Cumulative PV	-40 714	-133 706	-224 448	-313 002	-399 426	-483 777	-566 112	-614 482	-662 024	-708 751	-754 678	-799 818	-844 185	-887 792	-930 652	-972 777
IRR	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-71 794	**-73 034**	**-74 295**	**-75 578**	**-76 883**	**-78 211**	**-79 562**	**-80 936**	**-82 334**	**-83 756**	**-85 202**	**-86 673**	**-88 170**	**-89 693**	**-91 242**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-92 793	-94 396	-96 026	-97 684	-99 371	-101 088	-102 833	-104 609	-106 416	-108 254	-110 123	-112 025	-113 960	-115 928	-117 930
4 783	4 866	4 950	5 036	5 123	5 211	5 301	5 393	5 486	5 580	5 677	5 775	5 875	5 976	6 079
4 849	4 933	5 018	5 104	5 193	5 282	5 374	5 466	5 561	5 657	5 754	5 854	5 955	6 058	6 162
9 706	9 874	10 044	10 218	10 394	10 574	10 756	10 942	11 131	11 323	11 519	11 718	11 920	12 126	12 335
1 661	1 690	1 719	1 749	1 779	1 810	1 841	1 873	1 905	1 938	1 971	2 005	2 040	2 075	2 111
-71 794	**-73 034**	**-74 295**	**-75 578**	**-76 883**	**-78 211**	**-79 562**	**-80 936**	**-82 334**	**-83 756**	**-85 202**	**-86 673**	**-88 170**	**-89 693**	**-91 242**
-1 298 416	-1 371 450	-1 445 745	-1 521 323	-1 598 207	-1 676 418	-1 755 980	-1 836 916	-1 919 249	-2 003 005	-2 088 207	-2 174 881	-2 263 051	-2 352 744	-2 443 986
-41 404	**-40 695**	**-39 998**	**-39 312**	**-38 639**	**-37 977**	**-37 327**	**-36 687**	**-36 059**	**-35 441**	**-34 834**	**-34 237**	**-33 651**	**-33 074**	**-32 508**
-1 014 181	-1 054 876	-1 094 874	-1 134 186	-1 172 825	-1 210 802	-1 248 128	-1 284 816	-1 320 874	-1 356 315	-1 391 149	-1 425 386	-1 459 037	-1 492 111	-1 524 618
N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Business Case Model – Break-Even State

Business Case Model

Summary (kSEK)

Input values	**Value**	**Unit**
Financial Investment Data		
Discount Rate	3,50%	
Inflation Rate	1,73%	
Facility Investment Cost	1 485 000	kSEK
Facility Economic Lifetime (Depreciation)	30	years
Equipment Investment Cost	285 000	kSEK
Equipment Economic Lifetime (Depreciation)	7	years
Equipment Payment Duration	7	years
Operational Data		
Current Local Utilization	28%	
Operating Costs	11 550	kSEK/year
Energy Costs (electricity, water etc)	6 580	kSEK/year
Facility Rent	56 526	kSEK/year
Patients	43 136	patients/year
Patient Compensation	5,022	kSEK
Surgery Compensation	19,008	kSEK
Sick Leave Costs	25 696	kSEK
Increased revenue		
Increased patients (surgeries)	2 720	surgeries/year
Increased surgeries/year (best)	51 702	
Inreased patients (other care)	3 011	patients/year
	6,98%	%/year
Increased Patients (other care) revenue	15 123	
Increased Costs		
Increased Rent	71 775	kSEK/year

Cost Savings, [F] = Fixed Costs [V] = Variable Costs	**Value**	**Unit**
Efficient Facility Utilization (Removal of External Modules)	3 700	kSEK/year
Reduced Energy Costs [V]	57%	%/year
Reduced Operating Costs [V]	65%	%/year
Increased Productivity	10%	%/year
Reduced Sick Leave Costs [V]	5%	%/year

Business Case Model

Data (kSEK)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Revenue-side		**66 826**	**67 980**	**69 154**	**70 348**	**71 563**	**72 799**	**74 056**	**75 335**	**76 636**	**77 960**	**79 306**	**80 676**	**82 069**	**83 486**	**84 928**
Increased Patient Flow		15 123	15 384	15 650	15 920	16 195	16 475	16 760	17 049	17 343	17 643	17 948	18 258	18 573	18 894	19 220
Increased Surgeries		51 702	52 595	53 504	54 428	55 368	56 324	57 297	58 286	59 293	60 317	61 358	62 418	63 496	64 593	65 708
Cost-side, [F] = Fixed Costs [V] = Variable Costs	**-40 714**	**-96 246**	**-97 205**	**-98 181**	**-99 173**	**-100 183**	**-101 210**	**-61 541**	**-62 603**	**-63 685**	**-64 784**	**-65 903**	**-67 041**	**-68 199**	**-69 377**	**-70 575**
Increased Payments																
Facility Investment Payment [F]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment Investment Payment [F]	-40 714	-40 714	-40 714	-40 714	-40 714	-40 714	-40 714	0	0	0	0	0	0	0	0	0
Increased Rent Payment [F]		-71 775	-73 015	-74 276	-75 558	-76 863	-78 191	-79 541	-80 915	-82 312	-83 734	-85 180	-86 651	-88 147	-89 669	-91 218
Reduced Payments																
Efficient Facility Utilization (Removal of External Modules) [F]		3 700	3 764	3 829	3 895	3 962	4 031	4 100	4 171	4 243	4 316	4 391	4 467	4 544	4 622	4 702
Reduced Energy Costs [V]		3 751	3 815	3 881	3 948	4 016	4 086	4 156	4 228	4 301	4 375	4 451	4 528	4 606	4 686	4 767
Reduced Operating Costs [V]		7 508	7 637	7 769	7 903	8 040	8 179	8 320	8 463	8 610	8 758	8 910	9 063	9 220	9 379	9 541
Reduced Sick Leave Costs [V]		1 285	1 307	1 330	1 353	1 376	1 400	1 424	1 448	1 473	1 499	1 525	1 551	1 578	1 605	1 633
CF	**-40 714**	**-29 421**	**-29 226**	**-29 027**	**-28 825**	**-28 620**	**-28 411**	**12 516**	**12 732**	**12 952**	**13 175**	**13 403**	**13 634**	**13 870**	**14 109**	**14 353**
Cumulative CF	-40 714	-70 135	-99 361	-128 388	-157 213	-185 833	-214 244	-201 729	-188 997	-176 045	-162 870	-149 467	-135 833	-121 963	-107 854	-93 501
PV	**-40 714**	**-28 426**	**-27 282**	**-26 181**	**-25 120**	**-24 097**	**-23 113**	**9 837**	**9 669**	**9 503**	**9 340**	**9 180**	**9 023**	**8 868**	**8 716**	**8 567**
Cumulative PV	-40 714	-69 140	-96 422	-122 603	-147 723	-171 820	-194 933	-185 096	-175 427	-165 924	-156 584	-147 404	-138 381	-129 512	-120 796	-112 229
IRR	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**-23,58%**	**-18,09%**	**-14,07%**	**-10,99%**	**-8,57%**	**-6,62%**

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
86 395	**87 887**	**89 405**	**90 949**	**92 519**	**94 117**	**95 742**	**97 396**	**99 078**	**100 789**	**102 530**	**104 300**	**106 102**	**107 934**	**109 798**
19 552	19 890	20 233	20 582	20 938	21 300	21 667	22 042	22 422	22 809	23 203	23 604	24 012	24 426	24 848
66 843	67 997	69 172	70 366	71 581	72 818	74 075	75 354	76 656	77 980	79 326	80 696	82 090	83 508	84 950
-71 794	**-73 034**	**-74 295**	**-75 578**	**-76 883**	**-78 211**	**-79 562**	**-80 936**	**-82 334**	**-83 756**	**-85 202**	**-86 673**	**-88 170**	**-89 693**	**-91 242**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-92 793	-94 396	-96 026	-97 684	-99 371	-101 088	-102 833	-104 609	-106 416	-108 254	-110 123	-112 025	-113 960	-115 928	-117 930
4 783	4 866	4 950	5 036	5 123	5 211	5 301	5 393	5 486	5 580	5 677	5 775	5 875	5 976	6 079
4 849	4 933	5 018	5 104	5 193	5 282	5 374	5 466	5 561	5 657	5 754	5 854	5 955	6 058	6 162
9 706	9 874	10 044	10 218	10 394	10 574	10 756	10 942	11 131	11 323	11 519	11 718	11 920	12 126	12 335
1 661	1 690	1 719	1 749	1 779	1 810	1 841	1 873	1 905	1 938	1 971	2 005	2 040	2 075	2 111
14 601	**14 853**	**15 109**	**15 370**	**15 636**	**15 906**	**16 181**	**16 460**	**16 744**	**17 033**	**17 328**	**17 627**	**17 931**	**18 241**	**18 556**
-78 900	-64 047	-48 938	-33 567	-17 931	-2 025	14 155	30 615	47 360	64 393	81 721	99 348	117 279	135 520	154 076
8 420	**8 276**	**8 134**	**7 995**	**7 858**	**7 723**	**7 591**	**7 461**	**7 333**	**7 208**	**7 084**	**6 963**	**6 844**	**6 726**	**6 611**
-103 808	-95 532	-87 398	-79 403	-71 545	-63 821	-56 230	-48 769	-41 436	-34 228	-27 144	-20 181	-13 337	-6 611	0
-5,02%	**-3,68%**	**-2,56%**	**-1,61%**	**-0,79%**	**-0,08%**	**0,53%**	**1,08%**	**1,55%**	**1,97%**	**2,35%**	**2,68%**	**2,99%**	**3,26%**	**3,50%**

Interview Guide

2024-03-11 Chalmers Max Lund & Carl Svedberg

Intervjumall

Introduktion

1. Presentation av examensarbetet samt praktikaliteter kring intervjun
    a. Business Case på Kungälvs sjukhus
    b. Intervjun spelas in
    c. Andra praktikaliteter som stod med i utskicket
2. Bakgrund om respondenten
    a. Vilken region arbetar du på?
    b. Vad är din arbetstitel?
    c. Vad är dina arbetsuppgifter?

Projektbakgrund

3. Vad har ert specifika ombyggnationsprojekt inneburit?
    a. Vilket sjukhus har det berört?
    b. Vilka avdelningar har påverkats?
    c. Vilka åtgärder har vidtagits?
    d. Vad har tidsomfattningen varit?
    e. Vad har projektbudgeten varit?
4. Vad har din roll varit i ombyggnationsprojektet?
5. Vad var anledningarna till att ni gjorde ombyggnationen?

Investeringskalkylering på sjukhus

6. Hur viktig har den ekonomiska lönsamheten varit under planering och genomförande av ert projekt?
7. Vilka verktyg har ni använt er av vid beräkningar på dessa investeringar?
8. Vilken ersättningsmodell använder ni er av i sjukhusverksamheten?
9. Vad har ni sett för ekonomiska konsekvenser av er investering?
    a. Har ni räknat med ökade patientintäkter?
    b. Har ni räknat med ökade kostnader?
    c. Har ni räknat med kostnadsbesparingar?
10. Vilka generella nyttor har ni sett av er investering?
11. Vilka nyckelfaktorer ser du för att få investeringen ekonomiskt lönsam samtidigt som framtidens vårdkrav uppnås?
12. Kan en ombyggnation av ett sjukhus kan bli ekonomiskt lönsam?

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF ENTREPRENEURSHIP AND STRATEGY
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden
www.chalmers.se

CHALMERS
UNIVERSITY OF TECHNOLOGY