

A new settlement system at Norges Bank

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Norges Bank is one of the first central banks to have outsourced the IT operation of its settlement system and implemented a second-generation settlement system based on off-the-shelf software from an external vendor. The primary purpose was to ensure continuously stable operation of a system of critical social and economic importance. The outsourcing contract was signed in 2003, and the new system went live on 17 April 2009. In the two years the new settlement system has been in operation, operational stability of the system has been 100%. The changeover has reduced Norges Bank's costs associated with providing settlement services significantly. This article describes the processes and some of the tradeoffs and challenges that arose in connection with the changeover. We also discuss relevant issues and strategic choices relating to the use of external vendors and highlight a number of risk factors associated with the outsourcing.

1. Background

Norges Bank is responsible for promoting robust and efficient payment systems as part of its work to ensure financial stability. The payment system is an important component of the financial infrastructure and efficient, stable and accessible systems are essential for a smoothly functioning economy. Norges Bank may be viewed as the bankers' bank in that banks can make deposits in and borrow from the central bank and execute payments with settlement in central bank money. These functions are performed in a settlement system, the primary function of which is transferring funds from the account of any participant bank to that of any other bank. An essential precondition for financial stability is that the interbank systems are designed in such a way that banks' settlement risk is manageable and that any problems in one bank do not spread through the system to other banks (cf. CPSS (2000)).

Like a number of other central banks, Norges Bank introduced a real-time gross settlement system (RTGS) in the 1990s, enabling fund transfers between participant banks and to and from the central bank on a continuous basis with final settlement. Previously, all transactions were accumulated over the course of the day and funds were only transferred between banks' accounts after end of opening hours. This entailed some uncertainty as to whether settlement would be executed, as there was always a possibility that a bank might become insolvent while payments were in transit before settlement.

The core of the first settlement system, developed in the 1990s, was a standard banking system for keeping

accounts and payment services for ordinary bank customers. The system was purchased for use in connection with Norges Bank's function as the government's bank. Subsequently, private banks took over the task of providing payment services to government agencies.

In the same period, greater attention was paid to the risk inherent in financial infrastructures, with international recommendations for risk-mitigation measures, including introduction of real-time functionality in central banks' settlement systems. Norges Bank's in-house IT department incorporated real-time functionality into the system as well as arrangements for balance checking before payment orders were posted.

The system's functionality was thus in line with international best practice and complied with international recommendations (cf. CPSS (2000)). System users were also generally very satisfied with its user-friendliness. Nevertheless, several factors suggested that Norges Bank would eventually have to find alternative system solutions. Continued use of proprietary software appeared to be too risky in the long run. For that reason, Norges Bank decided to prepare the introduction of alternative operating and system solutions before the existing systems became outmoded and the risk of disruptions became too high.

Section 2 below describes the rationale for the choices Norges Bank made in establishing its strategy to outsource the settlement system. Section 3 describes the process for selecting an external operator for the system and the background for outsourcing the operation of the system before the software was replaced. Section 4 is a review of the main activities of the project to replace the settlement system software and a description of a framework for collaboration with the banking industry. Section

¹ Kjetil Watne served as project manager for the work to put in place a new settlement system. I am grateful to Qaisar Farooq Akram, Casper Christophersen and Svein Nygård for useful comments. Views expressed in the article represent the opinion of the author and may not be construed as expressing the views of Norges Bank on various issues.

5 summarises Norges Bank's experience of outsourcing, the changes replacing the software has entailed and how this has affected the operational stability of the settlement system. Section 6 outlines some of the challenges we faced during the procurement processes, while section 7 describes a number of issues arising when multiple external providers were involved. Section 8 concludes the article with some observations on how operational risk in the settlement system is affected by the outsourcing.

2. Norges Bank's strategic choices and clarification of principles

Since the 1990s, Norges Bank has increasingly focused on its core activities: financial stability and monetary policy. A major restructuring has taken place and non-core tasks have been phased out or outsourced. Even though promoting an efficient and robust payment system is a core activity by virtue of Norges Bank's function as the ultimate settlement bank, the actual IT operation of the settlement system need not be performed by Norges Bank. The operation and development of the settlement system can, for example, be provided by external IT companies on commercial terms.

However, independently of the organisation of the technical IT operations of the system, Norges Bank must make sure that the system is updated in accordance with best practice and needs and designed for high operational reliability. An external company with IT operations as its core business might be in a better position to build up and maintain broader technical expertise than a relatively small in-house IT department within the central bank. Outsourcing can thus improve operating stability and reduce costs. On the other hand, it will be more difficult to control external providers' resource use and priorities with regard to troubleshooting and upgrades compared with an in-house IT department. The risk of being treated as a low priority customer may be greater, the smaller the share of the provider's overall business the service required constitutes.

Regardless of operational solution, it is essential to be able to monitor stability, control products and services and secure expertise for dealing with non-conformance. This may be more of a challenge in an outsourcing model. These are factors that must be addressed in contracts with and ongoing follow-up of the external services provider.

Considerations of "a bank-based model"

In line with the policies of other central banks, Norges Bank has been charging banks for settlement services since July 2001. Prices have been raised gradually so that they now fully cover Norges Bank's estimated costs for settlement services. As banks are charged for settlement services, Norges Bank is of the view that they should also be

involved in discussions on functionality and development of the system. In 2002, before work commenced on outsourcing the settlement system, Norges Bank invited the banking industry to participate in a task force to consider adjusting the definitions of responsibility between banks and the central bank. The task force considered a "bank-based" model, in which banks, through NICS (Norwegian Interbank Clearing System), could perform more of the functions connected with transaction processing that are normally executed by the central bank settlement system. The actual account keeping of bank deposits and loans and related control routines remain the responsibility of the central bank also in a bank-based model. To learn more about bank-based models, Norges Bank examined how settlement services were provided by the Bank of Canada and the Swiss National Bank. At these central banks, settlement functions are organised in collaboration with commercial banks, with settlement executed in systems owned or controlled by banks. However, the central banks have influence through representation on the boards of the entities responsible for the systems.

Following a thorough examination by the task force of various alternatives for a bank-based model, the banking industry stated that the banks would not be interested in assuming more responsibility for interbank settlement. One argument was that it was not substantiated that such a model would entail overall cost reductions, and that the model might increase banks' liability and hence risk. The changes involved in implementing a bank-based model required changes in the private clearing system that would be substantial and costly. On this basis, Norges Bank concluded that a bank-based model would not be given further consideration.

Upgrading strategies

Starting with the principle of maintaining the existing lines of responsibilities between Norges Bank and the private banks, Norges Bank examined various alternatives for replacing IT systems and establishing external operational solutions. Simultaneously replacing the settlement system and moving operations was deemed too risky for such a critical and complex activity. Thus, two primary alternatives remained for carrying out the strategic decision to outsource the settlement system:

- First outsourcing operations from Norges Bank to an external service provider, then replacing the software
- First installing new software at Norges Bank, then outsourcing operation of the new system to an external service provider

Norges Bank placed particular emphasis on each alternative's ability to maintain high operational stability

during the entire changeover phase. The conclusion was to first outsource IT operation of the existing system to an external provider, and then replace the software after the outsourcing process was completed. To reduce the risk of disruptions and failures in the system, and thereby ensure stable operation, only absolutely necessary modifications to the systems were made during the outsourcing period.

3. Selecting the external service provider

Tendering processes of this kind in Norway are subject to public procurement rules, which emphasise transparency and a level playing field for relevant service providers. However, for reasons of system security, Norges Bank could not publicly disclose all the system specifications. Therefore, Norges Bank sent a request for proposal containing an overall description of the tasks and functions covered by the outsourcing contract directly to selected IT service providers. Five service providers were considered potential bidders based on the following criteria:

- Expertise in operating business-critical systems on the settlement system's technology platform (IBM mainframe).
- The possibility of implementing a transfer of undertaking, involving systems, infrastructure and personnel.
- Familiarity with and experience of the Norwegian payment system.
- The ability to implement and maintain the software, with a view to replacing systems and system architecture further ahead.

Relevant candidates received detailed specifications after signing confidentiality declarations and documenting procedures for the ability to handle critical documents confidentially.

Norges Bank announced that price would only be one of a number of factors considered in the selection of service provider. This is because operation of the settlement system is of considerable social and economic importance and involves numerous risk factors. Risk is particularly high when operations are moved to a new production site. The selected service provider was expected to play a key role in a subsequent software replacement once the outsourcing process was completed. Another important objective of outsourcing was to reduce the risk posed by the very limited and declining number of system experts with detailed knowledge of the software. The invitation to tender stated that bids would be assessed according to the following criteria:

- Evaluation of the provider, business model and organisation
- Operating solution and migration of operations
- Risk and vulnerability
- Costs and overall efficiency
- Terms and plan for the transfer of personnel
- Plan for upgrading of the software.

Norges Bank received four bids and negotiated in parallel with the two bidders that were ranked highest after an initial review. In the negotiations, Norges Bank focused on the service provider's ability to ensure proper migration of the systems and requested details on how the provider would ensure that key experts from Norges Bank familiar with the systems concerned would continue to be available to maintain the software and develop the software according to Norges Bank's needs. The operating solutions being considered would also have to meet strict security requirements.

The bid from Ergo Integration AS (subsequently reorganised as ErgoGroup AS and finally merged with EDB Business Partner ASA to form EDB ErgoGroup ASA) was ranked highest. Norges Bank's Executive Board and Supervisory Council approved an outsourcing contract with Ergo Integration on 13 June and 19 June 2003, respectively. The company assumed responsibility for operation and service provision from the system (using hardware that was still on Norges Bank's premises) as well as responsibility as employer for the relevant staff as from 1 September 2003. Ergo Integration then used the period until 1 March 2004 to gradually migrate operation of relevant software to new hardware on its own premises.

Prior to the outsourcing, a special IT department at Norges Bank responsible only for the settlement system had a staff totalling 39 persons. Of these, 26 employees were transferred to Ergo Integration as part of the outsourcing contract. Four IT staff continued in a new unit at Norges Bank responsible for following up the provision of IT services. Furthermore, the service provider was obliged to establish a dedicated core team of nine employees from Norges Bank with special responsibility for the outsourced systems and following up the provision of the services to Norges Bank. This was important for maintaining and developing expertise regarding Norges Bank's systems in order to ensure operating stability and provide resources for trouble shooting and system development.

4. Replacement of the settlement system software

Once the outsourcing process was completed and the settlement system was in operation at Ergo Integration, a plan was developed to replace the RTGS software.

The system was approaching the end of its expected life cycle and the settlement functions were technically and functionally integrated, both with other Norges Bank IT systems and with the systems in NICS. This complexity entailed excessive risk especially in the event of changes.

In August 2004, Norges Bank established a project called “NIBO – Nytt InterBank Oppgjørssystem” (New Interbank Settlement System). The task of the project was to prepare the procurement of a new standard settlement system and put it into operation on the external service provider’s premises. The project was divided into the following three phases:

Phase 1: Preparation of the Request for Proposal with specification of requirements.

Phase 2: Evaluation of bids and negotiation of contract.

Phase 3: Implementation and migration to the new system.

4.1 Phase 1: Preparation of the Request for Proposal (RFP)

Standardisation and simplification

The new system was required to be based on purchases of off-the-shelf software packages with standardised interfaces for data communication with external systems. With regard to networks for the exchange of messages between the system and its users, the standards and services provided by SWIFT were considered to be the most widely used in the financial sector domestically and internationally. In addition, the system was to be flexible with regard to modifications and should be cost-efficient in operation, even with requirements for extreme operating stability and a high level of security. Any need for special adaptations to Norwegian conditions was preferably to be addressed in modules “outside” the software to be used for the standard RTGS functions.

Statutory requirements for the procurement process

This procurement process was also subject to public sector procurement rules and processes, including those pertaining to transparency in the tendering process and competition between the bidders. Nevertheless, to ensure proper handling of information that was confidential for security reasons, distribution of detailed system requirements could be restricted according to certain criteria. For that reason, relevant bidders with experience in providing settlement systems to other central banks had to prequalify before receiving the RFP. The invitation to prequalify was publicly announced. In the prequalification, Norges Bank assessed the bidders’ procedures for handling confidential information and reviewed similar deliveries and service provisions to other central banks.

Only prequalified bidders received the detailed specification of requirements in the RFP.

Specification of requirements

The specific requirements for the software related to areas such as functionality, security, accessibility, technology and user-friendliness. The requirements were drawn up to strike an appropriate balance between, on the one hand, establishing requirements that the standard systems could realistically meet – Norges Bank wanted an off-the-shelf system and not a new, custom-designed one – and, on the other, meeting the real needs of the participating commercial banks and Norges Bank. Although the Norwegian banking industry was very satisfied with the old RTGS system, Norges Bank’s ambition was that the new system would be perceived as even better. At the same time, the central bank took the opportunity to review the basic principles determining the functionalities a settlement system should have. In this connection, a stakeholder analysis was performed to identify the needs of banks and those of the various departments at Norges Bank that use the settlement system or receive information from it.

Some organisations with in-house developed IT systems tend to keep adding new functions into the same system to meet new needs, regardless of strategic decisions and priorities concerning the kind of functions the system actually ought to perform. Norges Bank’s settlement system was modified in this way over time to handle a variety of less important functions not always related to RTGS functions. This creates a risk that disruptions in the less important functions could affect the stability of core functions, causing errors or disruptions in the important settlement engine. The goal was to design the new system to avoid or reduce such risk.

In parallel with the work to specify system requirements, potential standard settlement systems were identified and information was obtained to provide an overview of the functionalities these systems normally have.

Separate procedure for the central government’s consolidated account

Under the Norwegian government’s financial management regulation, government agencies’ surplus liquidity must be transferred from banks that provide payment and other banking services to government entities to the central government account in Norges Bank on a daily basis. Nor are government agencies allowed to be in a loan position overnight.

The former settlement system featured an account structure for calculating interest and liquidity functions for government agencies. It became clear early on that off-the-shelf systems in the market lacked a satisfactory account structure for this purpose. For that reason,

Norges Bank initiated a separate project to engage another supplier to provide services relating to the central government's consolidated account separate from the new settlement system. A separate procurement procedure was carried out and a new solution for consolidated account functions was implemented in November 2006. In the new solution for consolidated account services, the central government's surplus liquidity is transferred between banks that perform account services for the central government and the central government's account in Norges Bank in the same way as interbank payments, i.e. through accounts in the settlement system.

Request for Proposal from qualified bidders

The invitation to tender for the settlement system was sent to prequalified bidders on 20 May 2005. The closing date for submitting bids was 27 June 2005, i.e. according to the five-week time limit specified in EU procurement rules. The invitation to tender defined a number of elements to be described in the offer, as well as requirements on how to structure the offer. This was introduced to facilitate review and evaluation of the bids. Norges Bank included a draft service provision agreement and maintenance agreement that bidders could comment on, along with any reservations with regard to the content of the agreements.

4.2 Phase 2: Evaluation of bids

The tenders were relatively extensive and the system requirements contained compact descriptions of complicated matters. Bidders were therefore invited to submit any questions they might have regarding the invitation. Ambiguities or misunderstandings in the invitations to tender or system requirements discovered in this way were distributed to the other bidders to ensure a level playing field. Norges Bank received all four bids by the closing date.

Bids were evaluated based on the seven following criteria, as described in the invitation:

- 1) Compliance with functional, technical and security requirements, and Norges Bank's assessment of degree of compliance.
- 2) Fees, including a fixed price for implementing the system, annual licence fees for using the system, annual support and maintenance fees and charges for any consulting services and training of new employees in using the system.
- 3) Norges Bank's evaluation of the bidder's plans for implementing the system and assumed capability to deliver the system in question, including qualified personnel, and capability of providing maintenance services during the expected lifetime of the contract.

- 4) Norges Bank's evaluation of costs of system implementation for parties other than the bidder.
- 5) Norges Bank's evaluation of the bidder's references and presentation of the offered settlement system.
- 6) Norges Bank's evaluation of the bidder's ability to develop the system in line with Norges Bank's needs.
- 7) Norges Bank's evaluation of the bidder's solvency and financial position.

The provider was required to have experience in implementing similar systems in other central banks. Norges Bank also wanted the provider to be responsible for implementing the project plan for the new system, and therefore required the bidder to provide the main project manager.

Following an overall assessment using the aforementioned criteria, the two bidders deemed the best were invited to parallel negotiations. After negotiating for some time, one bidder emerged as the best, and a vendor contract was signed with the Italian company SIA SSB S.p.A. on 3 March 2006. On the same date, project phase 3 began with the practical implementation of the new settlement system.

4.3 Phase 3: Implementation project

Organisation

The implementation project was undoubtedly the most complex project phase, with the highest risk of failure and the most serious consequences if the quality of the delivered software or service was unsatisfactory. A number of parties, external as well as within the central bank, would be affected by the system changeover. All parties concerned needed to be involved in the project. Most of the project participants at Norges Bank normally worked in the Interbank Settlement Department, which is the system owner of Norges Bank's Settlement System (NBO), but the Department for Market Operations and Analysis, the Accounting Department, the IT Department, the Legal Department and the unit responsible for IT security were also involved. Moreover, external experts were engaged for tasks such as test management, security reviews, negotiation processes and quality assurance. Furthermore, ErgoGroup was engaged to deal with technical IT matters, such as installing the new hardware and IT infrastructure that would be the new system's operating platform. Around 40 employees from Norges Bank were involved in the project to varying degrees for shorter or longer periods. Of these, up to ten employees were involved virtually full-time on the project over a longer period.

The specification of requirements was relatively detailed, listing over 500 separate requirements. Never-

theless, a more detailed specification was needed to describe how each requirement was to be met in the new system, and Norges Bank had to verify that the provider properly understood the significance of the requirement. This specification was done in workshops where the provider went through the individual requirements together with Norges Bank and various proposed solutions were considered.

Even though the core functionality of settlement systems is fairly similar across different countries, there may be differences in the way central banks perform a number of functions. Thus, adaptations will be needed, even when a standard system is used. In the case of Norges Bank, this applied in particular to the format for data transferred to the accounting system. The F-loan facility (fixed-term loans to banks) used in the conduct of monetary policy is also particular to Norges Bank. Further, the execution of the settlement of the cash leg of securities trades needed a special arrangement. Lastly, the framework for pledging collateral for banks' borrowing from the central bank and the Scandinavian Cash Pool, a special arrangement between Norges Bank, Sveriges Riksbank and Danmarks Nationalbank whereby banks may use deposits in one central bank as collateral for loans in one of the other central banks, required a specially developed technical solution.

Extensive testing

The project's testing programme was constructed as a "step-by-step" process, whereby test scenarios as well as participation, both internally and involving external parties, were gradually expanded, with testing of the fundamentals first. Thus, the initial test cycle was an internal functional test at Norges Bank. Several internal test iterations were necessary, to assure the quality of the software before external test participants could be involved. Once the quality of the software was satisfactory, the largest banks and the Norwegian Interbank Clearing System (NICS) also participated. After that, all banks were involved, and finally all the parties concerned participated in a system test that simulated actual production as far as possible. The final test cycle also included implementation of corrective procedures to deal with the most probable errors.

Norges Bank also performed stress tests to verify the ability of the system to deal with high transaction volumes and even unauthorised access. The tests revealed that the system was capable of processing a substantially higher number of payment transfers than the normal transaction volume. During the tests, 20,000 transactions were processed in the course of an hour, while normally around 1,200 payments are posted each day. Experts with "hacker skills" were engaged to test whether unauthorised

persons could gain access to the system. The security arrangements put in place resisted attempted attacks and the experts failed to penetrate it.

Migration planning

The activity with the highest risk level and with the greatest consequences if it failed was the actual migration, i.e. the operational changeover from the old system to the new one. This can be done in several ways. The alternatives Norges Bank considered were:

- Gradual changeover to the new system software
- Pilot operation for selected users
- Parallel operation of two systems over some period, or
- Changeover for all participants at the same time and full operation of all functions in the new system from day one (a so-called "Big Bang").

Since the primary function of the settlement system is transferring funds from any participant bank's account to any other bank's account, Norges Bank concluded that neither parallel operation nor a pilot production involving only some banks was an option because this would require banks to maintain accounts in both the old and the new systems, with complicated transfers of data between the systems. Thus, the most practicable alternative was for all banks' accounts to be moved to the new system and for all functions to go live simultaneously. However, the phrase "Big Bang" was quickly dropped because of obvious negative associations. The plan was for a seamless, problem-free changeover to the new system.

Such a migration strategy can be a challenge because all system components must function as intended from the very start and all participants must be well prepared for the changeover and have adapted their systems accordingly. For that reason, various contingency arrangements to deal with a situation where this was not the case were considered. We explored the possibility of developing a pre-system to convert payment orders sent in "the old way" to the new format required for the new system. The intention was that it might be a contingency solution to handle payment orders from banks that discovered flaws in their new solutions and were thus forced to revert to the old system. This contingency solution was considered to be too complicated to substantially reduce total risk. For the solution to be realistic, it would have needed extensive testing. Furthermore, the costs for the necessary development of the pre-system software were deemed disproportionately high. Moreover, the risk associated with using a contingency solution of this sort in the event it should be needed was considered to be so high that this option was shelved.

As the new software required a new technological platform, the operating services provider needed to purchase new hardware for the settlement system. The extensive testing of the new system was done on the hardware to be used later in production – and not in a separate testing environment. In this way, all technical and functional aspects were thoroughly tested and the risk linked to the technical start-up of the new system at Norges Bank was very limited. However, a critical factor was entering data on all banks' accounts in the new system, including end-of-day account status on the day prior to start of production. Around 140 banks had accounts in Norges Bank and, due to the limited amount of data, manual capturing of new balances was preferred over automated conversion. This had to be done immediately after the old system shut down in the afternoon. The processes for recording data were practised several times in advance so that the operators were well prepared to record data within the limited time available.

Migration day on Friday

Following thorough analyses internally and with the parties concerned, Norges Bank decided that the new system should go live on a Friday. Normally, large-scale IT system conversions of this sort take place on a weekend, with the first day of production on a Monday. The weekend can thus be used to prepare the changeover and reverse it if defects are discovered and the conversion cannot be implemented as planned.

The main reason for Norges Bank's decision to migrate on a Friday were that most of the preparations for migration could be done on the days prior to migration and that operations that had to be performed in the old system after shutting it down on Thursday evening were relatively limited. This was largely because a completely new infrastructure was put in place for the new system, and very few elements of the old solutions would be reused in the new system. If the system failed during the first day of production, it might be useful to have an entire weekend to identify the cause of the defect and correct errors.

In accordance with the migration plan, the parties reported on progress on specific preparations for migration to Norges Bank at set times on the days before the actual system changeover. 8:00 pm on Thursday, i.e. the evening before the first day of production in the new system, was defined as the *point of no return*. This means that if a decision was made at that point to proceed with the migration, migration would continue virtually regardless of any error that might occur. The reason that reverting to the old system was not an option after passing the point of no return was that the clearing systems, including the Norwegian Interbank Clearing System (NICS)

and Norwegian Central Securities Depository (VPS), would have started preparations for data processing of payment orders to be settled the following day. It was too risky to stop these processes once they were started. In accordance with the migration strategy, any errors or problems arising after the point of no return were to be dealt with by corrective procedures and contingency solutions in the system of the participant where the error occurred.

Norges Bank benefited greatly from two practice runs of the migration plans. In the second practice run, the largest banks and data centres took part, with activities corresponding to those during the actual migration.

4.4 Involving the private banks

Since banks are charged for settlement services, in autumn 2004 Norges Bank invited the banks to a working group to take part in drafting the specification of requirements. In winter 2005 this partnership was formalised by the establishment of the Banks' Reference Group for NIBO for discussing principal elements and practical issues of the project of significance for the banks. The largest banks, various banking groups, the payment clearing house (BBS) and later also the Norwegian Central Securities Depository (VPS) were represented in the group. Furthermore, a number of expert task forces were established with participation from banks, the BBS and the VPS to solve specific issues concerning details in the new system. For example, the migration was planned by one of these expert groups.

The relationship and coordination with the banks in the various groups was essential for a successful migration to the new system and for making the most of the potential improvements offered by the new system.

Coordination with banks continues in the NBO User Forum, which is Norges Bank's primary point of contact with banks in matters relating to Norges Bank's settlement system.

5. Norges Bank's experiences following outsourcing

Increased stability and cost reductions following outsourcing of IT operations

After a few years' operation, Norges Bank assessed the effects of the outsourcing of IT operations. Except for some minor disruptions in the initial months after the IT operations were moved to the supplier's premises, operating availability has been equal to or even better than in the period of in-house IT operation. To some extent, however, the improvement may have been the result of fewer system changes than before the outsourcing.

Furthermore, outsourcing reduced Norges Bank's costs by around NOK 20 million in the period 2003–2006. This calculation includes all conversion costs, including expenses for redeploying staff. However, the calculation does not include any reductions in the central bank's shared costs after the outsourcing. Included in the total calculation is an estimated NOK 2.5 million in increased development costs following the outsourcing.

Technical and functional changes associated with the introduction of the new settlement system

The banks were very satisfied with the functionality of the old system. Moreover, the system was in line with international best practice. Thus, functionality aspects were not the reason for replacing the system. Nevertheless, Norges Bank took advantage of the opportunity presented by the system changeover to make functional improvements and improve efficiency in various areas.

The old system was technically integrated with the Norwegian Interbank Clearing System (NICS) and there were many different interfaces for exchanging data with external systems. In the new system, communication with other systems is based on SWIFT, which was already widely used in the banking sector. This reduced the need for expertise in several different interfaces for communication and removed an important source of disconnections in the communication with NICS. The new settlement system also has its own information and transaction system (a web client). Previously, information from the settlement system, including account balances and transactions, was available to the banks only through the banks' joint information system. The new transaction system has also replaced telefax for submitting payment orders from smaller banks to Norges Bank. In the new system, all payment orders are submitted electronically – even in contingency situations. This has reduced the risk of manual mistakes and incorrect captured information in the payment orders, as well as enabling reductions in staff at Norges Bank. The new settlement system has also improved monitoring tools for the operators at Norges Bank.

Since the new system is more of a pure settlement system, it has limited functions for correspondent banking, and Norges Bank no longer offers such services. Previously, a number of central banks had an account in Norges Bank and used the central bank as their correspondent bank in Norway. As a consequence of the changeover, most of these central banks closed their accounts in Norges Bank and opened accounts at private banks for the provision of correspondent banking in Norway. Various arrangements for internal Norges Bank accounts were also discontinued. Norges Bank now has all its payment and account services provided by a private bank on commercial terms. Nor does the system include

a function for handling the money market operations conducted by the central bank, including liquidity instruments such as F-loans and F-deposits. These instruments are now handled in another system at Norges Bank even if the settlement of cash takes place in the RTGS system.

The new system has a number of functions to improve banks liquidity management efficiency. There are separate subaccounts where banks may allocate funds for prioritised payments. Furthermore, the system has various forms of prioritising transactions and a *diarising* function to allow banks to submit payment orders for execution at a later date. To reduce the exposure to other participants, banks can also enter limits for the amount of funds they can transfer to other specific banks participating in the settlement system. The introduction of the new system entailed changes in banks' routines and processes, and they have not yet started using all the new functions.

One problem that may arise in real-time settlement systems is the potential for queues of unsettled payment orders if a bank has low liquidity and at the same time has posted a payment order in an amount for which it has insufficient funds while it is due to receive funds from another bank that is pending in the queue at the other bank (a gridlock situation). This may hinder the execution of payments for several banks. To reduce the consequences of such a gridlock situation, modern settlement systems normally have an override function that calculates the total value of transactions in the queues and ensures the execution of settlement of payments for which, overall, there are sufficient funds in participant banks' accounts.

Very stable new software

Operational stability since the new system was put into production in April 2009 has been 100%. However, we have experienced some problems with access to the information and transaction system (the web-client), although this has not influenced the ability to process payments in the system. Norges Bank has previously not recorded such a long period of operational stability.

Furthermore, preliminary calculations also indicated that the replacement of the settlement system has reduced operating costs. As the new system is not based to the same extent on third-party software, total expenses for software licences for the settlement system have also declined. Another result of using standard software is that the IT service provider is no longer responsible for system maintenance. Given the reduction in services, Norges Bank could negotiate a service agreement at a lower price. A final factor is that the new system is based to a lesser extent on manual routines, including those for entering payment orders on behalf of the banks received by telefax, resulting in a reduction of the number of staff on the operational side at Norges Bank.

Reduced control of IT development and maintenance

An issue relating to subcontractors and outsourced solutions for IT systems may be that the owner loses control of development resources it might need for correcting operational errors or when there is a need to conduct a rapid change in the event of e.g. a financial crisis. Like a number of other central banks, Norges Bank implemented extraordinary measures to bolster financial institutions through the financial turbulence in autumn 2008. These measures included a relaxation of the rules for the securities Norges Bank accepts as collateral for loans, issuance of fixed form loans with substantially longer maturities than normal, and arrangements with other central banks that require special accounts in Norges Bank.

Norges Bank's experience of the financial turbulence in 2008 showed that crisis measures could be implemented without technical changes in the software supporting either the settlement system or the collateral management system. However, it cannot be ruled out that any actions to deal with future financial crises will take a completely different form, entailing a need to adapt or modify this system or IT solutions.

6. Challenges associated with the outsourcing strategy

When central banks began to introduce real-time settlement systems in the 1990s, they had primarily been developed by central banks' own IT departments. Eventually, however, some software vendors began to offer off-the-shelf solutions for these systems. These vendors' most important customers have been emerging market economies where central banks had not yet developed in-house systems. Central banks intending to replace proprietary settlement systems, like Norges Bank, have subsequently entered this market. Still, the total market for such systems is relatively limited, with only a handful of companies offering them.

When a central bank decides to enter into a contract with a commercial enterprise on delivery of a settlement system, this might be considered the beginning of a long-term relationship - a partnership of at least approximately the same duration as the system's expected lifetime. Our experiences indicate that a settlement system has a technological lifetime of about ten years. Public procurement rules allow supplier contracts to have a corresponding term. It is also Norges Bank's experience that the costs of the actual implementation of the system is many times higher than the annual fees paid to vendors for maintenance and licence fees, so that the threshold for changing supplier can be very high. Once a vendor has a central bank as a customer, that vendor may expect a reliable flow of licence revenue for a relatively long period after

the contract is signed, without this necessarily requiring much effort after the system has gone live. This can conceivably reduce the vendor's incentive to provide good service and give priority to the central bank.

On the other hand, it would not take long for a vendor's failure to meet expectations to become common knowledge among central banks, reducing that vendor's chances to attract new central banks as customers. The vendor should thus have incentives to provide high quality service and keep the system updated as technology evolves, ensure swift error correction in the event of operational disruption and assist the central bank with enhancements and adaptations. The central bank and system vendor have a common interest in the partnership functioning satisfactorily.

Even though there is relatively broad consensus on the core functions of a settlement system, an off-the-shelf system does not necessarily meet the needs of all customers. For example, central banks differ in the way they conduct money market operations, in their rules for accepting collateral for central bank loans and in the way they organise cash settlement for securities trading, and accounting standards may differ from one country to another. Even though banks in many countries use the global standardised messaging system SWIFT, the standards can be applied in various ways, prompting a need for national adaptations of messaging formats in any event. Different central banks also have different kinds of account holders. Some central banks offer accounts only for banks; others provide payment and other banking services for government agencies or other categories of customers. Even an off-the-shelf settlement system will therefore need to be adapted to a particular central bank's operating framework or practices. Norges Bank underestimated the challenges of adapting the standard system.

7. Demanding structure of external IT providers

Norges Bank's outsourcing model for both the software and IT services for the settlement system has entailed a need for further skills at the central bank. In-house operation and development required an understanding of technology and specific software solutions. Outsourcing has revealed a need to follow up the service provider and vendors and put in place appropriate structures to follow up external parties. Merely having proper user rights described in contracts is insufficient. An appropriate structure for following up the service provider and vendors is probably just as important for operational stability and satisfactory deliveries.

Norges Bank has separate contracts with the system vendor and IT services provider. Both contracts contain

a service level agreement and operational stability provisions for software and IT operations, respectively. There are no agreements directly between the external suppliers. The contracts have been written to eliminate any doubts, insofar as this is possible, about which party is responsible in the event of disruptions or failures. Furthermore, the liability for non-compliance in third-party software deliveries has also been defined. However, in the event of non-compliance, it may be a challenge to identify immediately the cause and thus which party is actually liable. It is important for the external contractors to assist Norges Bank and each other to correct the defect even if liability has not been established.

Norges Bank holds regular separate service meetings with both the IT services provider and the software vendor to follow up deliveries and defects and deal with any corrective actions.

8. Outsourcing alters the risk environment

By outsourcing IT operations of and introducing off-the-shelf software for its settlement system, Norges Bank has substantially reduced the risk of errors and operational disruptions. Norges Bank is no longer dependent on software developed in-house and originally designed for other purposes, or on technical expertise confined to a small number of employees on complex technical aspects of the system. System operation and development are now being provided by specialist undertakings, where functions are performed by a team of professionals expected to have broader IT expertise and who are more qualified to maintain and develop the necessary expertise in this area.

However, outsourcing has brought with it new risks, including those relating to dependencies of the contractors' finances, strategies and priorities of resources and

management attention. For example, the service provider or software vendor may no longer give priority to central banks, or they may encounter financial difficulties owing to failed investment strategies or the loss of customers in other market segments. Following up Norges Bank can be impaired and the company may give lower priority to developing expertise in the area. Strategic changes of this nature may also be the result of an acquisition or merger.

Furthermore, there is a limited market for off-the-shelf software for central bank settlement systems and vendors specialised in these products may encounter financial difficulties and thus problems spending sufficient resources to satisfactorily follow up maintenance and other deliveries or ensure necessary system upgrades.

Lastly, if the IT service provider experiences major disturbances in its infrastructure causing operational problems in the service level to several customers, Norges Bank may, due to the relatively low share of the company's total cash flow, not receive the desired management focus and resources required to resolve the problems.

Even though Norges Bank's experience of the outsourced solutions has been positive so far, and operational stability has been excellent for a long period of time, the need for adjustments to the outsourcing strategy may arise at a later point in time.

References

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