MENON ECONOMICS

REPORT

BENEFIT ANALYSIS OF CHECK-IN AND PAYMENT SOLUTION BY IMATIS

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Foreword

On behalf of Imatis, Menon Economics has carried out a benefit analysis of the company's check-in and payment solution. The purpose of the assignment has been twofold. One goal has been to document realized benefits from the solution that is in use at four Norwegian hospitals. The second is to explore the additional benefits that may arise from a new version of the solution that is currently under development. The analysis is limited to examining only the benefits, i.e. the positive effects of the check-in and payment solution, and not the cost side.

The analysis has been led by Erland Skogli, with Caroline Aarre Halvorsen, Caroline Vinter and Live Nerdrum as project members. Ole Magnus Stokke has been responsible for quality assurance.

We thank Imatis for an interesting assignment. We also thank all interviewees for good input during the process. The authors are responsible for all content in the report.

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Summary

On behalf of Imatis, Menon Economics has carried out a benefit analysis of Imatis' solution for check-in and payments. The purpose of the analysis has been to illustrate the benefits that have already been realized by various hospital trusts, as well as highlighting potential benefits related to newly developed functionality in the payment solution. The analysis has been carried out in accordance with the guidelines for benefit realization published by the Norwegian Agency for Public and Financial Management (DFØ). Interviews with employees at the health trusts have been the most important source of information for the analysis.

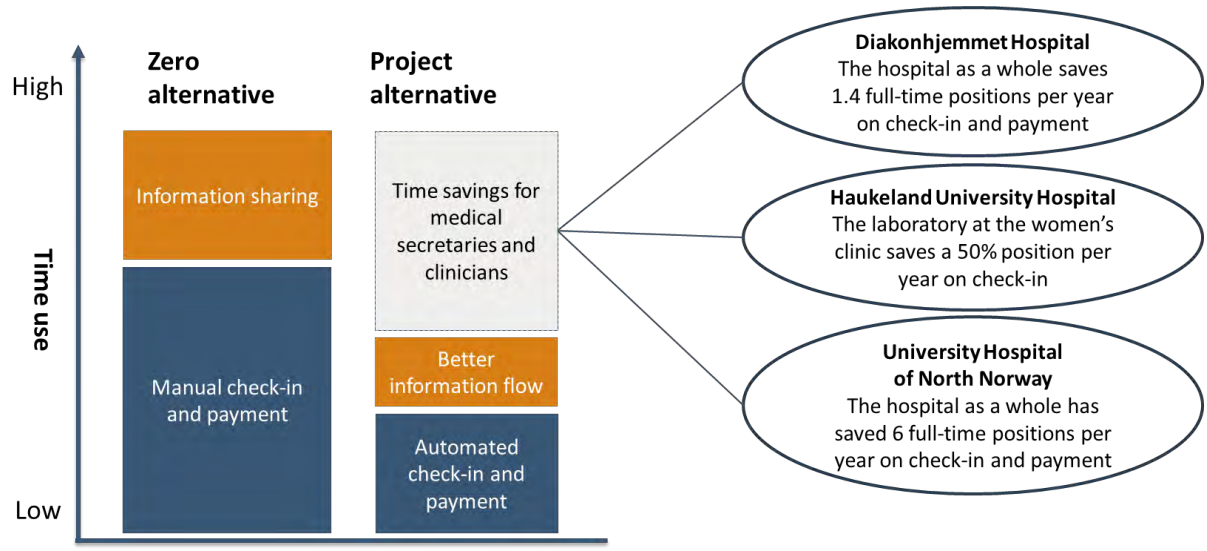
Several of the health trusts that were interviewed in the analysis have recently implemented the solution by Imatis. This means that they are still in an introductory phase, and that the benefits of the systems have not been fully realized yet in daily operations. The actual long-term benefits will likely be larger than what has been possible to quantify at this point in time.

All of the health trusts state that their main motivation for acquiring IMATIS has been to reduce the time medical secretaries spend on check-in and payment for users, and to improve the users' experience of their stay in the hospital. In addition, the health trusts wished for a general improvement in patient logistics that prevents long queues and contributes to more efficient treatment courses.

Efficiency gains related to automation of check-in and payment

The interviews reveal several efficiency gains in terms of time savings for all of the health trusts. The main source of these gains is the automation of the check-in and payment process. The time that is freed up is used for other administrative and/or more patient-oriented tasks. This has resulted in an improvement in the quality of the services.

Figure 1: Total realized efficiency gains for Imatis' check-in and payment solution. Source: Menon Economics

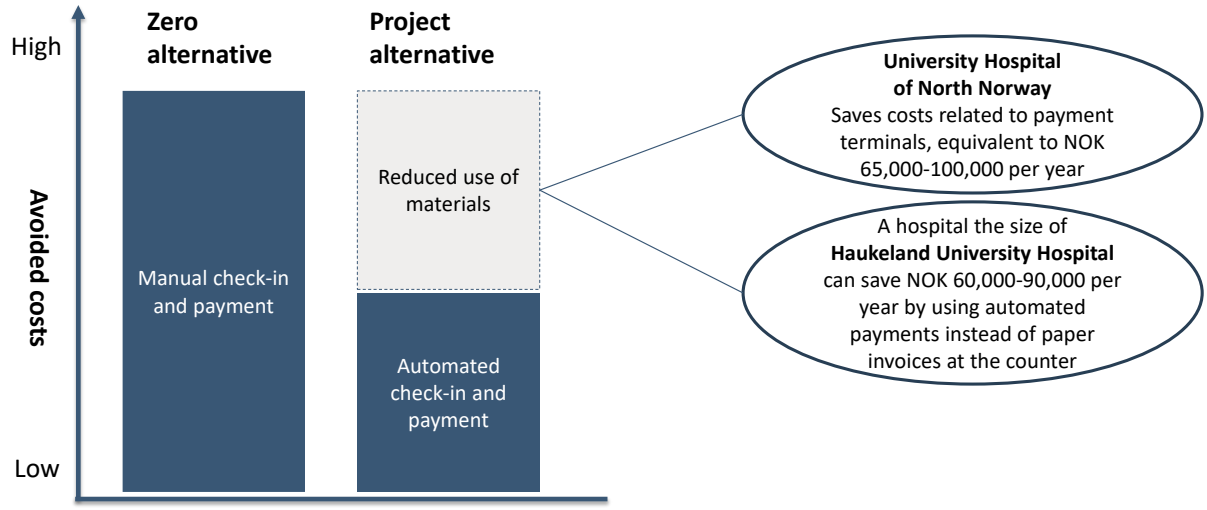


Diakonhjemmet Hospital, the laboratory at the women's clinic at Haukeland University Hospital in Bergen and Nordland Hospital have all realized large efficiency gains related to check-in and payment. The extent of the realized cost savings varies between the different hospital trusts, due to different organization models, varying degrees of centralization and how long the check-in and payment solution has been used.

Better information flow is also an important efficiency gain that is pointed out. The overview that shows which appointments a patient has before and after a consultation is useful for medical secretaries and clinicians, and is used regularly. The function that allows health personnel to communicate through IMATIS is especially effective, particularly across different hospital departments.

The analysis also shows realized benefits related to reduced need for the purchase of materials such as payment terminals, compared to earlier payment solutions.

Figure 2: Avoided costs related to diverse materials needed for the payment process. Source: Menon Economics



Quality gains related to automation of check-in and payment

In addition to efficiency gains, a number of quality gains have also been realized due to the implementation of the solution for check-in and payment.

Better flow in the outpatient clinics is mentioned by several health trusts. According to Nordland Hospital Trust, improved flow in the outpatient clinic has been crucial in managing the growth in the number of patients they have experienced at the outpatient clinic in recent years. Improved user experience has also been an important motivating factor for the implementation of a new solution for check-in and payment.

A better and more seamless user experience is achieved, among other factors, by the user receiving help to find their way to the consultation room, getting an overview of the status of their consultations and payment requirements, and receiving updates in the event of changes. Users also save time on the actual check-in and payment process by not having to queue.

Through updates and information delivered directly to their smartphones, users get ***greater freedom of movement in the hospital***, which means that the waiting time can be put to better use and becomes more comfortable. Payment by smartphone also means more flexibility for users as they can pay when and where it suits them.

Imatis makes it possible to consolidate user fees from multiple consultations in one payment, which makes the payment process more transparent and time-saving for users. The trusts' accounts departments also point to a ***more robust infrastructure and a better overview of payment status*** than earlier.

Potential gains from the new payment solution

Imatis is continuously working to improve its payment solution and has now added new functionality that provides a more comprehensive payment overview and automated follow-up of payments. The goal is that this will lead to the realization of further benefits for both patients and the health trusts, and especially for the accounts departments which usually have responsibility for these processes.

A more comprehensive payment solution and automated follow-up of payments

With the new solution, patients who have registered an agreement for e-invoicing in their online banking system will automatically be able to receive an e-invoice from the settlement in their online bank. In batches, a payment file with approved e-invoice payments is triggered from the health trusts' respective banks and keeps the health trusts' accounting system updated automatically.

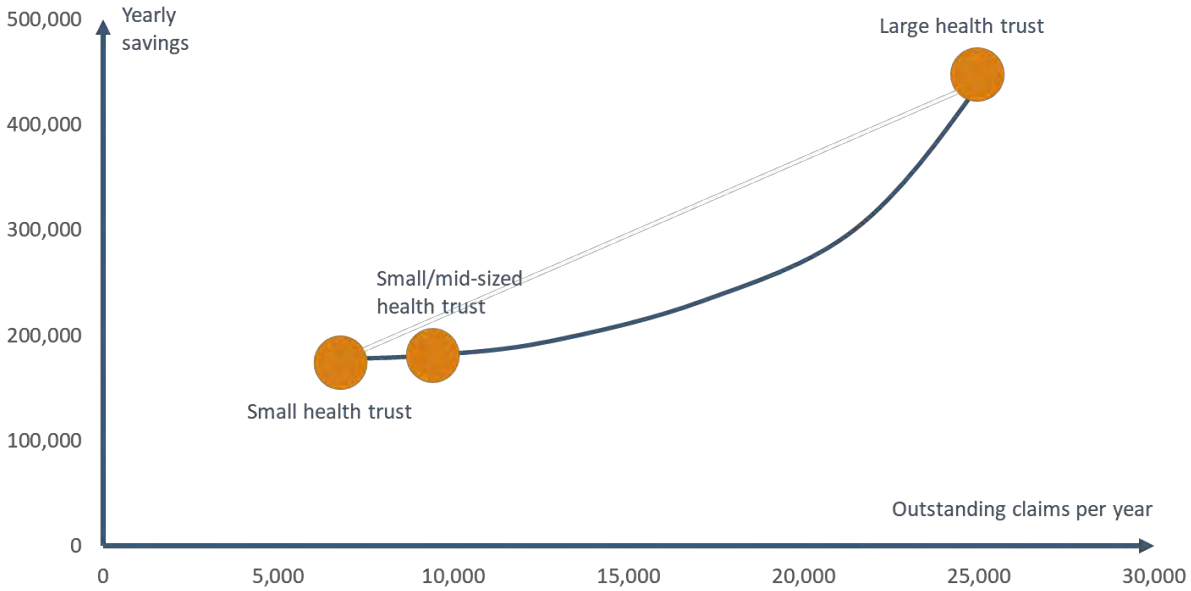
The health trust will get a more comprehensive overview of payment status for all claims with more detailed information. This overview makes it easier to carry out troubleshooting and will make payment statistics available that can be useful in reporting and will help with the assessment of potential bottlenecks.

The new solution is also equipped for sending automatic early payment notifications before an invoice is due and automatic reminders for unpaid claims. This means that the patient can receive free notifications when an unpaid invoice approaches its due date. The health trusts can also choose to take over the handling of reminders for outstanding invoices before these proceed to debt collection, which at present is often carried out by an external third party.

The new solution has potential for large benefits

Our assessment is that the largest benefits will come from automated follow-up of payments, both for the health trusts and for patients. With the new payment solution, the patients only need to approve their e-invoice, without having to do anything else about the payment. In addition, there are indications that early payment reminders and internal reminders for outstanding claims may lead to significantly fewer reminders with late payment fees and claims sent to collection. Data from the accounting departments at the health trusts we have interviewed show that between 50 and 75 per cent of the invoices that are not paid by the due date are paid after the first reminder. The use of automatic payment reminders will thus in all probability result in benefits for both the health trusts and for the patients. The graph below illustrates the estimated potential gains, and how they will depend on the size of the health trust.

Figure 3: Illustration of benefits (in 2021 NOK) from the introduction of early payment reminders. Source: Accounting data from different health trusts, Menon Economics

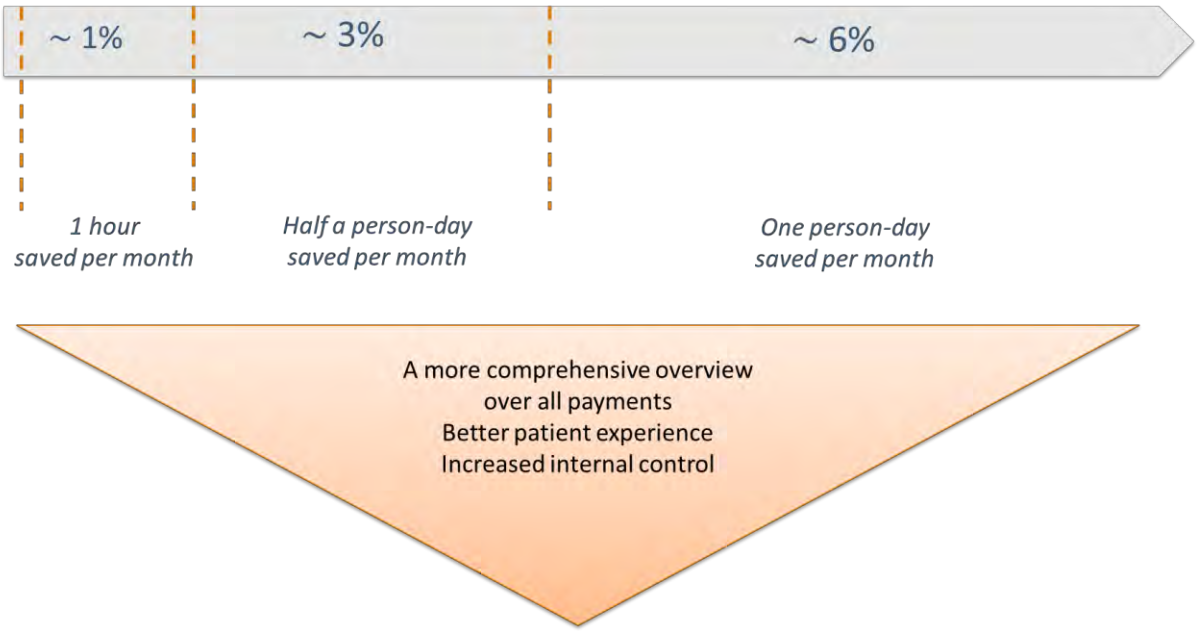


When handling the process of sending out reminders internally, the health trust will have to be prepared to use more resources to handle inquiries from patients, but in return, the trust will probably be able to renegotiate a more favorable agreement with the debt collection agency, which in the longer term will only handle claims that go to collection. Overall, it is likely that the benefits are significantly larger than the costs for the health trust.

If the health trust itself handles the entire invoice follow-up through Imatis, this could also lead to quality gains. The accounting departments will have better control and overview, and in addition patients will not have to deal with an external third party, which can contribute to a better patient experience.

To illustrate the potential benefits, we have created three scenarios that show potential savings that can be achieved at the health trusts' accounting departments as a result of a more comprehensive payment solution with the option of automatic payment follow-up.

Figure 4: Different scenarios for the percentage of full-time equivalents that can be freed up per year in the accounting department by introducing the new payment solution by Imatis. Source: Menon Economics



1. Introduction

IMATIS' solution for check-in and payment eliminates the need for many manual processes that affect both different roles within the health service and the patients. Therefore, there is reason to believe that use of the solution for self-service check-in and payment will result in a number of economic gains that will benefit both the health trusts and the patients. In this report, we present a benefit analysis of the IMATIS solution for check-in and payment at Norwegian health trusts.

1.1. About Imatis' check-in and payment solution

For many years, Imatis has developed and delivered various software products in the form of information and communication technology to the health sector. The purpose of these solutions is to make workflows more flexible and efficient for all users, and thus increase the quality and efficiency of the services.

One of the solutions Imatis is working to automate at present are manual processes related to patients' check-in and payment in hospital. Multiple health trusts, both in Norway and abroad, have started to use different versions of Imatis' solution for self-service check-in and payment. Imatis is continually working to develop and improve its solution to make it as efficient and user-friendly as possible. In addition, Imatis has developed new functionality that will automate a larger share of the payment process and be included in the same solution.

The health trusts' use of the check-in and payment solution

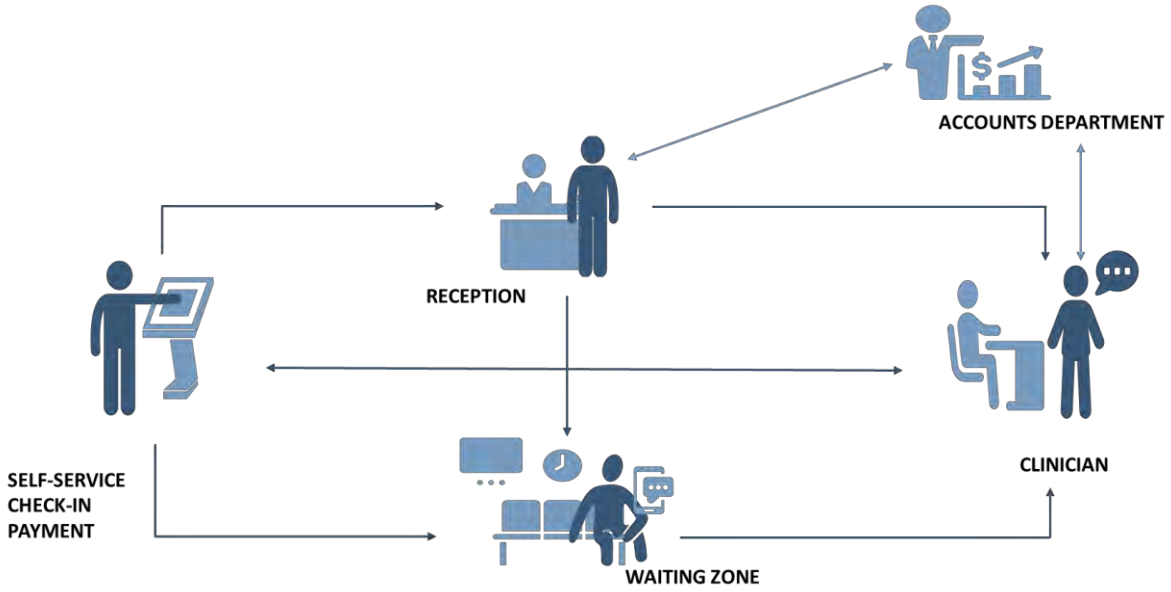
One feature of the check-in and payment solution by Imatis is that the product can be tailored to the individual health trust to a considerable extent. This means that the health trusts themselves can adapt the solution based on local strategies and framework conditions. When implementing the solution, the health trusts can choose which modules in the solution they need. Later, the users themselves can configure the solution in an easy way by buying a so-called low-code platform that is sold separately. Thus, the solution can be adapted relatively quickly and easily at any time to fulfill the needs of the individual health trust. Imatis also makes it possible for its customers to integrate the solution with other specialized systems, for example laboratory systems and the electronic patient journal.

The check-in and payment solution is specially designed and integrated for use in outpatient departments. The health personnel in outpatient clinics has an overview over patients that have checked in and can themselves finalize patient data in the system so the payment is ready.

Patients' use of the check-in and payment solution

For patients, the check-in and payment solution means that they can do self-service check-in on their smartphones or at a terminal when they arrive at the hospital. In addition, they receive check-in information by SMS in advance. They can see where they are in the queue on a screen in the waiting room and are also notified by SMS when the clinician is ready to see them. After the consultation, the patient can do the payment digitally on their smartphone or at a terminal. In principle, patients thus do not have to deal with medical secretaries or other personnel at any time during the patient journey, except during the treatment itself.

Figure 1-1: A typical patient flow. The figure also illustrates how the accounts department is connected to the whole system. Source: Imatis and Menon Economics



1.2. On the contents of the report

The benefit analysis consists of four parts. First, we will document the realized benefits from Imatis' check-in and payment solution that is used by Norwegian health trusts today. These benefits are calculated based on experiences from health trusts that have already implemented the solution. Thereafter, we analyze the preconditions and opportunity space for the realization of benefits from the existing solution. In addition, we explore potential gains from the new payment solution that is being developed, and finally we look at benefits related to future functions that can be integrated into the solution in the longer term.

As every health trust is different and can decide itself which elements to include in its solution, the report is also structured so that the existing gains from check-in and payment are mapped separately. This makes it easy for each health trust to get an overall impression of the total benefits for the solution they already have or consider procuring. In addition, this will provide information about the benefits from the different modules.

The analysis primarily builds on interviews with Norwegian health trusts. Several of the trusts we talked to have only recently implemented the check-in and payment solution and are in an introductory phase where they are still tailoring the solution to their needs. Due to this, they do not yet have sufficient experience to be able to assess the actual realization of benefits in the longer term. It is therefore important to point out that our calculations of existing benefits may be somewhat underestimated. In addition, none of the health trusts has had a system for measuring benefits. The analyses are thus exclusively based on experiences and estimates from selected employees at the health trusts. This leads to a certain amount of uncertainty and limits the quantitative calculations we have been able to carry out.

It is important to point out that the health trusts we have been in contact with are using the version of the check-in and payment solution that is currently available. Imatis is continually working to further develop the solution, with special focus on creating an even more comprehensive payment solution. The new solution may lead to additional benefits in several stages which the health trusts have not realized as per today. This may also mean that the existing benefits mentioned in the report can be realized to an even greater extent in the future.

1.2.1. Reader's guide

We start by presenting the method for identification and estimation of benefits in chapter 2. Here, we will provide information on the methodological framework for benefit analyses in general, and then describe in more detail how we, based on the framework, proceed to solve this assignment. Chapter 3 looks at the benefits related to Imatis' existing solution for self-service check-in and payment, while chapter 4 discusses preconditions for exploiting the opportunity space. In chapter 5, we present potential benefits related to Imatis' new and improved payment solution, while in chapter 6 we discuss future benefits related to new areas of payment where the solution can be applied in the longer term.

2. Methodological approach

2.1. Benefit analyses in brief

A benefit assessment is an analysis that identifies the most important benefits that arise from a given measure or project. A **benefit** is an effect that is seen as positive by at least one stakeholder.[1] Benefits are values and positive effects that are created when services and work processes are carried out in new ways. A benefit assessment only investigates the positive effects of a measure, as opposed to a cost-benefit analysis which examines both the negative and positive effects and evaluates these against each other.

In addition to identifying the benefits, a benefit assessment will also try to quantify them. The degree of quantification will depend on, among other things, how accessible the information is, the quality or credibility of the information and the purpose of the analysis. According to the Norwegian Agency for Public and Financial ***Efficiency gains*** result in cost savings for the budgets of public enterprises, for example in form of reduced staffing needs and reduced expenses.

1. ***Quality gains*** are gains that result in improved quality in one or more areas, such as a better work environment, more trust and quicker response times.
2. ***Gains for other actors*** are for example cost savings and quality gains for patients.

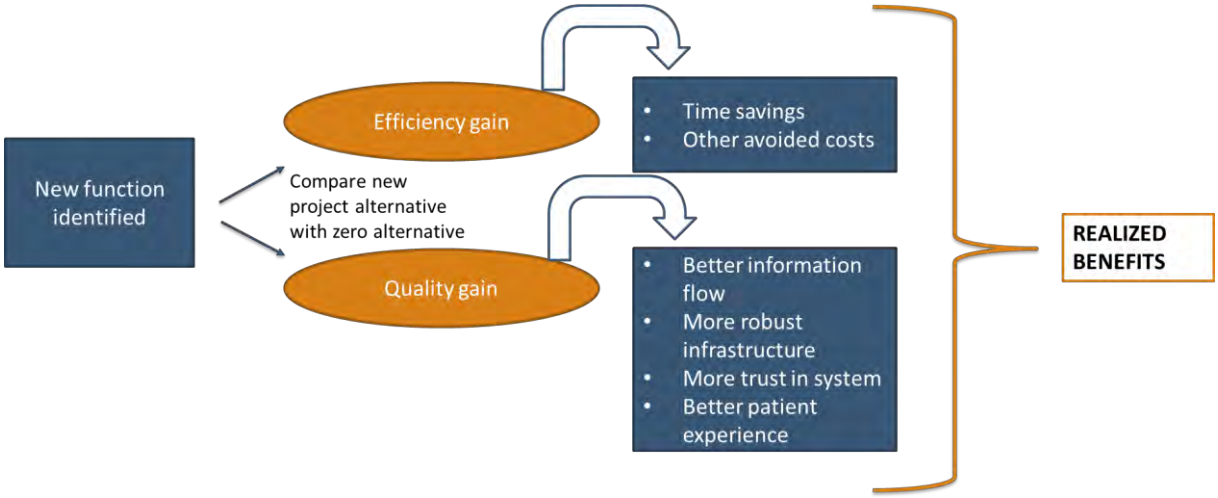
The basic principle of a benefit assessment is to compare a *project alternative* with a *zero alternative* (sometimes also called reference alternative). The project alternative is the situation where a given measure has been implemented, while the zero alternative is the most realistic continuation of the situation without the introduction of the measure. By comparing the two alternatives, one can identify the benefits deriving from the measure. In addition, a benefit analysis must also contain an assessment of the conditions that must be fulfilled for the benefits to be realized.

2.2. Analysis model

Figure 2-1 provides a brief illustration of the model for the identification of benefits. It is important to point out that the zero alternative varies between the individual health trusts due to differences in organization and local conditions.

[1] Definition taken from guidelines on benefit realization published by the Norwegian Agency for Public and Financial Management. DFØ (2014) Gevinstrealisering – planlegging for å hente ut gevinster av offentlige prosjekter [available in Norwegian only]

Figure 2-1: Model for the identification of realized benefits. Source: Menon Economics



2.2.1. Efficiency gains

Efficiency gains are divided into two main categories, both of them related to savings and/or reallocations in the budgets of the health trusts. Time savings are the first category. Here, reduced resource use following from automatization and efficiency improvements of work processes has been quantified.[2]

The next category of efficiency gains is defined as *other avoided costs*. This entails quantification of the amount of money saved by the health trusts as a consequence of automatization and digitalization of invoicing and other payment functions.

2.2.2. Quality gains

Quality gains on the other hand are related to measures that lead to higher quality in one or more areas. In this analysis, such gains will be related to a reduction in the number of deviations from normal operations as a consequence of an automated system. Better information flow and a more robust infrastructure, which can be seen as efficiency gains, are also examples of quality gains for this solution. Mapping of such quality gains will mainly be based on information gained from the interviews.

2.3. Information collection

The basis of this analysis is a systematic review of available, relevant information. This includes documents that present the solution offered by Imatis, product sheets for the functions in the Imatis solution, and data based on the experience of the health trusts. The documentation provides information about the functions in the solution that are available today, how they work and what benefits can be realized. Together, this provides a good information base for the identification and quantification of realized benefits. In addition, it provides a good starting point for collecting additional, and more detailed, information through interviews.

Interviews with different health trusts, both those that have started to use the existing solution and those that are potential future customers, are a key source of information for the identification and quantification of

[2] *"Appendix 2: Quantification of time savings" provides a detailed explanation of how the calculation of time savings and avoided costs has been carried out – in accordance with DFØ's guidelines for the calculation of non-monetized impacts.*

benefits. The trusts' insight into how processes were carried out before the solution by Imatis was implemented, how they experience the solution today, as well as barriers to and preconditions for realizing potential benefits to an even greater extent, is of key importance to the analysis. In addition, the basis from the interviews will provide us with an indication of the potential benefits from the new payment solution Imatis is planning to launch. This means that estimates related to the new payment solution will be scenario-based, with assumptions based on information from the interviews.

3. Benefits from the existing solution

In this chapter, we present the results from our assessment of benefits associated with the self-service check-in and payment solution that is used today. The mapping and identification of benefits is based on conversations with employees in different departments and roles in four Norwegian hospitals. A main motivation for all hospitals for procuring the check-in and payment solution is to reduce the time medical secretaries spend on check-in and payment for patients, and to improve the patients' experience of their stay at the hospital. In addition, the hospitals wished for general improvements in patient logistics that avoid long queues and contribute to more efficient treatment courses. The analysis of the realized benefits is first presented for the check-in module and then for the payment module before the findings are put in context and discussed.

3.1. Check-in

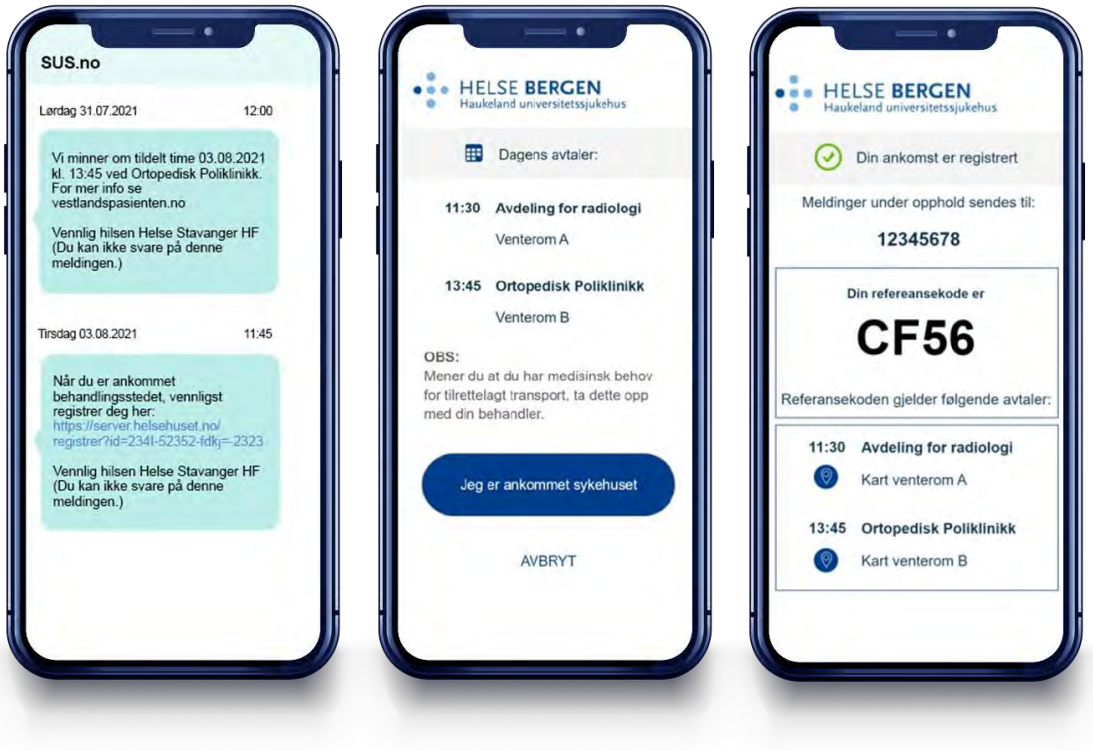
3.1.1. Check-in solution

Imatis offers solutions for check-in either via a terminal/tablet, on a smartphone or at reception. The solution is configured for both Norwegian and English, and it is easy to set up support for other languages as well. All patients that have registered with their phone number and consented to receiving notifications by SMS in the hospitals' systems are able to check in via their smartphones[3]. If a patient is registered with their phone number, they will receive an SMS with a registration link well in advance of their consultation. The patient registers their arrival at the hospital and receives an anonymized reference number. Each hospital trust can decide for itself what level of security to use for the authentication of patients at check-in, for example ID-porten, which is a common ID-system used to log into Norwegian public services. If the check-in is done from a terminal/tablet, the patient needs to type in their birth number[4] and is then allocated an anonymized reference number consisting of a combination of letters and numbers.

After checking in via a terminal or smartphone, the patient receives an overview over the day's appointments and the relevant waiting zones. When checking in on a terminal, this overview is either provided on a printed receipt from the terminal or via SMS, depending on whether the patient has consented to receiving SMS-notifications. When checking in on a smartphone, the receipt is automatically delivered by SMS. The solution provides a guidance function that with the help of a map or explanatory text tells the patient how to get to the right waiting zone or treatment room.

[3] Not all patients are registered with their phone number in the hospitals' systems, and these patients are not able to check in via smartphone. This especially applies to first-time patients.
[4] A unique personal identification number allocated to all citizens/residents in Norway.

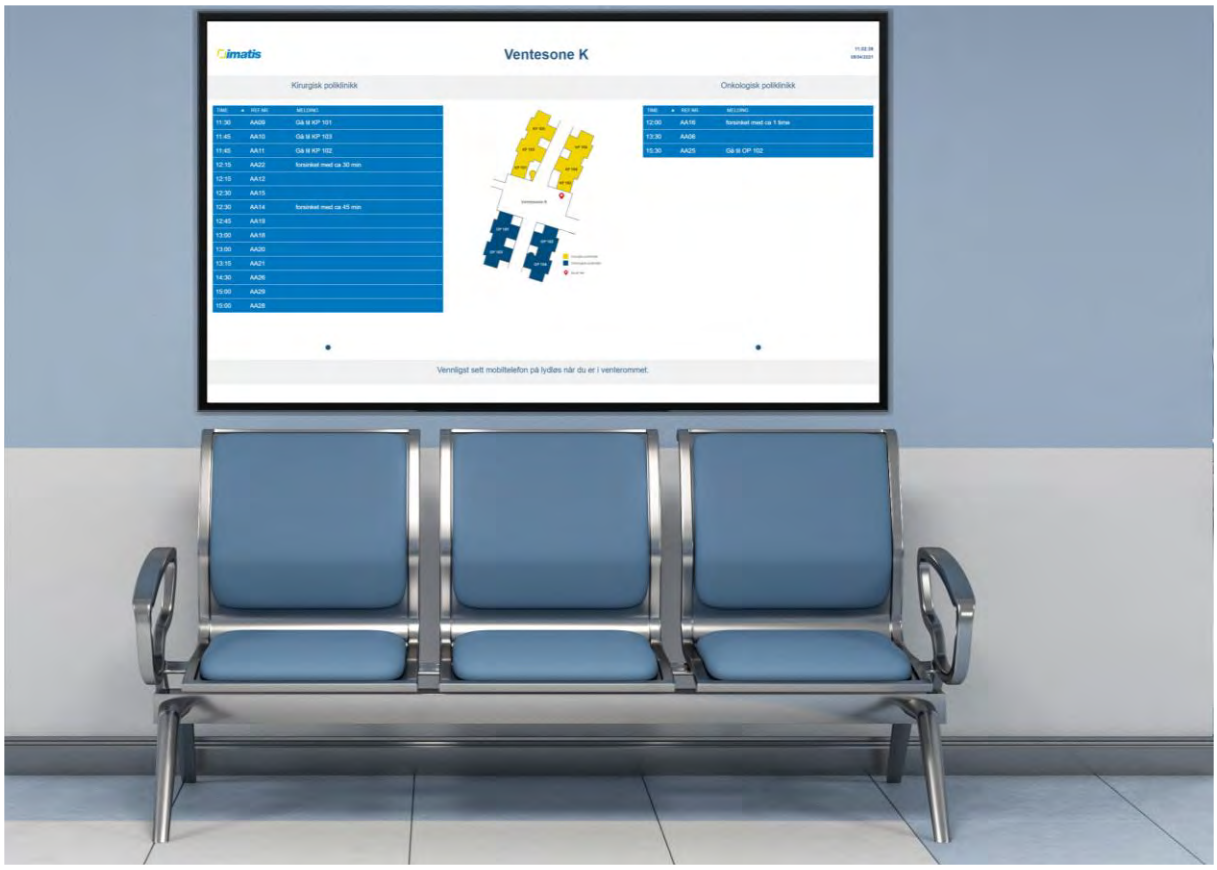
Figure 3-1: An example of what the display on a smartphone looks like when the patient checks in via SMS. Source: Imatis



It is also possible to check in manually, via the IMATIS-system at the hospital. Irrespective of what type of check-in is used, the medical secretaries and clinicians have an overview over all patients' appointments and arrival status in the IMATIS-portal. This overview is updated automatically in real time. The patients also receive a reminder before their consultation, no matter which system was used to register the appointment.

In the waiting zones, there are screens that list the patients' reference codes, in the same order as the patients' appointments. Once a patient has checked in, their reference code will appear on this screen. The screen in the waiting zones also shows average waiting time and the patient's place in the queue. The overview is updated continuously.

Figure 3-2: An example of what a screen in the waiting zones looks like. Source: Imatis



Once the clinician is ready to receive the patient, they call up the patient through the system. A notification with the patient's reference code appears on the screen in the waiting zone, with a message that the clinician is ready for the consultation as well as information about the room the patient should go to. The patient also receives a notification by SMS with the same information. In addition, the patient receives all important information via SMS and on the screen, for example about delays and their place in the queue. Thus the patient can wait whereever they like rather than having to stay in the waiting zone. If a patient is delayed, the clinician can call up another patient with a later appointment who has registered their arrival.

All of the hospitals that participated in this study use a solution that includes check-in via terminal/tablet and reception. In addition, most hospitals offer the possibility of checking in via smartphone and a guidance function.

3.1.2. Zero alternative for check-in

Without Imatis' check-in solution, the normal procedure for check-in is that the patient contacts a medical secretary who looks up the patient in an electronic patient journal and registers the patient's arrival in a separate system. The medical secretary has no overview over where the patient is in the process, i.e., whether they have had one or more previous consultations at the hospital and if those have been completed. There are separate processes for appointments in RIS (Radiology Information System) and the patient journal system provided by DIPS. When the clinician is ready for the consultation, they need to go out to the waiting area and call up the patient by name. In this context, it is important to understand that the zero alternative may vary somewhat between different health trusts due to differences in organization and local conditions.

3.1.3. Realized benefits for check-in

Efficiency gains

All hospitals report that the biggest efficiency gain for the hospital overall is that the check-in solution frees up a significant amount of time for the medical secretaries as they do not have to check in all patients manually. For most hospitals, this has not resulted in an actual reduction in the number of employees but meant that the time that has been freed up can be used for other administrative tasks. This is especially true for hospitals that have maintained a similar organization structure as before the check-in solution was implemented. This means that the medical secretaries can complete their tasks more quickly and that they can carry out new tasks that they did not have capacity for earlier. In these cases, the efficiency gains resulting from the solution have increased the quality of the services offered.

Text box 3-1: Experiences from Diakonhjemmet Hospital and Helse Bergen related to time savings for check-in. Source: Diakonhjemmet Hospital, Helse Bergen and Menon Economics

According to medical secretaries at Diakonhjemmet Hospital, they spent between 0.5 and 1 minute per patient on manual check-in before the check-in solution was introduced. Based on visitor statistics from the hospital, it is estimated that the hospital in the course of one year will save ***almost 1,400 hours, equivalent to 0.8 FTEs****. It must be emphasized that these estimates are based on experienced check-in figures between April and July 2021. These were the first months after implementation of the solution and it is possible that the number of check-ins will increase with time as employees and patients become more familiar with the system. If the number of patients checking in increases, the benefits will increase accordingly.*

At the laboratory at the women's clinic at Haukeland University Hospital, before the implementation of IMATIS a biomedical laboratory technician needed to man the reception at all times and welcome patients. There was no alternative queueing system for patient registration. By using Imatis' check-in solution, the employee in question saves an estimated 3-4 hours per day. In the course of a year, this amounts to ***more than 800 hours, equivalent to 0.5 FTEs*** *for the women's clinic.*

In addition, there are examples of health trusts that have implemented the check-in solution in connection with a larger reorganization of the hospital where, amongst other measures, reception counters for different areas have been merged and waiting areas centralized. These hospitals underline that Imatis' check-in solution has

Text box 3-2: Experiences from Nordland Hospital related to staff reductions resulting from reorganization. Source: Nordland Hospital and Menon Economics

Nordland Hospital is an example for a health trust that has undergone a reorganization process in parallel with the implementation of the check-in solution. According to the health trust, the introduction of an automated system like the one offered by Imatis was of key importance for a well-functioning patient flow at the new hospitals. As a result of this process, Nordland Hospital was able to achieve a permanent reduction in reception staff of ***about 1 in 3, amounting to 6 full-time positions****. These 6 positions equal an annual cost saving of approx. NOK 3.2 million.*

The other important efficiency gain is better information flow. In particular, our interviewees emphasize that the overview showing a patient's appointments before and after a consultation is useful for medical secretaries and clinicians and is used regularly. Clinicians can for example check whether patients have completed the necessary steps before a consultation, such as x-rays and blood tests.

The medical secretary can get an overview over where a patient is in the process to assess whether the patient in question is in time for their consultation. In addition, it becomes clear from the responses that the function that allows health staff to communicate via IMATIS is effective, especially across different units and departments.

In addition to better information flow, our respondents also mention that patients are more likely to be on time for their appointments. This is probably due to the fact that it has become easier for them to find their way around the hospital, thanks to improved signposting and the map function. A reduction in delays also contributes to increased efficiency in the patient journey.

Quality gains

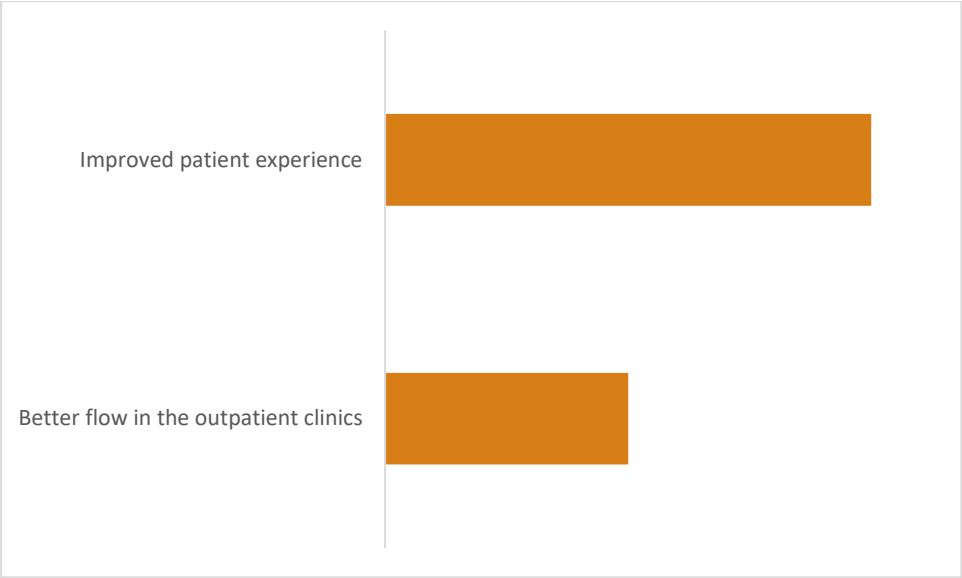
One significant quality gain is that there is better flow in the outpatient clinic at each step in the patient journey. When the patients use the self-service check-in, there are fewer queues in the reception area. After check-in, the patients can choose to wait wherever they like in the hospital, which further contributes to less crowded waiting areas. In addition, the function for queue optimization ensures that queues can be adapted in case of delays, which leads to better flow. This gain can be especially significant for new hospitals that are developing entirely new patient logistics based on Imatis' solutions. For the medical secretaries, this means that they do not need to follow up patients as closely anymore, and their working day becomes more flexible. According to Nordland Hospital, the improvement in patient flow in the outpatient clinics has been absolutely crucial in order for the hospital to be able to handle the growth in the number of patients in the outpatient clinics they have experienced in recent years.

According to Nordland Hospital, in the years since 2014 the outpatient clinics have gone from receiving 20 percent to receiving 80 percent of the total number of patients at the hospital, and the check-in and payment solution from Imatis has been an important factor in making this possible. This development, with a large increase in the number of consultations at outpatient clinics and fewer days in hospital, can be seen at all the health trusts. In accordance with the goals of the national plan for health and hospitals, as a consequence of better and more efficient treatment methods the hospitals experience a higher total number of patients in the form of fewer inpatient stays and more consultations in outpatient clinics. This means that they need to handle a much larger patient volume, despite the fact that each patient spends less time in hospital. It will therefore be very important in future that hospitals have a logistics system that can manage more patients, but with short stays.

Gains for other actors

From the patients' perspective, there are several benefits that result from the solution. Most importantly, they have a better and more seamless user experience. They get help finding the way to the consultation room, have an overview of the status of the consultations and receive updates when there are changes. In addition, they save time during the actual check-in procedure by not having to queue. If they check in via smartphone, another advantage is that they have greater freedom of movement in the hospital, which makes the waiting time more comfortable. Another benefit for the patients is increased privacy protection, because clinicians no longer have to call up patients by name.

Figure 3-3: Realized quality gains for check-in with associated size of effect. Source: Menon Economics



These effect sizes are intended to illustrate the order of benefits when it comes to benefit realization. It also gives an indication of the differences in the size ratio between the two benefits. As shown in the figure, improvements in patient experience come first, followed by better flow in the outpatient clinics, based on experiences from the individual health trusts.

3.1.4. Summary of the identified benefits related to the check-in solution

In chapter 3.1., the efficiency and quality gains related to the check-in solution by Imatis have been presented and discussed. The figure below shows a summary of all benefits resulting from the check-in solution that have been identified for at least one of the hospitals in the study.

Figure 3-4: Total identified benefits from the check-in solution, for at least one of the hospitals in the study. Source: Menon Economics

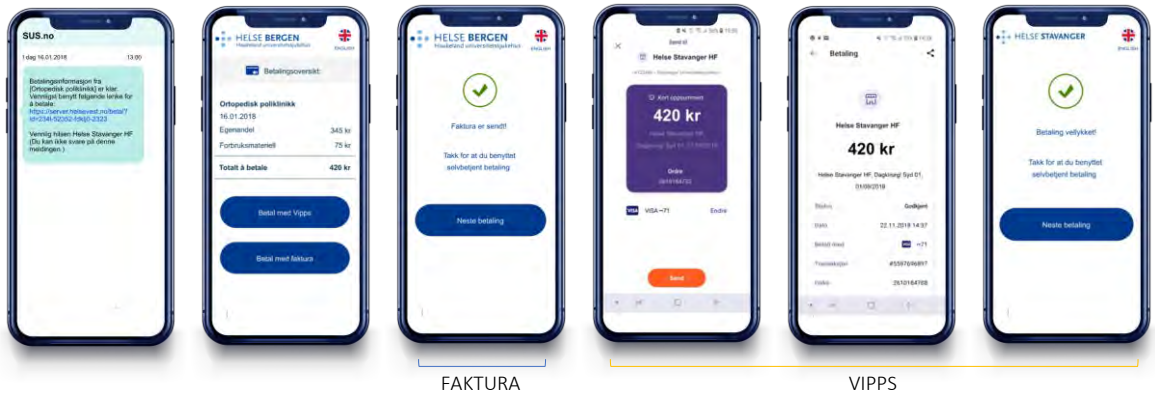
- Frees up time for medical secretaries
- Enables an efficient reorganization of the premises
- Provides good overview of all patient appointments
- Makes it easier for hospital staff to communicate
- More patients are on time for their appointments
- Fewer queues at the reception counters
- Less busy waiting zones
- Better flow in the patient queue
- More flexibility for the medical secretaries
- Better handling of outpatient consultations
- More seamless user experience for patients
- Time savings for patients
- More freedom for patients
- Stronger privacy protection for patients

3.2. Payment

3.2.1. Payment solution

When the consultation is over, the patient can, similarly to the check-in procedure, choose to pay via a terminal/tablet, via their smartphone or at reception. The solution is set up for both Norwegian and English language, and other languages can easily be supported as well. If the patient does not pay via one of the alternatives within a set amount of time, they will automatically be sent an invoice. If the patient chooses to pay via smartphone, they can leave the hospital right after the consultation and receive a message with a link to the payment overview as soon as the clinician has finalized the patient data in the system. The patient can choose between payment by Vipps (a mobile payment application used in Norway), invoice or credit/debit card. Once the payment has been carried out, the patient can download a receipt in form of a pdf-file to their own device or receive a receipt sent to their registered e-mail address.

Figure 3-5: An example of the display on a smartphone when the patient pays via Imatis. Source: Imatis



If the patient chooses to pay via a terminal/tablet, they need to type in their birth number to get to the payment overview that shows the invoicing amount and cost type. At this point, the patient can select payment by credit/debit card or invoice. Payment via a terminal/tablet is however not possible before the clinician has finalized the patient in the system. Once payment has been made, the patient receives a paper receipt from the terminal. The patient can also choose to pay at reception, where the medical secretary processes the payment through the IMATIS-portal by looking up the patient's name. Here, the patient has a choice between paying by card or making a cash payment.

The medical secretaries have a general overview over payments in the IMATIS-portal and thus only need to deal with *one* system to process payments. The accounts department on their part have a system that provides an overview over all invoices and their status. Employees in the department can use this as a reference tool, for example in connection with troubleshooting and questions related to payment issues, for example in case of patient inquiries.

Nordland Hospital, Diakonhjemmet and Helse Bergen all have payment solutions that allow payment via both terminal/tablet and smartphone.

3.2.2. Zero alternative for payments

Without Imatis' payment solution, the normal procedure for payment is that the patient takes contact with a medical secretary who looks up the patient's invoice in the patient journal, prints the invoice and scans it in the payment system. The patient has a choice between paying by card or making a cash payment. In many cases, a card payment via DIPS is also possible. The payment cannot be made before the clinician has finalized the patient in the system. A common practice is that each outpatient clinic is responsible for daily settlement, which is then reported to the accounts department. The health secretaries are also responsible for forwarding invoices to patients who have not paid at the hospital. There are separate processes for payment from RIS and DIPS, which means that the medical secretaries have to deal with multiple systems in connection with payment. It is important to emphasize that the zero alternative may vary somewhat between different health trusts due to differences in organization and local conditions.

The accounts department has a separate system for overview and follow up.

3.2.3. Realized benefits for the payment solution

3.2.3.1. Efficiency gains

The biggest efficiency gain from the payment solution is that the medical secretaries save time, both by not having to process payments from patients and not having to handle administrative tasks related to accounting such as sending out invoices and settlements.

Text box 3-3: Experiences from Diakonhjemmet related to time savings from payments. Source: Diakonhjemmet Hospital and Menon Economics

According to medical secretaries at Diakonhjemmet, they previously used at least 1 minute per patient for manual payment. Based on payment statistics from the hospital, it is estimated that the hospital over one year will save ***almost 1000 hours, amounting to 0.6 FTEs****.*

In addition, we have identified significant reductions in direct costs in the form of payment-related materials, such as for example leasing costs for payment terminals.

Text box 3-4: Experiences from Nordland Hospital related to reductions in fixed costs for payments. Source: Nordland Hospital, Nets Group AS and Menon Economics

Since the introduction of the payment solution, Nordland Hospital has been able to get rid of 20-30 payment terminals. The price for a payment terminal is normally around NOK 350-400 per month. The reduction in the number of payment terminals thus reduces yearly costs by ***NOK 100,000-180,000.***

In addition, as described in the zero alternative, the hospitals had variable costs for payments, beyond time use by the staff. These are mainly costs related to printing paper invoices (paper, ink, etc.) and for card payments. The calculation of costs related to this zero alternative is described in more detail in Text box 3-5 below.

Text box 3-5: Calculation of costs related to variable expenses for manual payments. Source: Mastercard Payment Services, Helse Bergen, Diakonhjemmet and Menon Economics

None of the hospitals was able to provide us with experience-based figures for variable costs associated with payments, and prices will vary somewhat between hospitals as each of them negotiates their own agreements with the suppliers. Based on assumed cost intervals, combined with payment statistics from Diakonhjemmet for all departments that use Imatis today (in aggregate) we have calculated the total variable costs for the zero alternative (see Appendix 2 for cost estimates). Assuming that in the zero alternative a paper invoice is printed out for all patients and the payment is carried out through a terminal, the total variable costs are calculated to* ***NOK 130,000-270,000 per year.*** *These are not net savings, as there are also costs associated with Imatis' payment alternatives.*

* Radiologisk Pol., Enhet for rus og psykiatri, Kirpol Colonlab, Senter for infusjonsbehandling, Helsepsyk. tjeneste, ALD pol A1, LMS, KirS Pol i post, Senter for ortopedi og revmatologi, PHT POL D2, Fact Pilestredet, ALD ambulerende, Kirpol Stue59, ALD Poliklinikk, Kir POL, Allmennpsykiatrisk poliklinikk, Fact Solli, POIVA POL, OrtoSA Pol i post, Kirpol Gastrolab, PHT POL Med.pol, Spesialisert poliklinikk, MedSA Pol i post, Poliklinikken raskere tilbake, Dagkirurgi, ALD pol D2, Enhet for kunnskapsutvikling, Ger POL, Med POL, Akuttmottak, Rev S Pol i post, OrtoSB Pol i post (32 avdelinger)

Before the implementation of the check-in and payment solution, the hospitals also had costs for envelopes, postage and time use for readying and sending invoices to patients that did not pay while in the hospital. In the interviews, it also became clear that some patients both received a paper invoice to take home from hospital as well as paying through a bank terminal at the counter. The unit costs associated with the paper invoice, including postage and printing, as well as the unit costs for other payment alternatives are described and discussed in Appendix 3.

3.2.3.2. Quality gains

Quality gains at the accounts department are that the department now has a robust system with a good overview over payments. Several of our interviewees report that the payment overview means that it is easier to spot mistakes, and that it is possible to get better reports from the system. In addition, there are environmental benefits from replacing paper invoices with electronic payments.

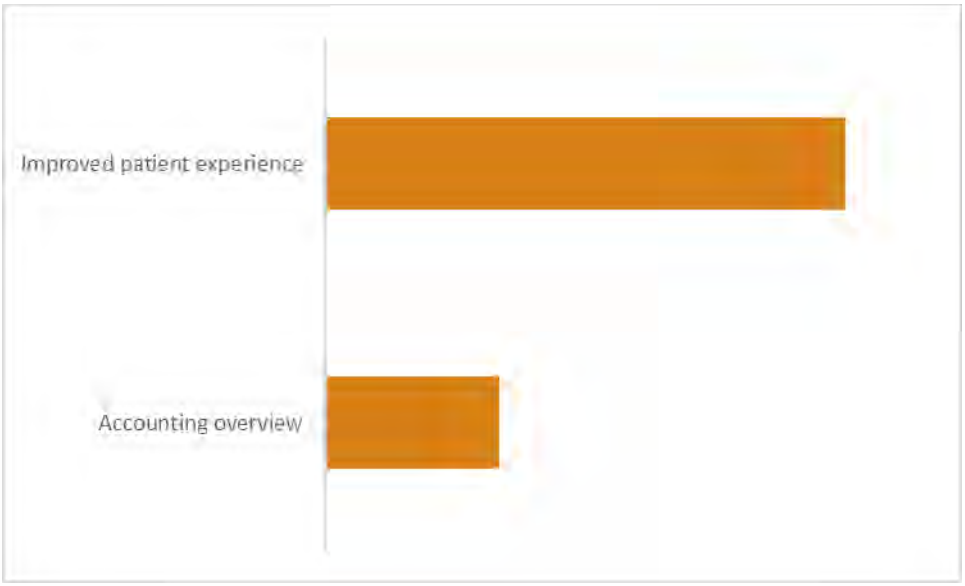
3.2.3.3. Gains for other actors

There is a number of benefits that accrue to the patients when using the payment solution. The solution makes it possible to include co-pays from multiple consultations in one payment, which makes payments more transparent and saves time for the patient. The patient also saves time by not having to queue for payment. In addition, there are further benefits for patients choosing to pay by smartphone. They have all payment information on their phone and can pay whenever it suits them. They do for example not have to wait in the hospital until the clinician has finalized the patient data in the system.

As it is easier and faster for patients to pay with the Imatis solution, it is reasonable to believe that this means that a larger share of patients will pay directly in connection with the consultation. If they do not pay directly on receiving the payment information, they will be sent an electronic invoice, which will most probably result in some patients making a payment before a formal payment reminder has to be issued. In total, this means that

fewer patients will proceed to a reminder process, which is cost-saving both for the hospital and the patients in question. We have not been able to test whether the number of patients that require a reminder has changed in accordance with this hypothesis, as we have not had access to documentation related to this development.

Figure 3-6: Quality gains for payment with associated effect size. Source: Menon Economics



These effect sizes are intended as an illustration that shows the order of gains when it comes to benefit realization. It also indicates the difference in the size ratio between the two benefits. As can be seen in the figure above, in the same way as with check-in, we have identified a better patient experience as the clearly largest gain, followed by the quality gains related to having a better payment overview for the accounts department.

3.2.4. Summary of identified benefits related to the payment solution

The efficiency and quality gains related to payment with Imatis' solution have been presented and discussed in chapter 3.2. The figure below shows a summary of all gains resulting from the payment solution that have been identified for at least one of the hospitals in the study.

Figure 3-7: Total identified benefits related to the payment solution for at least one of the hospitals. Source: Menon Economics

- Frees up time for medical secretaries
- Reduces fixed costs in the form of payment materials
- Reduces variable costs for payments
- Robust payment system with good overview
- Environmental benefits
- More seamless user experience for patients
- Time savings for patients
- Greater freedom for patients

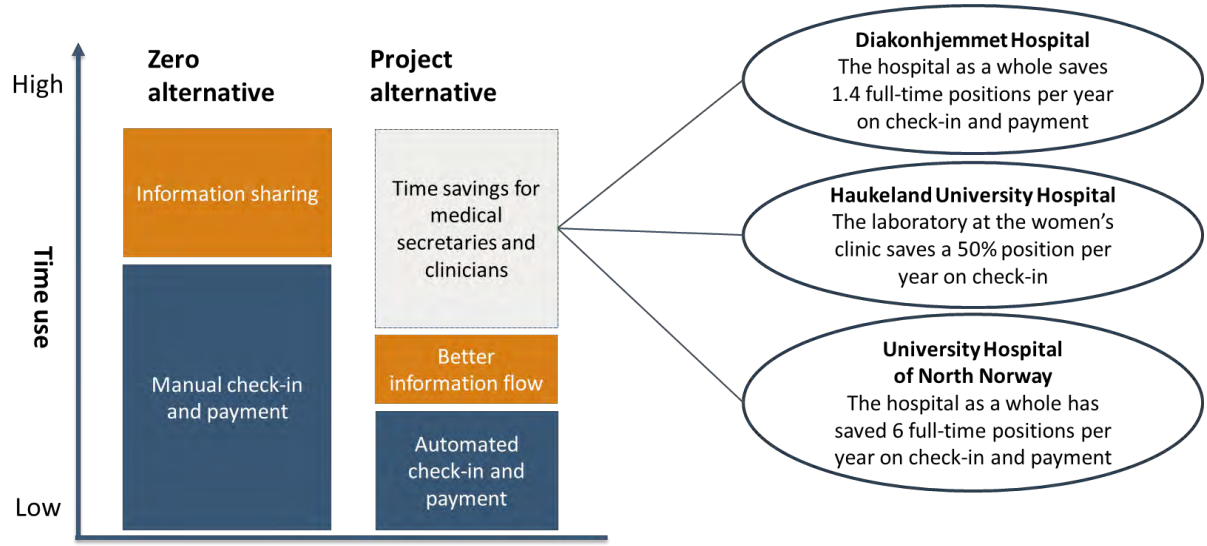
3.3. Summary of benefits related to Imatis' solution for check-in and payment

A main motivation for all hospitals for acquiring the payment solution has been to reduce the time medical secretaries spend on check-in and payment for patients, and to improve the patients' experience of their stay at the hospital. In addition, the health trusts wished for a general improvement in patient logistics that prevents long queues and contributes to more efficient treatment courses. Our study has shown that the realized benefits to a large degree reflect these objectives, through significant efficiency and quality gains related to the solution for self-service check-in and payment.

One of the clearly most important benefits is time savings for the medical secretaries as a result of avoiding manual check-in and payment processing of patients. These benefits are summed up in Figure 3-8 below. Another important benefit is increased user satisfaction among patients.

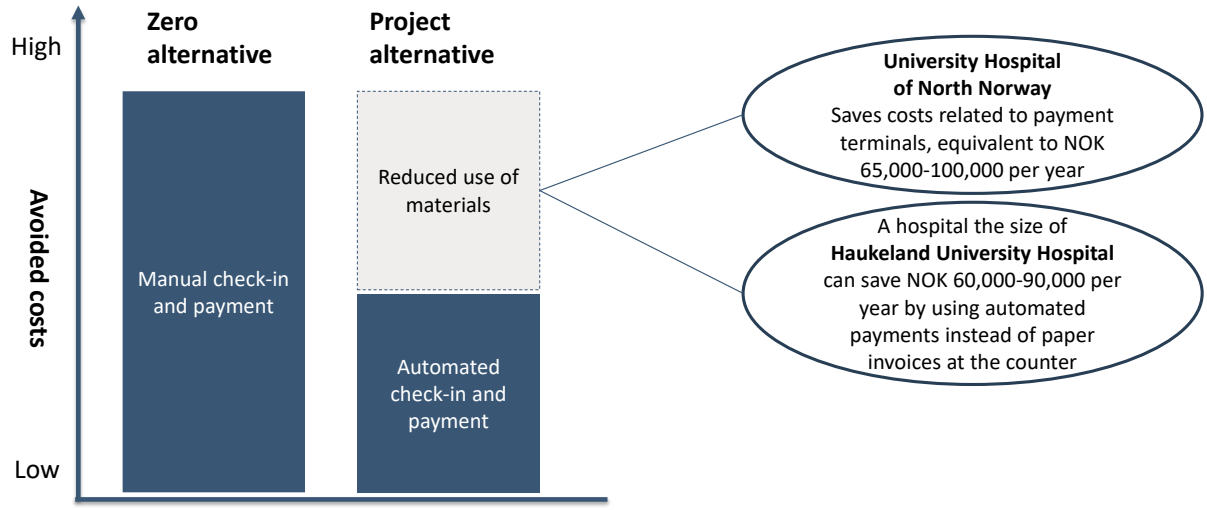
According to hospital employees, the solution has resulted in a more seamless, efficient and flexible patient journey for a large majority of the patients. In addition, it seems that the solution, in most cases, has improved information flow as well as patient logistics at the hospital.

Figure 3-8: Total realized efficiency gains for check-in and payment. Source: Menon Economics



In addition to time savings, it is a significant benefit that the health trust saves costs related to payment materials. Figure 3-9 below shows the documented gains. These relate both to avoiding fixed costs in the form of payment terminals, and variable costs resulting from manual payment.

Figure 3-9: Summary of documented avoided costs for check-in and payment. Source: Menon Economics



A general finding from our dialogue with the hospital employees has been that the implementation process has provided valuable experience with regards to the factors that have made it possible to realize the potential for benefits. Here, we provide a summary of these different success factors.

The first success factor is ***solid anchoring***, both with hospital management and clinicians. The management must take ownership of the solution unequivocally and make sure that the benefits resulting from the check-in and payment solution for the hospital as a whole are visible to everyone. In addition, it is important that the clinical perspective is taken into account and that the clinicians feel that their needs and challenges are considered in the process.

The second success factor is ***establishing an internal system for tailoring both the check-in and the payment solution*** to the needs of the hospital. From experience, there tends to be a need for multiple adaptations of the solution to tailor it to local conditions and make it function optimally. Therefore it is important that the distance between management/administration and both clinicians and patients is short. The distance between hospital management and clinicians depends, among other factors, on an open working culture that can be stimulated by encouraging experience sharing and discussion. In addition, channels can be developed to document this important feedback. To gain insight into feedback and reactions from patients, Diakonhjemmet Hospital has positive experiences from using hosts or volunteers as intermediaries. Their role is to help patients with self-service check-in and payments, and they have a good understanding of the users' experiences.

The third and last success factor consists of ***supporting the patients with different measures***. It is for example important that there is clear and easy to understand signposting for the different departments and waiting zones. The hosts or volunteers play an important role here as well, as they can help patients who do not understand the technical solutions or need help in finding the way. This does not only improve the user experience of more vulnerable patient groups, but it also increases benefit realization by preventing that requests for help are directed at other hospital employees. Experiences from the hospitals show that this type of guidance is especially necessary in the introductory phase.

4. Potential benefits related to new payment solution

Earlier, we have documented what benefits have been realized in different departments that have started to use Imatis' check-in and payment solution. The results show, among other findings, that efficiency gains related to the follow-up of payments by the health trusts have not yet been realized. The reason for this is that in several of the health trusts, some of the tasks that previously were carried out by the outpatient clinics have been moved to the accounts department as a consequence of the implementation of the check-in and payment solution. Imatis is working continually on improving the payment solution and has now added new functionality that provides a more comprehensive overview over payments and enables automated follow-up of payments. The objective is that this will lead to the realization of additional benefits for both patients and the health trusts, and especially in the accounts departments which usually are responsible for these processes. In this chapter, we will present the new functions in the payment solution and discuss associated potential benefits.

4.1. A more comprehensive payment overview and automated follow-up of payments

In the same way as before, the patient can still choose to pay for their hospital visit by card, Vipps or invoice, but the new solution also enables automated sending in form of an electronic invoice (eFaktura) to the patient's online bank if the patient has given consent to receiving e-invoices in the central database used for the administration of e-invoicing agreements in Norway. The time allowed for payment of an e-invoice can easily be determined by the health trust itself, depending on how quickly it would like to have the settlement completed. In batches, a payment file with approved e-invoice payments is triggered by the health trusts' respective banks and keeps the health trusts' accounting system updated automatically. In this way, patients with an e-invoicing agreement do not have to worry about payment in connection with their visit at the hospital and can easily approve the e-invoice in their online bank whenever it suits them to do so.

The medical secretaries and employees in the accounts department on their side have an expanded overview in the IMATIS-portal where they can look up payments, independently of the system they originally come from, with more detailed information on payment status and other variables. They can for example access information on choice of payment alternative, incorrect payments and unpaid invoices. This information and overview also makes troubleshooting easier. In addition, claims can be administrated with the help of different actions for special cases, for example by putting a claim on hold or deleting it. The new solution will also make payment statistics available, for example for reporting purposes and to assess potential bottlenecks.

The last important improvement in the new solution is that it is set up for sending automatic early payment notifications to patients before an invoice is due (so-called soft reminders) and automatic reminders for unpaid invoices after the due date. This means that a patient can get free reminders when an invoice is approaching its due date. The health trusts can also choose to take over the handling of unpaid invoices before they are sent to debt collection, which today is often managed by an external third party. In this case, the health trusts will be able to choose if they want to add a late fee to the reminder or not. If a patient is not supposed to receive notifications or reminders for various reasons, this can be registered in the IMATIS-portal in an easy way.

4.2. The new solution has the potential for large benefits

As the new payment solution in its entirety has not been tried out in practice yet, we have no basis to comment on the realization of the actual benefits that may result from the solution. At the same time, the interviews have provided some indications that there are additional benefits to be realized by implementing the new payment solution.

For the patients, the more automated payment process in itself entails probably first of all quality gains in the form of greater freedom when it comes to choosing a payment alternative. This will affect what payment alternatives patients will choose, and this change may lead to financial gains for the health trusts. See Appendix 3 for a comparison of the costs related to the different payment alternatives. For the health trusts, both the reporting functions in the solution and the real-time overview will potentially contribute to efficiency and quality gains by making it possible to identify potential bottlenecks more quickly and thus improve flow.

When it comes to follow-up of payments, this is an area that requires significant resources today. Our assessment is that the biggest gains will come from automated follow-up, both for the health trusts and the patients. The accounts departments are usually responsible for follow-up of invoicing and handling outstanding claims. At present, procedures for this differ in the individual health trusts. In case of unpaid invoices, the health trust is obliged to send out at least one reminder before an outstanding claim is sent to collection, and this process is often handled by a third party. When a reminder is sent, the patient is charged a late fee of NOK 35. Some hospitals that use the services of a debt collection agency for all stages of the reminder process also incur a fee of NOK 35 for each reminder that is sent out. Our impression from interviews with both debt collection agencies and accounts departments is that most inquiries related to unpaid invoices are due to misunderstandings. This is supported by data from the interviews which show that between 50 and 75 percent of the claims that are not paid by the due date are paid after the first reminder. Almost all of the remaining claims are paid after the next reminder. Thus, it is reasonable to assume that fewer of the payment claims will become overdue if the patient receives an early reminder in advance of the due date. If true, this also means that fewer of the claims need to go to debt collection. This entails both direct cost savings for the patient, but also for the health trusts that are charged for each reminder that is sent. Several employees from the accounts department that we have interviewed were convinced that this new function would benefit patients, both financially but most of all by experiencing increased quality of health care services. All of our interviewees were exclusively positive towards trying out this new feature.

If we assume that those who pay after receiving the first reminder today will pay when they receive an early payment notification in advance of the due date, the share of payments that does not incur late fees will be between 50 and 75 percent. Although our estimate is likely to be somewhat optimistic, due to the fact that compliance tends to be higher when a late fee is charged, our assumption will still be a good estimate of the benefits that can be expected. Text box 5-1 shows our estimates for the efficiency gains that may be triggered for the health trusts and patients if payments happen one step earlier in the reminder process as a consequence of early payment reminders.

Text box 4-1: Efficiency gains from early payment reminders

A small health trust

A small health trust with an average number of 7000 outstanding claims per year will be able to trigger **almost NOK 180,000 in annual cost savings** for patients and the equivalent for the health trust if it is presently paying a fee for each outstanding claim.

A mid-sized health trust

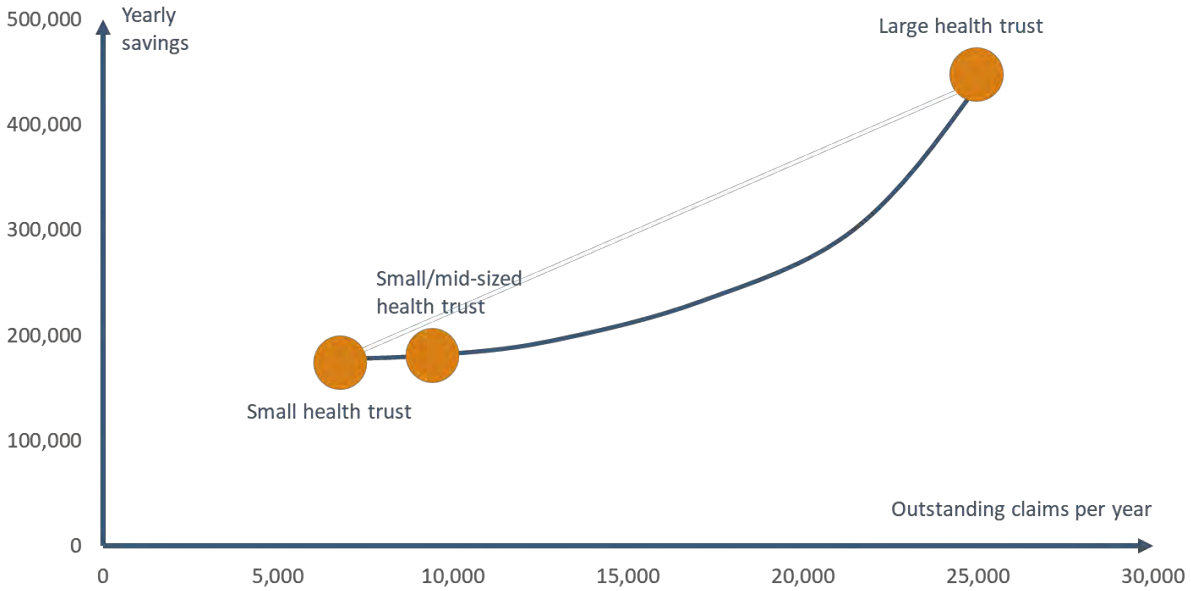
A mid-sized health trust with an average number of 8500 outstanding claims per year will be able to trigger approx. ***NOK 200,000 in annual cost savings*** for the patients and the same for the health trust if it is presently paying a fee for each outstanding claim.

A large health trust

A large health trust with an average number of over 25,000 outstanding claims per year will be able to trigger approx. ***NOK 440,000 in annual cost savings*** for the patients and the same for the health trust if it is presently paying a fee for each outstanding claim.

We also find that the smaller and more centralized a hospital trust is, the more patients pay after the first reminder. This is in line with our impression from the interviews, where it becomes apparent that it is easier to have control and keep an overview over payments where the hospital structure is less complex. Data from the different accounts departments show that a smaller, centralized hospitals had managed to prevent 75 percent of overdue invoices with the help of early payment reminders, while a large, more decentralized hospital had prevented 50 percent of outstanding invoices from becoming overdue. This is illustrated in Figure 4-1. If a large hospital trust had managed to prevent 75 percent instead of 50 percent of invoices from becoming overdue, the savings would be larger.

Figure 4-1: Illustration of benefits (in 2021 NOK) from the introduction of early payment reminders. Source: Accounting figures from various health trusts



It is also important to point out that findings from the interviews show that different health trusts have different starting points when it comes to realizing the benefits from new functions and applications. Both the size and the degree of centralization of a health trust seem to be important for how easy it is to realize benefits in the short and medium term. There seems to be a connection between the degree to which administrative tasks are centralized and benefit realization.

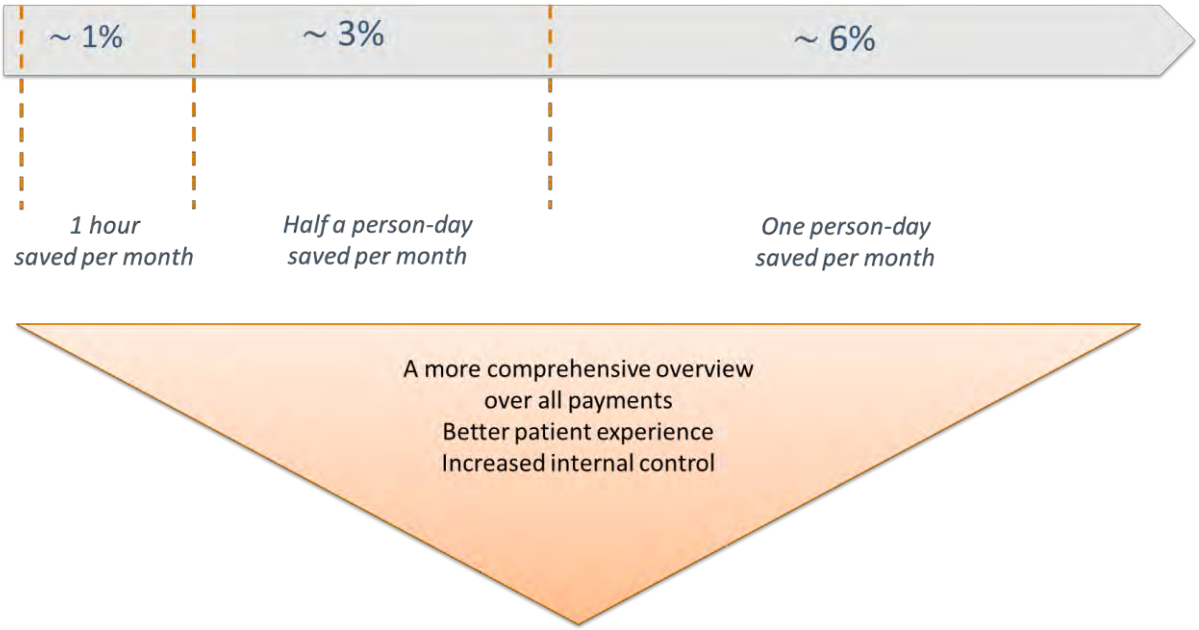
If the health trust chooses to handle the reminder process internally, it will not be necessary to involve a third party before claims go to debt collection. This will probably lead to some extra work due to inquiries from patients about payments. In this case, the overall benefits will be somewhat smaller. However, from the interviews we know that some patients who receive reminders at present take contact directly with the hospital anyway, independently of whether it is the hospital that has sent the reminder or a third party. From a broader perspective, it may therefore be more efficient that the hospitals handle this process themselves, at least for the patients. In addition, the accounts departments will have better control and overview and the patients only need to relate to the hospital instead of a third party. This may create more trust and lead to a better user experience for the patient. There will probably also be quality gains when the hospital itself takes control of the reminder process.

If the hospital decides to charge for the reminder, the fee will go to the hospital itself instead of the debt collection agency and provide revenue to the hospital. The hospital can also decide to make reminders free of charge, and in this case there will be a benefit for the patients. In the longer term, handling reminders internally may lead to a reduction in the size of the framework agreements with the debt collection agencies, which will result in cost savings. It is important to point out that the purpose of the new payment solution by Imatis is to ensure that as few claims as possible go to the reminder process and on to collection. Therefore, early payment reminders are one of the most important functions in the new payment solution.

As we have seen, better follow-up of invoices through soft reminders and internal reminders for outstanding claims will most probably lead to fewer reminders and fewer claims that go to debt collection. This again will result in both resource savings and a better patient experience. On the basis of this, we have developed three

scenarios for total potential efficiency gains where we assume small, medium-sized and large resource savings as a consequence of the implementation of the new payment solution.

Figure 4-2: Different scenarios for the *percentage of full-time equivalents* that can be freed up per year in the accounting department by introducing the new payment solution by Imatis. Source: Menon Economics



The different scenarios range from time savings of 1 hour to 1 day per month. Where the different health trusts are located on this scale depends both on their starting point in the process and other internal factors. It is also important to point out that this is time that can potentially be freed up for other tasks, which will then lead to better workflow for the health trust as a whole. A better patient experience, more internal control and a better overview will be the most important benefits.

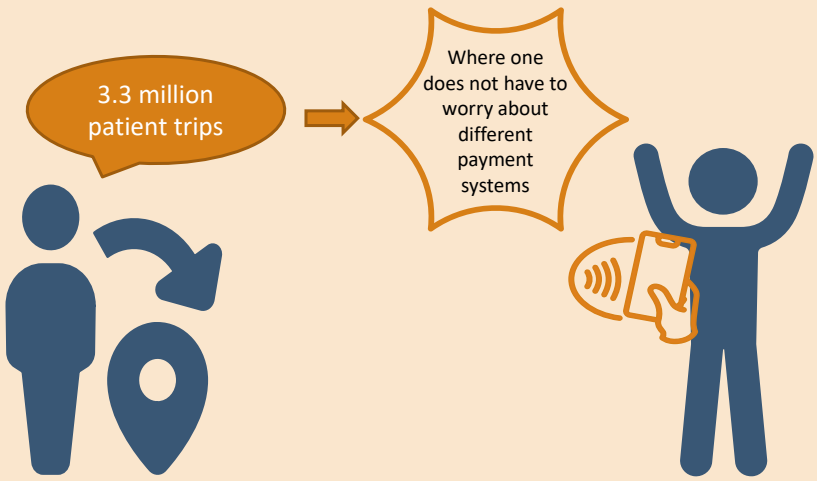
5. Future benefits

As mentioned early, Imatis is continually working to improve its solution for check-in and payment. Imatis wants the solution to be as good as possible, so that taking the comprehensive solution into use optimizes the realization of benefits. In addition to the already existing and potential benefits from Imatis' new and expanded solution, as described above, there is great potential in expanding the solution further, by integrating new future functions with the same user interface. These are entirely new functions that are not covered by existing or planned elements in the new payment solution.

Other functions that may trigger additional benefits are so-called micro payments. Micro payments are described as all new functions that can be integrated into the payment solution and thus contribute to an even more seamless, efficient and simple payment process. Micro payments can for example be payments for patient travel, parking, cleaning and video consultations, as well as the integration of the payment system of the cafeteria and other shops in the hospital in the new payment solution. These applications will have the same user interface, making them very user-friendly for the patient. The more payment processes are integrated in the solution, the larger the opportunity to realize additional benefits, and thus contribute to an even more comprehensive and holistic solution. To illustrate future gains from micro payments, we present the integration of payment for patient travel as an example.

Text box 5-1: Patient journeys as an example for micro payments

The purpose of the Norwegian subsidy scheme for patient travel is to ensure that travel expenses do not prevent patients from accessing necessary medical examinations or treatment. Patients who use the travel scheme and have a referral, i.e., the patient travel office organizes the journey for the patient, still have to pay a deductible for the journey*. Integrating payment for patient travel into Imatis' payment solution will provide an even simpler and more accessible way of paying for this. With this, the patient only needs to deal with one single payment system. In addition, the patient avoids having to make multiple payments via different systems if all expenses related to their hospital visit are consolidated into one payment in the IMATIS-system. In 2020, 3.3 million patient trips were made with a referral via patient travel**. An integration of patient travel into the payment function by IMATIS will therefore allow for further quality gains in the form of improved user experience.



* Unless the patient has an exemption card

** Pasientreiser HF

On a more general level, micro payments will contribute to an even more holistic and simple payment process where the patient only needs to relate to one and the same system all the way through. As shown in the example about payment of patient travel, micro payments will mainly result in quality gains for the patients. This is true for most of the micro payments that could potentially be integrated into the solution. One of the main motivations for starting to use the check-in and payment solution by Imatis for the health trusts was a wish to provide their patients with a better user experience – from their arrival at the hospital until they leave. Additional integrated micro payments will mean that this wish will be fulfilled to an even greater degree.

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Appendix 1: Overview over interviews

Table A: Overview over interview objects. Source: Menon Economics

Actor	Topic for interview
Nordland Hospital Trust	Realized benefits from the existing solution and potential benefits from new payment functions
Østfold Hospital Trust	Realized benefits from the existing solution and potential benefits from new payment functions
Helse Bergen	Realized benefits from the existing solution and potential benefits from new payment functions
Diakonhjemmet	Realized benefits from the existing solution and potential benefits from new payment functions
Telemark Hospital Trust	Benefits from existing and new payment functions
Mastercard Payment Services	New payment functions under development

Appendix 2: Quantification of time savings

To value the time savings resulting from the use of Imatis' solution for check-in and payment, we have followed the guidelines for the quantification of benefit implications developed by DFØ.[5] The goal is to quantify the benefits as far as possible to illustrate the significance of the measure that is being assessed. According to the framework, the benefits should be quantified in a suitable physical unit, for example the number of FTEs. Another important principle is that the impacts must be quantified in units per year for the whole period they are expected to have an effect.

It is important to emphasize that the figures are qualified professional estimates, at the same time as the estimates are calculated without complete information. Despite the fact that these are rough estimates, they are a good starting point that provides an indication of the potential resource savings that have been achieved.

Valuation

The time savings have been valued in the form of a profitability calculation in 2020-NOK. According to DFØ's framework, all benefits must be valued at what it is assumed that the population as a whole is willing to pay to avoid a disadvantage. The Norwegian Ministry of Finance's circular R-109/2014 points out that the willingness to pay for the benefit implications of the measure can be reflected through calculation prices.

$$Value\ of\ impact\ (per\ year) = calculation\ price\ x\ quantity\ (per\ year)$$

Where in this case impact (benefit implication) = time savings, calculation price = labour cost, and quantity = number of hours saved.

$$Value\ of\ time\ savings\ (per\ year) = Labour\ cost\ x\ number\ of\ hours\ saved\ (per\ year)$$

Labor cost corresponds to gross salary, i.e., salary including tax, employer's social insurance contribution and social costs (including pension costs). In the table below, we present an overview of how we have calculated the labor cost for selected occupational groups to determine hourly wages.

Table B: Calculation of average hourly wage for selected occupational groups in 2020-NOK. Source: Statistics Norway, Table 11418[6]

Professional title	Monthly wage	Yearly wage	Pension cost	Employer's social security contributions	Labour cost	Hourly wage
Bioengineer	44 790	537 480	22 467	78 952	638 899	377
Receptionist/ medical secretary	37 570	450 840	18 845	66 226	535 911	316

[5] *Norwegian Agency for Public and Financial Management (2018) [available in Norwegian only]*

[6] *Assuming pension rate for the health and social care sector in 2020 = 4.18%, employer's social contribution for zone 4a =7.9%, and number of hours for an FTE doing shift work = 1695*

Time savings related to check-in

To calculate time savings related to check-in at Diakonhjemmet, we have identified an average time saved per checked-in patient with the help of interviews. In the following, we have scaled up the time savings to a yearly unit and adjusted for seasonal variation. As Diakonhjemmet has not used the solution for a full year yet, we have based the seasonal adjustment on statistics from Helse Bergen. Finally, we have adjusted the annual time savings to reflect the actual proportion of patients who check in via terminal or smartphone. According to statistics from Diakonhjemmet, a small share of patients has continued to check in via reception even after the introduction of the check-in solution, and thus there will not be any time savings for these patients. We have based our calculation on the average monthly wage for a receptionist when quantifying the cost savings at Diakonhjemmet Hospital. As the time estimates apply to medical secretaries who would normally have checked in most patients, we assume that the estimates are representative for the average patient. The yearly estimate therefore applies to the hospital as a whole.

For the laboratory at the women's clinic in Helse Bergen, we mapped the daily time savings through interviews. Then we scaled up the estimate with the number of yearly working days at the outpatient clinic (230 days). Based on the monthly salary for a bioengineer, we quantified the savings. Since the estimate for time savings is specific for the laboratory at the women's clinic and therefore not representative for the hospital as a whole, the yearly estimate only applies to the laboratory at the women's clinic and not the hospital in its entirety.

In the table below, we have summed up the benefits.

Table C: Profitability calculation for check-in in 2020 NOK. Source: Menon Economics, Diakonhjemmet Hospital and Helse Bergen

Health trust	No. of hours saved per year (rounded)	Total no. of FTEs saved	Yearly profitability calculation (rounded, 2020-NOK)
Diakonhjemmet Hospital	1,400	0.8	440,000
Helse Bergen (laboratory for women's clinic)	800	0.5	300,000
Nordland Hospital (check-in and payment)		6	3,200,000

Time savings related to payment

To calculate the time savings related to payment for Diakonhjemmet, we have used the same method as for check-in. The only difference is average time use per patient, which has also been determined through interviews.

Table D: Profitability calculations for payment in 2020-NOK. Source: Menon Economics and Diakonhjemmet Hospital

Health trust	No. of hours saved per year (rounded)	Total no. of FTEs saved	Yearly profitability calculation (rounded, 2020-NOK)
Diakonhjemmet Hospital	1,000	0.6	310,000

Direct costs related to payment

To calculate the fixed costs for payment, in the form of leasing costs for payment terminals, we have found out from interviews with Nordland Hospital that they avoid having to lease 20-30 payment terminals per year as a consequence of the introduction of the payment solution. In addition, Nets Group AS has informed us of the yearly cost for leasing a terminal. By multiplying those two estimates, we find the yearly fixed cost for payment.

When it comes to calculating the variable costs for payment, we have used cost estimates from Mastercard Payment Services for payment via card terminals and estimates from Oslo Economics for printing out paper invoices. These costs are presented in Table E. We have assumed that all payments in the zero alternative were carried out by a medical secretary printing the invoice and processing payment at a terminal. We have also based us on seasonally adjusted yearly payment statistics from Diakonhjemmet to scale up the costs.

Table E: Profitability calculations for payment in 2020-NOK. Source: Menon Economics, Nordland Hospital, Mastercard Payment Services and Diakonhjemmet Hospital

Health trust	Unit cost per year	No. of units per year	Yearly profitability calculation (rounded, 2020-NOK)
Nordland Hospital	5,235 – 5,985	20-30	100,000 – 180,000
Not specific	2.25-4.5	59,246	130,000 – 270,000

Cost for different payment alternatives

The table below shows on what costs and assumptions we have based our calculations of the costs for the different payment alternatives. The costs for all alternatives will depend on the specific agreements each hospital has with its suppliers.

Table F: Assumptions for the calculation of prices for the different payment alternatives. Source: Mastercard Payment Services, Oslo Economics

	Unit cost	Assumptions
Paper invoice	NOK 12 incl. postage NOK 2-4 per printout	
Card payment (BankAxept) via terminal/smartphone	NOK 0.25-0.5	
Vipps via smartphone	1.5-2.5% of transaction sum	Unit cost depends on amount. Assuming an average amount of NOK 375 which is standard co-pay.
eFaktura (via bank, not Imatis)	NOK 2-4	

Appendix 3: Costs for the different payment alternatives

The material costs for the health trust will vary significantly between the different payment alternatives, but there is reason to believe that more and more patients prefer digital payment solutions, including eFaktura. There will be large costs associated with paper invoices where both postage, envelopes and printouts are part of the material costs. The table under shows the cost estimates per payment for the different payment alternatives offered by Imatis.

Table G: Cost estimate (material costs) per payment alternative. Source: Mastercard Payment Services, Oslo Economics[7]

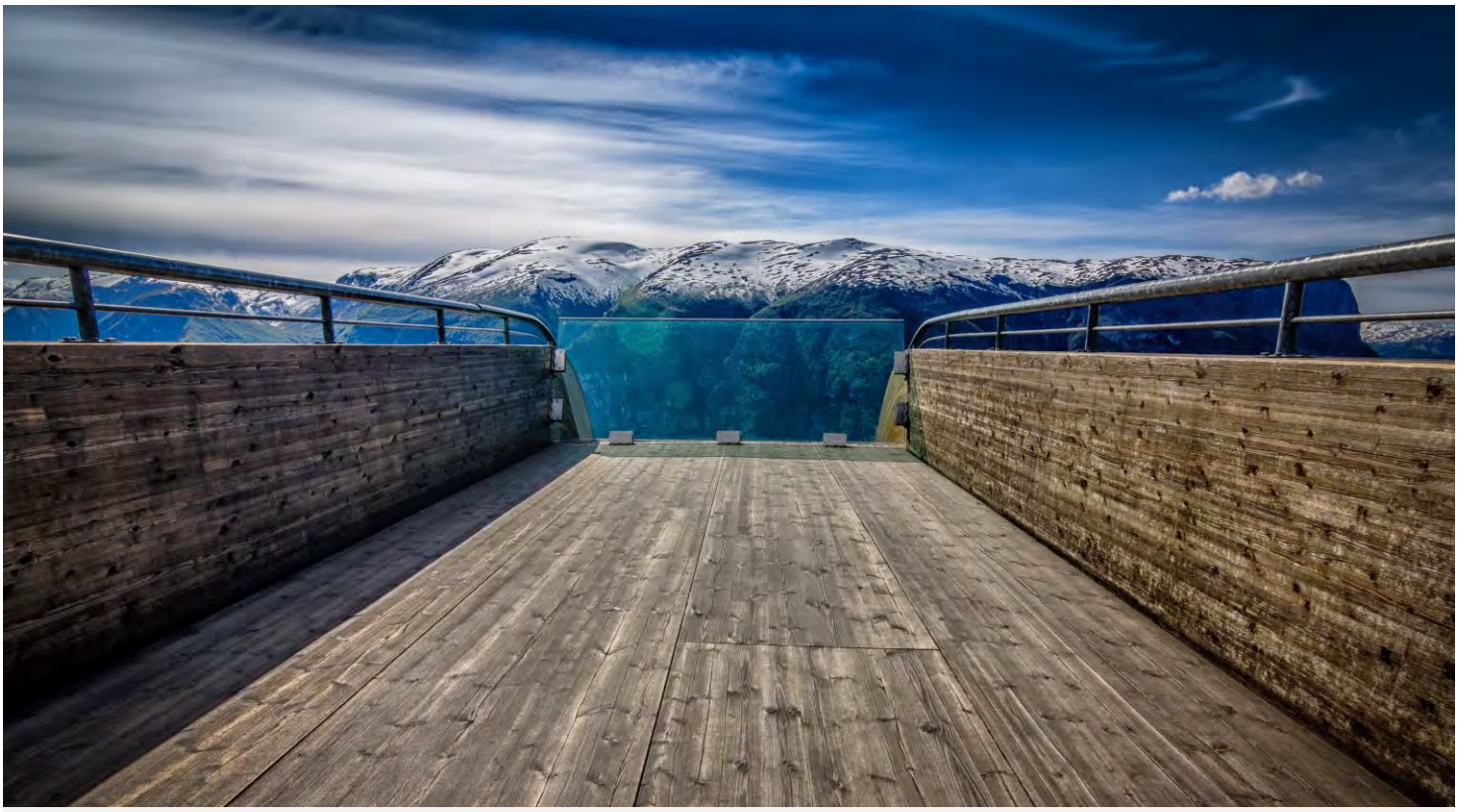
Payment alternative	Cost estimate per transaction in NOK
Paper invoice	12
Card payment (BankAxept)	0.25-0.5
Vipps	6-9
eFaktura (via bank)	2-4

Paper invoice is the most expensive alternative both with regards to material costs, as shown in the table above, both also working time, as estimated earlier in chapter 3. It is between 25 and 45 times as expensive to issue a paper invoice, compared to a card payment. It is still important to point out that the zero alternative for the health trust did not necessarily consist only of paper invoices before Imatis' payment solution was introduced.

The costs for paying via Vipps are approx. times larger than for an ordinary card payment. In comparison, the cost for sending an ordinary e-invoice via the bank, i.e., not via Imatis, approximately right in the middle of the two alternatives. It is important to point out that the costs for leasing the bank terminal are not included, so that the comparison will be somewhat exaggerated. The cost for sending an e-invoice via Imatis has not been determined year and therefore not presented in the overview. The costs for a transaction via Vipps and card payment depend on the amount and will therefore vary. See Appendix 2 for more information on the assumptions and costs these calculations are based on.

It is possible to adapt the payment solution in Imatis so that the variable payment costs are minimized. One can for example adjust the set-up of the screen in a way that steers the patients towards choosing the least expensive alternative. Another possibility is to not offer the most expensive alternatives at all. This choice can increase the financial benefits from the perspective of the health trust but will also limit the patients' choices. Thus, this choice comes at the expense of the patient's user experience, and therefore it is not clear whether the benefits for society as a whole will be larger or smaller.

[7] The calculations by Oslo Economics (2020) show the total distribution costs for paper invoices where the cost for postage and printing is estimated to NOK 8 and 4 respectively.



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