Northern Norway EHR: A Case Study

Executive Summary

The Northern Norway Regional Health Authority (Helse Nord RHF) is responsible for public hospitals in Northern Norway, a region which is made up of 45% of the land mass of Norway and 9.5% of the country’s population.

In 2009, the decision was made by Helse Nord to carry out a major procurement process for the main clinical systems for information sharing and interaction between hospitals in the region. The Electronic Health Record EHR, which is described as Electronic Patient Journal/Patient Administration System (EPJ/PAS) by Helse Nord, is the core system in this procurement as it sits at the centre of interaction between the other clinical systems.

Statistical analysis was carried out by Helse Nord into the value of introducing clinical systems before the investment began. Stakeholders were brought together to form a reference committee in order to discuss how to manage the changes clinical systems would bring. From this a clear description of needs and tools required was developed. Working groups of stakeholders were then formed for developing requirements.

Helse Nord chose a procurement process which stimulated competition. It was ultimately decided that the procurement for each system would be approached in a stand-alone fashion, in that bidders had to complete a full and detailed bid for each system. The intended procurement was widely publicised so that all interested parties could apply to participate in the competition. The applications were assessed and candidates selected. Candidates received tender documents and could prepare their offers. A evaluation and negotiation phase then ensued which reduced the number of candidates until the final round of negotiations where the winning bidders were selected based on explicit criteria. The project working groups’ recommendations were then presented to the steering committee for approval. Contracts were signed 1st April 2011.

The procurement project lasted approximately two years and the total investment was 427.4 million NOK, approximately 58 million Euro for six systems:

- EHR: Electronic Patient Record, called Electronic Patient Journal in Norway, and Patient Administration System (EPJ/PAS)
- Laboratory System (LAB)
- Electronic requisitioning from doctor’s surgeries for laboratory services (ERL)
- Radiology Information System (RIS)
- Picture Archiving Communication System (PACS)
- Pathology Information System (Patologi)

Key outcomes and lessons learnt from the project include quality as the motivation for investment, the importance of a long term strategic context with clear goals, culture change alongside procurement, the necessity of user involvement, the advantages of a procurer led market and the importance of pace.
1. **Context**

1.1 **Health system**

In Norway, an organisational reform of healthcare was undertaken in 2002 whereby hospital ownership was transferred from the 19 local counties to five regional health enterprises; all 100% owned by the state. The regional enterprises have a statutory responsibility for ensuring provision of specialist health services within a health region and are accountable to the minister of health. Each region is subdivided into local health enterprises, whereby the 55 previously stand-alone hospitals merged into 21 health enterprises which act as service delivery units and are owned by the corresponding regional health enterprise.

*Figure 1: Geographical division of regional health enterprises in Norway*¹

The Municipal Health Care Act in 1984 made municipalities, of which there are 429 at a more local level than counties in Norway, responsible for primary health services. Many municipalities are small, with less than 5,000 inhabitants, and are the lowest level of public administration and local democracy. Municipalities are responsible for GPs, public health nurses, running nursing homes and home care.² Nursing care within and outside institutions is also the responsibility of the municipalities. So is the general practitioners scheme where all inhabitants in the municipality have the right to a general practitioner.³ Funding for services comes in the form of federal block grants, local taxation and out-of-pocket payments.

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The reform and the creation of regional health enterprises has centralised formal and political authority and clarified local responsibility. The shift in the distribution of funding from 19 counties to five enterprises, later reduced to four by merging the south and east region to one region; Helse Sør-øst, means that a different approach to budgeting and planning can be used. “The organisation of specialised care into enterprises means that organisational tools from the private sector are used although traditional public governance elements are also used to operate the welfare policy.”

The reform allows regional health enterprises greater freedom regarding investments, flexibility in planning and provision of health services, organisation and use of resources across their organisation, for example financing can be distributed depending on the needs of hospitals. However, capital costs and depreciations have to be included in budgets as well as in the accounts and investments have to be defendable.

Helse Nord is the regional health enterprise for the northern region of Norway. It includes Svalbard, a group of islands halfway between Norway and the North Pole. Helse Nord is state-owned by The Royal Norwegian Ministry of Health and Care Services, is lead by a management board and has its administration located in Bodø. Some key facts on the Helse Nord regional health enterprise are:

- It comprises 45% of the area of Norway
- Covers 9.5% of the population of Norway
- Consists of five local health enterprises called trusts:
  - Finnmark Hospital Trust [Helse Finnmark HF]
  - University Hospital of Northern Norway Trust [Universitetssykehuset Nord-Norge HF]
  - Nordland Hospital Trust [Nordlandssykehuset HF]
  - Helgeland Hospital Trust [Helgelandsykehuset HF]
  - Hospital Pharmacy of North Norway Trust [Sykehusapoteket HF]
- Employs 12,700 people
- Has a revenue of 13.6 billion Norwegian Krone (NOK), approximately 1.8 billion Euro
- Invested 1.4 billion NOK, approximately 186 million Euro in 2011
- Had a surplus in 2011 of 373 million NOK, approximately 49.8 million Euro

Since 2009, deviation from the healthcare budget by the region has improved year on year.


Ibid.

The large size of the region and the relatively small and scattered population means that a decentralised approach had to be taken to structuring of healthcare provision. The ageing population in Norway is an issue which is increasing in magnitude and with it the pressure placed on healthcare structures. Helse Nord’s structures are adapted to manage these pressures and healthcare delivery strategies utilise a quality-focused approach. ICT is considered a crucial tool for maintaining this quality of patient service and so the ICT strategy at Helse Nord has a high priority status. Electronic communication with GPs has also been a priority since early on in the reform and common patient systems have been in place since 2004.

**1.2 Strategic setting**

The improvement of quality, better organisation, reduction of unnecessary investigations and further involvement of patients were trends that Helse Nord observed in global healthcare and wanted to emulate. In addition, Helse Nord realised that although unification under regional health enterprises had been achieved through the organisational reform better coordination and standardised procedures were required to further improve patient experience. Service improvements were therefore targeted at coordination between general and specialist health functions so that treatment could be performed to a high quality, in a professional manner, without hassle and be perceived by the patient as a high quality and streamlined experience.

It was through considering the means by which to achieve standardised procedures and better coordination that the idea to introduce clinical systems- Felles innføring kliniske systemer (FIKS)- was 

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6 Ibid.
hit upon. Partial inspiration for such a solution came from observation of Kaiser Permanente’s systems in the USA and doctors were quick to perceive the benefits such a system could bestow for service quality improvement.

2. **eHealth investment brief**

   - Helse Nord, regional health enterprise for the northern region of Norway is the project owner and provided project funding
   - The northern region of Norway, covered by Helse Nord, is 45% of the total land mass of Norway and includes the islands of Svalbard, between mainland Norway and the North Pole.
   - The region consists of 9.5% of the total population of Norway
   - Helse Nord’s revenue for 2011 was 13.6 billion NOK, approximately 1.8 billion Euro
     - Total investments by Helse Nord in 2011: 1.4 billion NOK, approximately 186 million Euro
     - Project investment was 427.4 million NOK, approximately 58 million Euro
   - FIKS project includes 6 systems:
     - EHR: Electronic Patient Record, called Electronic Patient Journal in Norway, and Patient Administration System (EPJ/PAS)
     - Laboratory System (LAB)
     - Electronic requisitioning from doctor’s surgeries for laboratory services (ERL)
     - Radiology Information System (RIS)
     - Picture Archiving Communication System (PACS)
     - Pathology Information System (Patologi)
   - Steering board formed for procurement project consisting of members of Helse Nord, Northern Health IT and the five Health Trusts
   - 80 to 100 people from the region’s hospitals where involved in the formulation of requirements for the various system areas
   - The systems acquired will be used in specialist health services (second and third level), but also includes electronic solutions (XML messaging system) for collaboration with GPs and health services in the municipalities. In 2011 Helse Nord employed 12,700 people
   - Project duration of approximately two years: planning began in April 2009 and the contract was signed in March 2011
   - Period of awarded contract: eight years

3. **eHealth investment description**

   It was also observed in other contexts that standardised procedures are effective in achieving improvements in quality and patient experience. Achieving this requires a culture change which is central to the IT strategy of Helse Nord and which would use clinical systems as a basis. Although the project comes from initiatives of the IT strategy it is a clinical project as much as it is a technical project.

   In order to realise Helse Nord’s vision, access to enterprise data is required. This data can form the basis for:

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• Clinical databases
• Regional quality records
• Analysis of patient groups’ flow through the health trust and the region
• Access to databases of anonymous statistics and management information based on user-defined access
• Improved data capture
• Comparison of cost information from multiple clinical systems to illustrate the costs associated with a patient’s path through the processing chain.

This is to be achieved through information sharing. Analysis suggests that clinical systems will facilitate this information sharing in a more cost effective and easier manner.⁹

Therefore, a vision was developed for information sharing, see figure below:

Figure 3: Helse Nord’s vision for information sharing¹⁰

The region is also keen to capture the clinical work processes so that clinicians as far as possible relate to digital information instead of paper. It is Helse Nord’s strategy to ensure the best possible electronic interaction between the five health trusts in the region. By 2009 there was already some clinical information support in place between hospitals, such as:
• EPJ / PAS systems
• PACS systems Common blood bank system
• Microbiology system

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⁹ Ibid.
¹⁰ Ibid.
• Pathology system
• Birth delivery system
• Common public patient transportation system
• System related to clinical chemistry
• Electronic communication with GP’s based on Edifact

However, these systems were decentralised. Every system was hosted locally with its own database.

In 2009, the decision was made by Helse Nord to carry out a major procurement process for the main clinical systems for information sharing and interaction between the five trusts. It was decided that these systems should include:

• EPJ/PAS which includes the following subject areas:
  o Somatic
  o Adult Psychiatry
  o Operation Planning
  o Child and Adolescent Psychiatry (optional)
  o Substance abuse (optional)
  o X-ray information system included PACS (Picture Archiving and Communication System)
• Laboratory Information System in the areas of:
  o Medical Biochemistry
  o Immunology
  o Clinical Pharmacology
• Electronic requisition of laboratory services (ERL)
  o including - electronic requisition for other disciplines (optional)
• Pathology

A project was therefore formed for the procurement of 6 systems:

  o Electronic Patient Record/ Patient Administration System (EPJ/PAS)
  o Laboratory System (LAB)
  o Electronic requisitioning from doctor’s surgeries for laboratory services (ERL)
  o Radiology Information System (RIS)
  o Picture Archiving Communication System (PACS)
  o Pathology Information System (Patologi)

The systems acquired will be used in specialist health services, second and third level, but also include electronic solutions, upgrading to XML messaging system, for collaboration with GPs and health services in the municipalities.

3.1 Strategic planning
Statistical analysis was carried out by Helse Nord into the value of introducing clinical systems before the investment began. This argument was included in a weekly newsletter from the director of Helse Nord which described how statistical proof supports the assertion that the use of equal and common

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11 Ibid.
12 Ibid.
13 Ibid.
practice reduces the number of people who will die and that complications and problems for the individual are less likely to arise. The director then advocated the need for using checklists and different practices.\textsuperscript{14}

Such communication with stakeholders and the public, which also took other forms such as visits with doctors to solutions in place at other sites and lecture tours, enabled Helse Nord to judge the likelihood of acceptance of such a solution.

In terms of the investment plan, this was managed by Helse Nord. As outlined earlier, Helse Nord controls the budget for specialist healthcare provision in northern Norway and as such is responsible for planning and organisation of resources and investments as well as providing defendable economic results. Capital costs and depreciations have to be included in budgets and the accounts and investments have to be defendable.

Helse Nord has not negatively deviated from its budget since 2009, see figure below. This planning has made surplus funds available for future investments. Surplus funds were then able to be allocated for the procurement of clinical systems.

\textit{Figure 4: Helse Nord deviation from financial budget}\textsuperscript{15}

Planning was also applied to project organisation. A steering committee was put in place consisting of Helse Nord, Northern Health IT and Health Trusts. This committee was responsible for:

- Initiation and termination of the project
- Approval of the most important deliveries in the project
- Ensuring that project deliverables are completed as planned in the project mandate
- Ensuring that project requirements are fulfilled according to the project mandate, for example in connection with recruitment and participation of health trusts

\textsuperscript{14} Vorland L.H. Direktørens fredagsbrev [Director’s Friday Letter]. Bodø: Helse Nord RHF.
3.1.1 Acquisition of project management

The health sector represents a relatively narrow segment of the IT industry where access to consulting expertise for eHealth is particularly challenging. Traditionally, few major acquisitions are implemented within this area and the deployment of tightly integrated clinical systems that interact on a daily basis in clinical work flows has not been tried before.

However, the acquisition of clinical systems for Helse Nord shared significant similarities with the procurement of traditional Enterprise Resource Planning (ERP) systems. Additionally, "Best Practice" principles established in other areas of the IT industry could be transferred and applied to the health sector.

It was expected that several vendors with experience in procurement of clinical systems would respond to the call, but consultants with experience of similar acquisitions of EHR systems were not available. However, it was anticipated that experience in the procurement of ERP systems would be sufficient.

It was found important, by Helse Nord, to have a strategy in place from early on, with awareness of the strengths and weaknesses both within the organisation and the consulting industry before announcing their intention to hire consultants, and before the project was established. Helse Nord were aware that the strengths of the various participants in the project as a whole should compensate for the weaknesses they identified. This approach required a broad understanding of the organisations involved and the processes they undertake, as well as a good overview of the consulting market. Helse Nord were also conscious, from experience, of the need to evaluate consultants based on their offers and not on the consulting house and its reputation.

Helse Nord had previously established agreements with a number of consultants in other projects and through the use of these framework agreements built a foundation of experience regarding their qualifications for the procurement of clinical systems. From this experience Helse Nord recruited project management consultancy from A-2, Norway.

A-2 consultant, Bent Gjøstøl, acted as the front-of-house operations manager for the procurement project, while Helse Nord’s IT director, Bjørn Nilsen, took care of strategic matters. This division allowed the front-of-house operations manager to focus on the day-to-day issues whereas the IT director was able to observe whether strategic goals were being met and prompt the operations manager when they were not.

3.1.2 Utilisation of other regions’ experience

Based on the region’s previous experience, it was known that the clinicians, who would participate in the acquisition, had not previously worked with design specifications and were generally unfamiliar with this type of work methodology. However, within the specialist health service in Norway there is a tradition of sharing experience and material from previous processes. In preparation for the procurement process Helse Nord obtained specifications from other health regions concerning acquisition of clinical systems. In particular, Helse South / East contributed a significant amount of material from their processes.

The reasoning behind using past specifications for other systems was so that both consultants and Helse Nord participants could quickly form an understanding of the methodology behind the
description of requirements and use existing specifications as the basis for new / altered requirements.

It was also of interest to Helse Nord to encourage the supplier industry to develop new functionality, based on previous specifications, which were not already implemented in existing systems and thus manage the market. Thus, there is particular interest between customers in sharing information so as to allow procurers to address the market in a way which further drives development in the supplier industry.

For an understanding of how Helse Nord was able to implement the procurement process in such a short time limit it is essential to understand the region’s desire to reuse as much as possible from previous acquisitions in other regions. The approach also reduces the risk of this type of procurement significantly.

3.2 Design stage

3.2.1 Clinical aspects

Traditionally, clinical systems have been regarded as documentation systems with a limited degree of process support. However, Helse Nord wanted to acquire systems with a greater degree of support for hospital clinical processes. This decision was based on the underlying assumption that the standardisation of clinical practice facilitates an increase in quality, more consistent patient care, ease of use, and efficient system management.

The standardisation of hospital processes across the region not only requires the procurement of new technology but also an entire culture change in the way hospitals function and staff operate. In order to facilitate this change the process started with those it directly affects. Stakeholders were brought together to form a reference committee, approximately 80 in total, in order to discuss how to implement this change and how they could work together. Through their discussions a joint vision was elaborated of how they could co-operate and the tools they would need to do so, this was the starting point for system design. Below are some points for standardising and harmonising working processes and practices:

- Code Works and setup
- Journal Structure
- Registration Policy / procedure
- Work Processes
- Measurement Indicators and reporting
- Access Principles
- Templates and letters
- Organisation Setup
- Training
- Infrastructure
- Integration

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Once a clear description of needs and desires was in place the functionality required was worked out and then the economic implications of such a solution could be calculated. A criteria was thus developed and responsibility for meeting it taken on by the Project Steering Committee, which has representatives from each trust. The criteria was for:

- Solutions that support the business needs of patient flow, workflow and information flow internally at the hospitals and between hospitals
- Solutions that support integration between systems
- Solutions that provide good decision support
- Solutions with high usability
- Solutions with high stability, scalability, availability, safety and low response times

Working groups were also created with different stakeholders for developing requirements for different areas of the different systems; Functional, technical, implementation maintenance and contract pricing. The functionality working group included staff who would be using the system on a daily basis. A reference group, which included clinicians, also read through the requirements as they were developed and gave feedback.

An example of the considerations which had to be taken into account when considering the functionality of clinical systems for operation planning is below:

**Operation Planning**

- Provide support for the claims process and workflow connection with operation planning functionality to:
  - report a patient for surgery in a structured form,
  - optimal planning of an operational program,
  - functions and display and supporting documentation of operations.
- There should be appropriate functionality for all parties participating in the hospital’s operating activities.

The project is rather clinically orientated than purely technical. Therefore, it didn’t take much persuasion for clinicians to realise that the project will benefit their work. The crucial issue was rather how they will find time for these changes in working. Communication was a key tool in gaining acceptance from hospital staff.

**3.2 Organisational aspects**

Since 2002, Helse Nord has conducted a series of common public procurements within both the administrative as well as clinical systems. Steering groups were used in these procurements. The groups included participation from various levels of the organisation and utilised methodologies related to public procurement. The procurement process for Helse Nord has long emphasised that intended users of a system should be the key players in the negotiation process. Typically, this manifests itself in responsibility for designing specification of requirements regarding functional use of the systems. Experience from several of those earlier acquisitions was used in the creation of the procurement project for the six clinical systems, including the EPJ/PAS. The challenge is that with acquisition process there will be people involved who lack understanding and procedural knowledge.

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of procurement regulations. Knowledge of the process and understanding must therefore be rebuilt among participants at intervals.

A central ICT team was created for the procurement, these experts formed a portion of the working groups particularly the technical working group and built up competency.

Centralisation of the procurement also meant that a steering committee was created with representatives from each trust to ensure that their opinions were included. The steering committee was appointed by Helse Nord’s director Lars Vorland and consisted of:

- Mr. Paul Martin Strand (Leader) Helse Nord
- Mr. Eivind Solheim, CEO (Nordland Hospital Trust)
- Mr. Tor Ingebrigsten CEO (University Hospital of Northern Norway Trust)
- Mr. Jan Erik Furunes CEO (Helgeland Hospital Trust)
- Mrs. Eva Pedersen CEO (Finnmark Hospital Trust)
- Mr. Ole J. Hauge Director (Internal ICT – Northern Norway Health Auth.)
- Mrs. Irene Skiri Helse Nord

The project team and steering committee recommended that in order to introduce standardisation a greater degree of uniformity was required in the region, including:

- Agreement on the processing line / production processes
- Agreement on standardised course templates
- Agreeing on common codes and layouts
- Common journal structure
- Agreeing on common recording practice / procedure
- Best possible centralised operating environment
- Common performance indicators (KPIs) and reporting
- Decision-controlled access
- Regional government groups

Due to the challenging nature of the procurement Helse Nord employed A-2 consultants to project manage the procurement.

During April to July 2009, A-2 and Helse Nord went to each of the trusts and met the key people and agreed on the way in which to approach the project. The steering committee roles and tasks were then agreed on and in October 2009 the first workshop was held to train participants in communication regulations particularly with vendors.

3.2.3 Legal aspects

When considering the design of clinical systems to facilitate information sharing and standardisation of practice Helse Nord had to consider restrictions by Norwegian Law on storage and access to data.

- Legal framework up until 2011
  - not allowed to accumulate data for multiple legal units
    - when stored in a common databases, data must be logically separated
    - no collection of data by a person in a legal entity from another entity
access to data between legal units shall be conducted by means of electronic messaging.\textsuperscript{20}

Realisation of the vision for information sharing at this point would involve a breach of Norwegian law; however in 2012 the law was changed so that clinicians can now obtain information directly from other health enterprise databases. With the disclaimer that data must be logically separated when stored in common databases.

3.2.4 Technical aspects

It was decided that six clinical systems would be required; however these systems had to be fully interoperable and able to integrate with the others. This was especially relevant as the procurement process requested that competitors bid for each system individually or for all six as a package. This meant that each system had to be designed to allow it to integrate with any other possible system from any other provider. Integration was particularly important for the EHR (EPJ/PAS) as it sits at the centre of system interaction. See the figure below.

Figure 5: Clinical systems’ interaction\textsuperscript{21}

In order to develop requirements, between 80 and 100 people from the region’s hospitals were divided into working groups based on the different system areas, such as functional and technical. The participants from different system areas then worked together to define how their discipline should interact with other disciplines in order to establish the best overall process. Functional and technical requirements were then updated in the respective specifications so that the process could be realised across the system areas.

However, clinical systems in Norway had previously been focused on documentation, rather than process support and standardised workflows. Hospital staff involved in developing the requirements were accustomed to documenting systems and initial attempts to envisage requirements without

\textsuperscript{20} Strand P. 2012. Leader Steering Committee. Bodø: Helse Nord RHF.
\textsuperscript{21} Ibid.
reference to such prior systems was challenging. A vision for the future systems was developed through workshops and observatory visits to process supporting solutions.

**Cooperation between specialist healthcare organisations**
The four regional health authorities have established a joint partnership forum called the National ICT. In this collaborative forum a number of studies have been conducted on the processes of supporting systems and their architecture. In these national studies Helse Nord has participated and provided architectural expertise from Helse Nord’s internal ICT department.

Experience from earlier acquisitions shows that it is extremely challenging for an organisation to establish their own proprietary standards for integration as the supplier industry can do little to offer this type of integration to other customers in the market. It was therefore important to base integrations on the adopted national architectural and content standards.

In order to tie together the work completed nationally to Helse Nord’s regional procurement the technical part of the requirement specifications was led by architect Ronny Thomassen who is also Helse Nord’s representative for work on the national architecture.

Design of the technical part of the specification was based on functional requirements from clinical specialists in order to ensure good process flow between the systems. Where there were no national standards the supply industry were asked to describe the necessary development.

**Compliance with national standards for hospitals**
There are a number of national standards in Norway which are not managed by specialist services. These standards are used for electronic communication between specialist health services and other parts of the sector. There are also various other standards which regulate and set requirements for EHR systems. These standards are administered by the company KITH, commissioned by the Directorate of Health.

Before Helse Nord’s requirements were presented to providers they were quality-assured by Thorbjorn Nystadnes of KITH; which is responsible for the management of the national EHR standard. This was to ensure that Helse Nord did not direct requirements to the supplier industry, which were contrary to the requirements of national authorities.

Several of the solutions used in the integration between internal systems are derived from these standards (KITH XML). It is important that this type of procurement, to the extent possible, is based on approved technical and functional standards.

Requirements were set for every single integration, of which there were 300. Maintenance specifications were also set but were the same for all systems and need support to be undertaken in a common way. There were also working groups for the functional needs of each system as well as across the system. A-2 acted as the coordinator between the various working groups.

Service-oriented architecture and flexibility in the presentation layer was also a requirement. This should include:

- Better and more flexible clinical work space, but as part of system portfolio
- Integration of multiple levels (integration palette)
- Structured data
• Commitment to integration with existing national services
• Clear integration commitments for selected suppliers.\textsuperscript{22}

The goal is to move away from a monolithic client-server model to multi-tier, service orientated architecture.

\textbf{Figure 6: Vision of service orientated architecture\textsuperscript{23}}

3.3 \textbf{Procurement phase}

Helse Nord’s goal was to have systems which:

• support the business needs of patient flow, workflow and information flow internally within hospitals and between hospitals
• have high stability, scalability, availability, safety and low response times
• involve a high cost-efficiency
• provide good integration solutions
• are maintained centrally in the region (at one or more locations)
• are consistent with the overall strategy for Helse Nord
• allow for consolidation of systems to create economies of scale
• are established and widespread in today’s market
• have a good and proven functionality
• provide opportunities for the future use of service-oriented architecture\textsuperscript{24}

Helse Nord also emphasised that the EPJ/PAS (EHR) should not only maintain the documentation required by clinicians, but also support the clinical processes.

\textsuperscript{22} Ibid.
\textsuperscript{23} Ibid.
\textsuperscript{24} Nilsen B. 2012. ICT in Special Health Care in Nothern Norway. Bodø: Helse Nord RHF.
As described above these objectives were translated into requirements which were developed by working groups made up of hospital personnel. These requirements were also reviewed by a reference group and ultimately the project steering committee.

The main supplier for clinical systems in the Helse Nord district is DIPS. DIPS originates as a hospital based company in the region and had developed an EHR solution in Bodø. The company had then expanded and diversified. DIPS, therefore, had a market advantage; its systems are known, trusted and already used by many hospitals. In 2004, Helse Nord signed an agreement for a common regional EHR framework for all hospitals in the region. As a result, the University Hospital of North Norway changed EHR system in the period 2005/2006.

However, Helse Nord was now driving towards a much more encompassing and inclusive solution. Additionally, it had been deemed legally unacceptable by the Auditor General for Norway to merely renew previous contracts for EPJ/PAS (EHR), LAB and RIS. The Public Procurement Act demands that contracts are opened up to competition on a regular basis. A rigorous procurement process was therefore required.

However, carrying out a procurement competition that was truly competitive and that would render solutions to transform existing technical systems and work flows was a challenge. The dominance of one company in the market, DIPS had 70%, meant that competition was low and DIPS was not challenged directly. In the Health South region a procurement had recently taken place where only DIPS competed. This was a constellation Helse Nord was keen to avoid; not only the lack of competition but the stagnation to innovation this can cause.

Despite the challenges faced by Helse Nord and the trusts, they realised that implementing a new procurement process which stimulated competition would have positive effects. Competition would push providers to find and create better solutions. It would also provide an opportunity to improve the standards of ICT in the region as this approach to procurement would mean the removal of presupposition and the development of wholly new solutions. A regenerating procurement process would ensure better use, better architecture and better value could be gained from the resultant systems.

In April 2009 the planning and development phase for the procurement ensued and Helse Nord together with A-2 consultants developed:
- A business case
- The project mandate
- The budget
- Project organisation
- A procurement strategy

3.4 Implementation and use
Implementation began in 2012. Regular training workshops are now being held and monthly review meetings are held between the suppliers and Helse Nord are held to explain what has been achieved and to which requirements it relates. The detailed and extensive nature of the requirements means that this phase takes time. The amount of involvement from Helse Nord at this stage was an issue

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raised during the negotiation period and so this has been planned for and the resources are in place; a matter which is reassuring for the vendors.

Although there are standards in place for how the different systems work together vendors have decided for themselves on a method of collaboration; this was developed through negotiations. Such a constellation as multiple vendors is not an issue in Norway and is considered quite normal. However, as DIPS are creating the EPJ/PAS (EHR) they play a central role in the organisation of working relationships.

3.5 Monitoring and evaluation

Once the winning bidders had been announced in February 2010 a quality assurance process was carried out. The grounds for bidder selection were also presented and in order to provide assurance, in preparation for public scrutiny, an external evaluation tool was used throughout the procurement process. A quality assurance audit was also undertaken by an external lawyer, again for assurance, and was also provided to the public.

2011 was used to verify the investments for the realisation of the vision of information sharing in the region. In reporting to the Board, it was noted that the amount of 338.5 million NOK was incomplete. Therefore, in 2012 the following were added: Test Environment, payment for participation by clinicians in the development phase, payment for internal IT in the project. After quality assurance in 2011/12, the level of investment in the project was increased to 427.4 million NOK, approximately 58 million Euro.26

Supplier’s perspective

The winning bidder for the EPJ/PAS system, DIPS, observed that one advantage of their involvement in the process of training and implementation is that they are able to utilise the experience they have gained through the use of their systems previously in the region. This past experience allowed DIPS to evaluate the past systems and identify areas which were not properly utilised. In turn these areas can be targeted in training workshops, now taking place across the region, and thus brought to the attention of users.

In terms of enabling the change process, DIPS stated that it targets change through training workshops. To ensure this, Helse Nord have quality monitors in place. This gives confidence to all that it will be a success.

4. **Procurement process**

Figure 7: Timeline of procurement process

**Northern Norway EHR**

- **2009**
  - Procurement approach planned
  - Staff training

- **2010**
  - Procurement approach planned
  - Staff training
  - 1st meeting
  - 1st workshop
  - Working groups recruited
  - Announcement on TED and invitation to market

- **2011**
  - Requirements finalised
  - Bidder selection
  - Invitation to qualified bidders

- **2012**
  - Bidder selection
  - Contract signed

**Negotiation and evaluation phase**
4.1 Designing a procurement process

Between April and May in 2009 different procurement processes were considered and approaches developed. It was ultimately decided that the procurement for each system would be approached in a stand-alone fashion, in that bidders had to complete a full and detailed bid for each system. However, attention would be paid to ensuring integration with all other possible systems was enabled. This meant that six different competitions would take place within the same procurement process. Vendors could then decide on the number of systems for which they wanted to compete; there was no restriction on this. Vendors were also able to submit a singular bid for all systems; however no bidder took this opportunity.

Using this approach, the procurement was divided into six different separate competitions, it was decided that one person from Helse Nord with strategic and commercial responsibilities should participate in the evaluation of all offers and participate in all negotiation meetings to ensure that the various competitions did not deviate from the selected strategic target aim. Such participation entailed a thorough perusal of all offers submitted in the competition and evaluation in the technical, administrative and commercial parts of the offers. Consultants from A-2 were responsible for the process in their respective areas of competition including responsibility for contact with the supplier. Through this approach to the commercial consequences of the acquisition, the procurement is anchored to the ongoing investment plans of the region and ensured realistic economic conditions were in place at the point of contract signing.

Once the procurement process had been decided on, planning the procurement could then get underway. This meant that key documents such as the business case, budget, project mandate and project strategy could be developed.

Figure 8: Overview of procurement process

[Diagram of procurement process with timelines and tasks]

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4.2 Organisation
As the systems are intended for the entire region of northern Norway, the procurement took a centralised approach. A steering committee was created with representatives from each trust to ensure that views from each division of the region could be represented. Working groups for the development of requirements and participation in negotiations were also created with staff from each of the regional trusts.

Stakeholders were brought together to form a reference committee in order to discuss how to manage the changes clinical systems would bring. The reference committee, which included clinicians, read through the requirements as they were developed and provided feedback to working groups. They were also involved at the negotiation stage.

For project management Helse Nord recruited A-2 consultancy. A-2 consultant, Bent Gjøstøl, acted as the front-of-house operations manager for the procurement project, while Helse Nord’s IT director, Bjørn Nilsen, took care of strategic matters.

For an overview of project organisation see the figure below.

Figure 9: Procurement project organisation

4.3 Adhering to regulations
In the spring of 2009, the task of preparing staff for the procurement was undertaken. Much time was devoted to educating people about procurement regulations, which are based on European Commission procurement recommendations. This preparation was crucial as without staff awareness the procurement could breach legal constraints and the entire process would be deemed a failure, money wasted and a new process would have to be engaged.

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4.4 Developing requirements
In August 2009, the project working groups were recruited, from hospital staff within the different trusts, and assembled for the creation of detailed requirements. In September 2009 the groups met for the first time and in October the first workshop was held. Five workshops were held in total and by April 2010 the requirements had been refined and finalised. The first workshop, in October 2009, also tackled the issue of confidentiality and competition rules; participants were instructed on what they were able to communicate to vendors. This training was particularly important as vendor staff were also present and working within the hospitals. The participants were required to sign declarations of interest and a project agreement.

The workshops were an important tool in the development of the requirements, they provided opportunity for the different working groups to meet and learn from one another. This was important for building relationships, as the group members did not know each other prior to the project. It was also important for the exchanging of requirements. One working group would develop requirements and this would then be reviewed by another working group. In order to simplify this, process templates were created for the workshops to enable participants to include their responses. Additionally, the same structures for evaluation were used throughout the process so as to ease progression and ensure a lack of bias through the establishment of standardised procedures. A-2 consultants were responsible for the organisation of these workshops and the establishing of templates and procedures. A-2 acknowledge that a large quantity of time needed to be spent on process development.

4.5 Qualification round
In parallel to the creation of the working groups and requirements, there was a qualification round for vendors to compete in the competition. Publication of the intention to procure took place throughout the European community, to ensure that all potentially interested parties could apply for participation in the competition. An announcement was also made in the European public procurement journal: Tenders Electronic Daily (TED). The suppliers were provided, in accordance with the provisions of the Funding Opportunity Announcement (FOA), 30 days to prepare their application. There were 26 responses to the call in total, three for the EPJ/PAS (EHR) system. Bidders were allowed to have subcontractors, although the main contractor would be responsible for meeting the contract so it did not prove a popular option. At this time a procurement protocol was also put in place.

Qualification of vendors was established through eligibility criteria. An evaluation of whether the vendor was qualified to apply for the competition was also applied. This reduced the number of bidders. If this evaluation was successful, they were allowed to demonstrate their solutions for three hours with use cases created by the project teams. For the EPJ/PAS they were allowed to demonstrate the system for eight hours following a demo script with use cases created by the project teams and based on discussion with the reference committee and working groups. The script was used to ensure that relevant issues were tackled. This demonstration began the negotiation process.

After the demonstration, the first round of negotiations took place. Following these negotiations, and after receiving credit reports on the vendors, a selection round then ensued. This reduced the number of bidders to 15 in total, two for the EPJ/PAS system. There were then clinical visits to reference hospitals by the selected vendors.
4.6 Negotiations

In April 2010 the requirements were finalised. There were more than 2,000 requirements in total. Bidders were provided with the tender documents and invited to make an offer. Vendors were given six weeks to prepare their offers. Bidders presented their offers and the first round of negotiations for qualified bidders ensued. Bidders were asked questions on their offers by the procurers, which included representation from the working groups. Working group leaders went through the offer documents and provided feedback to the vendors on the areas in which they could improve. Feedback was accompanied by a disclaimer informing the bidder that the feedback provides no guarantee that they will win the bid. These negotiations and feedback were crucial for ensuring the vendors had a clear understanding of what the procurers want as well as serving as reassurance to the procurer that their needs were being met.

Figure 10: Number of bidder applicants and number of qualified bidders who made offers

<table>
<thead>
<tr>
<th></th>
<th>1 EPJ/PAS</th>
<th>2 X-ray</th>
<th>3 LAB</th>
<th>4 Requ. LAB</th>
<th>5 Pathodology</th>
<th>6 PACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of applications</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Number of offers</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

There were four rounds of negotiations. By the fourth, and final round, of negotiations the number of bidders had once again been reduced through evaluation of offers. For this final round bidders were scored on four criteria, these criteria were provided to bidders in advance to allow them to prepare. The strategy behind the decision to provide bidders with the criteria before the negotiation meeting was for optimisation of the offer; the bidders’ adjustments to their offers, in order to meet these criteria, would raise quality aspects in line with the procurers’ needs. These alterations by bidders to their offers were not enforced but vendors were aware that in order to win the bid they would have to meet these criteria as far as possible. The same effect occurred with the detailed feedback provided by the working groups throughout the negotiation rounds. This feedback was comparative and so the bidders were aware of their position in relation to the other bidders throughout the process and so improved their offer in order to match the competition.

4.6.1 Responsibilities in negotiations

In the negotiation process different persons had responsibility for different parts of the specification. For the functional part of each competition the negotiations were conducted by a representative clinician and this person was responsible for formulating specific questions to the various suppliers. Such an approach has two advantages: it ensures a high degree of ownership of the outcome of the negotiation process as well as ensuring accuracy by utilising the person with the greatest knowledge of such activities to seek understanding and clarification of the vendor’s response. The same principle was applied in other parts of the specification such as technical, administrative and commercial. But these three areas were considered in the context of realising functional needs.

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29 Ibid.
The following persons participated in the negotiation Phase.

**EPJ/PAS (EHR):**

Anne Anderssen (evaluation leader), University Hospital of Northern Norway Trust/ Internal ICT

Susann Backstrøm (Support, Functional req.), University Hospital of Northern Norway Trust

Bjørn Nilsen (Commercial and strategic responsible) (Northern Norway Health Authority)

Tore Magnussen (A-2)

Frank Fredriksen (Implementation/maintenance), Internal ICT

Ronny Thomassen (Technical), Internal ICT

**Laboratory and Electronic requisition:**

Åshild Halvorsen (evaluation leader), University Hospital of Northern Norway Trust

Bjørn Nilsen (Commercial and strategic responsible) (Northern Norway Health Authority)

Gudleif Aronsen (Technical), Internal ICT

Stian Halvorsen (Implementation/maintenance), Internal ICT

Bjørn Børresen (A-2)

**Pathology:**

Inger Tranung (Group leader), (support: Åshild Halvorsen) University Hospital of Northern Norway Trust

Bjørn Nilsen (Commercial and strategic responsible) (Northern Norway Health Authority)

Gudleif Aronsen (Technical) Internal ICT

Stian Halvorsen (Implementation and maintenance) Internal ICT

Bjørn Børresen (A-2)

**Radiology Information System and Picture Archiving System:**

Trine Skjeflo (Evaluation leader), Nordland Hospital Trust

Truls Wright Nilssen (Functional), Helgeland Hospital Trust

Ingunn Skjervold (Functional), University Hospital of Northern Norway Trust

Bjørn Nilsen (Commercial and strategic responsible) (Northern Norway Health Authority)

Stian Halvorsen (Implementation and maintenance), Internal ICT

Bengt Pettersen (Technical), Internal ICT

Bent Gjøstøl (A-2)

Corporate lawyer, Ann Elisabeth Rødvei and external lawyers did not participate directly in the negotiations but quality assured contracts during and after the final negotiations.
A2 facilitated the practical aspects of the process in the various competitions and coordinated participants and their exchanges.

4.7 Evaluation and selection

Once the final offers had been submitted an evaluation process was undertaken based on the four criteria presented earlier. The working groups’ recommendation on the bidder selection was presented to the steering committee for approval. In February 2011, following approval, this selection was then made public and a quality assurance process was carried out. The reasoning behind choices was provided in extreme detail in order to avoid complaints of unfairness. This task was simplified by the rigorous documentation of the process facilitated by A-2 consultants. Feedback was then received from bidders on the selection process and the opportunity to present any complaints regarding the procurement process was provided. However, most parties agreed that a fair and rigorous process had been employed.

DIPS was selected as the Vendor for EPJ/PAS (the EHR). The decision behind their selection is based on their scoring against the four criteria specified in the final negotiation round:

- Solution quality and fitness (43%) DIPS ranked first
- Quality of the management services (22%) DIPS ranked second
- Quality of project services (13%) DIPS ranked first
- Total rates (22%) DIPS ranked first

4.8 Contracts

In March 2011 the contracts were signed. There was a master contract which held the 6 different service contracts together and individual service contracts. There was also contracts for maintenance, future training, upgrades, documentation and roadmaps. The length of the contracts is eight years, excluding the maintenance contracts which are longer. The procurers have deemed this too short a contract length for the type of solutions involved and the amount of time and resources invested in the process.

Requirements are set for each contract from the view that specific requirements are necessary in order to ensure targets are met. Each working group was responsible for different areas of the contracts. Each working group had a list of documents that they had to provide for the contracts and these documents were then checked by other working groups. The most important area for requirements was integration.

Helse Nord has, with one exception, used purchase agreements in the procurement of the new systems for the following reasons:
- Allows for a longer duration of the agreements
- A greater degree of strategic partnerships with suppliers
- Facilitates a greater degree of standardisation
- Expect better commercial terms
- For the procurement of clinical systems purchase agreements was used across the whole region.
- Site-agreements - The agreements should not have production limitations that hinder the utilisation

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of the systems in clinical practice.
- Important framework conditions for the use of the principles of service orientation (SOA).

4.9 Investment

The acquisition of the clinical systems and safeguarding of investments for necessary purchases is financed by Helse Nord’s investment budget. Around 19 million NOK, approximately 2.6 million Euro, was used for the completion of the procurement process. This investment cost is due to contracts entered into. The total investment cost for the region as a result of contracts entered into at the conclusion of the procurement process is estimated at 350 million NOK, approximately 47.1 million Euro, spread over a 4 year period. In addition, investments in existing systems, infrastructure and the establishment of new computer labs, testing and training environment have also been taken into account. These investments are handled as part of Helse Nord’s annual budget process.

The entire procurement process spanned two years, from spring 2009 until spring 2011. Although the desire for a shorter process is an impression gained from both procurers and vendors this project is comparably short when looking at similar investments in other countries.

4.10 Future developments

The development of this procurement process has not only proven valuable to Helse Nord in terms of effectively securing new clinical systems, but it has also created a platform which future procurements can build on.

Helse Nord is now presenting to the other health regions, the requirements specifications drawn up, so that the results from Helse Nord can be further developed and improved in other regions. These presentations, therefore, are aimed at adding to the continuous improvement of specialist health care through the sharing of experiences and results. If other regions choose the same vendors, Helse Nord will receive other regions’ improvements in terms of new functionality through continuous development of suppliers’ systems.

5. Outcomes and lessons

The adopted negotiation style allowed the procurers to gain advantages in solution quality and to manage the market. The increased competition through informing bidders of their comparative position and providing them with assessment criteria coaxed further improvements from bids.

These negotiations and feedback were also crucial for ensuring the vendors had a clear understanding of what the procurers want. This also serves as reassurance to the procurer that their needs are being met. When such reassurance is in place a relationship of trust can be built which improves negotiations and is vital for the working relationship post procurement exercise.

The inclusion of hospital staff, and thus potential users, in the working groups during the negotiation phase, in the reference committee or through consultations was crucial to the success of the project. Not only from the point of view that their experience can be drawn on for creating functionality requirements but also for establishing the culture of change that is necessary for the long term improvement of quality in the region. The inclusion of these people within the project has a two fold benefit, not only are they able to create meaningful requirements but they have become ambassadors of the system and will lead the coming change processes.
Strong leadership is important. The involvement of the director of Helse Nord throughout the process has given strength to this culture change mission. The same is true of the involvement of the directors of the five health trusts, which ensured that the change message was taken seriously and by all parts of the Helse Nord region.

Another effective tactic was the division between strategic and operations management. A-2 consultant Bent Gjøstøl acted as the front-of-house operations manager, while Helse Nord IT director, Bjørn Nilsen took care of strategic matters. This division allowed the operations manager to focus on the day-to-day issues whereas the IT director was able to observe whether strategic goals were being met and prompt the operations manager when they were not. The inclusion of the strategic context and its long term implications and goals proved an extremely effective tool for project management and motivation.

Professional project management has been an effective tool in the Norway case. A-2 consultants have experience from complex procurement and IT-implementation projects in the Nordic countries, as well as experience in the different stages of a project of this nature. They were also aware of the needed for developing good workgroups/negotiation teams across processes and the positive effect of using standardised templates and procedures in a procurement so large and complex. By these methods and their experience the required detail and consideration was applied but the pace of the project maintained.

The time taken in educating staff about procurement regulations was crucial as without staff awareness the procurement could breach legal constraints and the entire process would be deemed a failure, money wasted and a new process has to be engaged.

One challenge however, is the length of the contracts which at eight years is the longest allowed. The procurers have deemed this too short a contract length for the type of solutions involved and the amount of time and resources invested in the process. For eHealth procurements such as EHRs where the life span can be up to 15 years, the restriction of almost half that time suggest a redundancy of effort.

Another challenge is the difficulty of an organisation establishing their own proprietary standards for integration as the supplier industry can do little to offer this type of integration to other customers in the market. It is therefore important to base integrations on the adopted national architectural or content standards.

Improving service quality as the motivation for an investment rather than the drive to stay technologically up-to-date served Helse Nord well. The investment was easily defended and users were convinced of the value of the investment and accepted the consequential changes it would bring to their working life as the project was approached from a clinical standpoint.

For an overview of the Northern Norway EHR project’s steps to a successful procurement model see the figure below.
6. Generalisation of lessons

Many factors contribute to successful procurement. However, integration of all factors can guarantee a successful procurement:

- Quality should be the motivation for investment in an EHR and guide the procurement process.
- A long term strategic context with clear goals needs to be in place in order to maintain motivation, ensure project success and gain user acceptance. Culture change is a prerequisite for the procurement to be effective. Procurers can lead the market to their advantage by asking for commitment from bidders to a development path.
- Procurers can raise the performance of bidders, and thus gain better offers, by providing information to bidders e.g. feedback and performance scores.
- User requirements need to inform culture change to gain acceptance.
- User informed specifications are required for ensuring the solution is effective in practice, particularly functional requirements which should govern the procurement. However, it must be ensured that the functional requirement specifications are in line with the overall target image and within acceptable financial constraints.
- Maintain a dialogue with bidders throughout the process to ensure understanding and thus the production of a rewarding solution.
- Ensure the resources for procurement, especially the process of determining user needs, are sufficient and timely.
- Build flexibility into negotiations and contracts to create security for future developments and raise the value of the current investment.
• It is necessary to maintain pace; a fast pace uses a high volume of resources but maintaining pace contains costs on both sides

• A stable, successful, overall medium term financial performance enables sustained eHealth investment

• Base integrations on the adopted national architectural or content standards so as to ensure a willing supplier can be found
7. References


Vorland L.H. Direktørens fredagsbrev [Director's Friday Letter]. Bodø: Helse Nord RHF.