Annual Report

2004

Simula Staff

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Simula Research Laboratory conducts basic research in selected areas within information and communication technology. The main objectives of Simula are to conduct high-quality research, educate graduate students and support the establishment of businesses based on the research it conducts. All research projects are designed with the potential for application.

Annual Report, Simula Research Laboratory 2004

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ISBN: 82-92593-03-9

Translations: Linda Sivesind
Design: virtualena.com
Printed by: Bjerch Trykkeri AS

Will Simula Research Laboratory be accorded the status of a permanent research institution?

Simula's activities are based on a contract with the Research Council of Norway. The contract runs from 2001 up to and including 2010, and it contains a provision which requires that Simula be subject to a mid-way evaluation during the duration of the contract. The goal of the evaluation is to determine whether Simula is making satisfactory professional progress. The evaluation of Simula was conducted in the autumn of 2004. Commissioned by the Research Council of Norway, the evaluation was conducted by a committee consisting of five internationally respected professors who work in Simula's main fields of research. In response to the question of whether to prolong the contract, the Committee writes:[1] *"The Evaluation Committee recommends that the Simula Research Laboratory be funded for the next 5 years."*

Professor Aslak Tveito, Managing Director

Prior to the evaluation, the Board of Simula and its Scientific Advisory Board (SAB) asked the administration to promote the idea of a new 10-year contract for 2006-2015. In its report for 2004, SAB writes: *"However, a new five year period without any prospect of long-term status will gradually erode the invaluable esprit de corps, ethos and team strengths. Ineluctably, as the five years progressed, SRL would lose some of their best researchers and their current ability to focus on significant, long-term research objectives. To avoid this scenario, SAB strongly advocates further investments in order to strengthen the laboratory, to sustain its rapid growth in international prominence, as one of the best ICT research labs in Europe. This ambition is realistic but it evidently requires a new 5+5 contract combined with a gradual increase of the funding in real terms."*

In its report, the International Evaluation Committee discusses this issue and goes a step further by proposing that Simula be offered a rolling 5+5-year contract: *"Furthermore, to ensure long-term continuity, the Evaluation Committee recommends that the Simula Research Laboratory be placed on a rolling 5+5 year contractual basis. An evaluation should be performed at the mid-point of this contract, examining performance and plans for a further ten years. If the evaluation is sufficiently positive, the contract should be extended, so that the laboratory never has less than a five-year planning horizon."*

The autumn of 2004 was also influenced by the development of an IT and Knowledge Centre at Fornebu being on the political agenda in Norway. In 2003, the Norwegian parliament (Stortinget) asked the Government for a status report on the centre at Fornebu. A report was drawn up by Oxford Research. On the basis of that report, the Ministry of Trade and Industry drafted a White Paper. Simula was consulted on the topic by the Storting's Standing Committee on Finance and Economic Affairs, and the Committee visited Simula. In the recommendation[2], the Committee's majority wrote: *"The majority has noted the favourable evaluations of the Simula Research Laboratory, and it favours Simula being granted research contracts for the period from 2006 to 2015."* (Our translation)
Later on, it turned out that the entire committee supported this statement.

'The evaluation indicates that Simula has made an excellent start'

The evaluation indicates that Simula has made an excellent start. One department was rated 'excellent', a second department is well on its way to the same rating, and a third department is also most promising. Given Simula's initial condition, it is difficult to envisage a better result. These excellent ratings are attributable to Simula's highly motivated, focused staff.

The continuation of Simula is currently being discussed by the Research Council of Norway. Naturally, Simula's Board of Directors, Scientific Advisory Board, and the entire staff and administration hope that Simula will be offered a rolling 5+5 year contract in line with the Evaluation Committee's recommendation. The results are on the table; now it is up to the ministries that fund Simula, as well as the Research Council of Norway, to make a decision.

1 The entire evaluation is reproduced in an appendix. It is also discussed on page 16.
2 Innst.S.nr.80 (2004-2005) Innstilling frå næringskomiteen om status for IT- og kunnskapssenteret på Fornebu, desember 2004

Directors' Report 2004

In 2004, Simula Research Laboratory (Simula) consolidated its position as an internationally acknowledged research institution. Simula made new advances in its scientific endeavours, and its strategic focus on research-based innovation has yielded good results.

Simula has grown rapidly since it was founded in 2001. In 2003, it reached its originally planned targets with respect to scientific activity, number of full-time positions and financial parameters. In 2004, an evaluation commissioned by the Research Council of Norway verified that the results of the establishment and growth phases were good. The evaluation was performed by an international committee consisting of five professors from the USA, Great Britain, Sweden and France.

The evaluation describes Simula's scientific quality, operational efficiency, and visibility in the media and society in very positive terms. It confirms that Simula is a research unit that is gaining international recognition, and the Committee's recommendation to the Research Council is that Simula's contract be renewed and that it be granted more long-term funding. The Board notes that the process surrounding the evaluation was well organised by Simula, and is pleased with the favourable conclusions.

Strategic objectives
Simula's strategy for 2003 to 2005 defines three main objectives:
1: To develop research departments that perform research of the highest international calibre;
2: To educate graduate and post-graduate students in collaboration with the Norwegian universities;
3: To encourage commercial spin-offs based on the research done at Simula.

The evaluation confirms that Simula is in the process of achieving the first of these objectives. As for the second objective, the Evaluation Committee considers the number of PhD students to be low in relation to the number of academic staff members. It is therefore recommended that Simula seek more funding from the Research Council or other sources to reach this objective. The Board looks forward to examining this issue more closely in 2005.

In 2003, Simula established a separate Innovation Department to deal with the third objective. That department's efforts were furthered in 2004 by the establishment of the subsidiary Simula Innovation AS, which will also be in charge of the Simula activities that are liable to tax. During the year under review, Simula Innovation's staff contributed to the establishment of two spin-off businesses based on research done at Simula, and worked on several other projects that will be pursued further in 2005.

The Board of Directors notes that the Evaluation Committee was impressed by the quality, thoroughness and enthusiasm demonstrated during the planning of Simula Innovation. The evaluation confirms that cooperation with business and industry can enhance the relevance of Simula's research without sacrificing its status as a centre for basic research.

The Board also points out that Simula Innovation conducted a preliminary project in 2004 that resulted in a large-scale joint research project with Norsk Hydro ASA aimed at developing new technologies and methods for oil exploration based on simulation expertise developed by Simula's Scientific Computing Department. The project focuses on research and entails, *inter alia*, that Hydro will fund several PhD students and postdoctoral research fellows over a five-year period. This new industrial cooperation furnishes gratifying confirmation that Norwegian industry recognises the value of the research being done at Simula.

Long-term funding
When Simula was established in 2001, the Research Council pledged funding for 10 years on the condition that a successful international evaluation be conducted during that period. In 2005, the Research Council will decide whether to continue funding Simula until 2010; the favourable evaluation provides a very strong basis for that decision.

Simula's Board asked the administration to try to obtain a 10-year contract with the Research Council, a request reiterated in the evaluation as well as in a statement issued by the Scientific Advisory Board (SAB). A new five-year contract without any prospect of long-term status as a research institution would lead to a risk that the current strong research community could be eroded. Conversely, a long-term contract until 2015 would consolidate Simula's position as one of Europe's foremost ICT research centres. The Board of Directors is also of the opinion that the State ought to increase its contributions to ICT research, since the field is highly significant for Norway's progress as a knowledge nation.

Simula and the Fornebu community
Simula was established as the central basic research group in a larger vision of 'IT Fornebu', a new research and knowledge centre intended to trigger major investments in knowledge-based industry in the Fornebu area. In February 2004, the Danish consultancy Oxford Research AS submitted an evaluation of the IT Fornebu initiative, which formed the basis for a White Paper in June. Among other things, the evaluation indicated that the Fornebu initiative built around Simula has failed to develop as planned, so it recommended revitalisation in 2005. The IT Fornebu evaluation also pointed out that Simula has not gained any advantages from being located at Fornebu. This view was confirmed in the subsequent evaluation of Simula, where it was pointed out that the location is actually an unnecessary impediment to collaboration with other research centres in the Oslo region and limits the participation of master's degree students from the University of Oslo.

Oxford Research ascertained that key elements of the IT Fornebu vision had either been abandoned or their level of ambition had been reduced significantly. The Board of Directors shares this assessment, and is concerned about the strong focus on real estate and infrastructure and the lack of focus on research and innovation. IT Fornebu AS has, nevertheless, done an impressive job in finding tenants for the existing buildings at Fornebu at a time when both the international ICT market and the real estate market in the Oslo region were extremely difficult.

The evaluation made by Oxford Research formed the basis for a White Paper (Report No. 42 to the Storting 2003-2004) on the status of the IT and knowledge centre at Fornebu. The evaluation recommended that future allocations to Simula not be conditional on the centre being located at Fornebu. The Storting's Standing Committee for Finance and Economic Affairs supports this view, giving Simula the option of relocating unhindered.

'The Board of Directors notes that the Evaluation Committee was impressed by the quality, thoroughness and enthusiasm demonstrated during the planning of Simula Innovation'

The Board has taken note of the assessments made in the evaluation of IT Fornebu and Simula as well as during the political process. Against this background, the Board is prepared to discuss the issue of relocation, based on Simula's own objectives and ambitions, once its contractual relationship with the Research Council has been clarified in 2005. The Board also recognises that it would be prudent for the administration to work to strengthen further cooperation between the ICT institutions in the Oslo region.

Highlights
The Research Council of Norway resolved in 2003 to implement a new type of support for Outstanding Young Investigators. The objective of the initiative is to offer talented younger researchers favourable conditions under which to realise their potential to achieve international excellence. The initiative is intended to help to develop talented research managers and to enhance the quality of Norwegian research.

In June 2004, Simula researcher Joakim Sundnes was selected to participate in the Outstanding Young Investigators scheme and was awarded a grant from the Research Council. The Board congratulates Sundnes on achieving this distinction, which he won in keen competition against no fewer than 221 applicants competing for a total of 26 grants. The grant will be used to build up a research group based on the project entitled *Computing the Mechanics of the Heart*. Sundnes was also hired to head the Scientific Computing Department as from 1 March 2004, making him the first researcher at Simula to be given tenure.

Ever since Simula was established, its external project funding has shown strong steady growth, reaching a total of MNOK 10.1 (including Simula Innovation) in 2004. This is in line with the agreement with the Research Council of Norway, which envisaged external project revenues of MNOK 11 in 2004 and MNOK 15 in 2005. Cooperation with Norsk Hydro will probably ensure the growth needed to achieve the financial goal for 2005.

One of Simula's objectives is that its research departments participate in research that is of a high international calibre. Simula has continued to pursue its high aspirations from previous years as regards the number of its partner institutions and projects in Norway and abroad. Roughly 65 per cent of Simula's partners are European, while about 25 per cent are in the U.S. and 10 per cent in other countries. In 2004, Simula was named coordinator of the major new EU project 'Mobility and Adaptation enAbling Middleware (MADAM)', which will help to raise new project revenues. Simula also participated in the EU project 'Scalable Intelligent Video Server System (SIVSS)' during the year under review. The EU's research programmes will be an important target area for Simula in future.

Simula staff members made several short, and a number of longer, visits to foreign institutions in 2004, and the incidence of visiting foreign researchers at Simula is on the increase.

A proactive, visible presence
In 2004, Simula maintained a proactive, visible presence in the media, as well as in its fields of speciality in Norway and abroad. A Simula project that examined budgetary overruns on ICT projects in business and industry and the public sector created quite a stir in the media. Among other things, the media coverage led the Minister of Trade and Industry and the Minister of Labour and Administration to take an initiative to acquire better statistics on public ICT expenditure.

Simula's most ambitious conference in 2004 was 'Mathematical Methods for Curves and Surfaces VI', which was organised in Tromsø in July in collaboration with the Centre for Mathematics for Applications (CMA) at the University of Oslo. The conference attracted about 140 participants from all over the world.

Professor Morten Dæhlen headed the preparation of the report 'eVITenskap og Anvendelser' ('eScience and Applications' — eVITA), which was submitted to the Minister of Education and Research as a contribution to the drafting of a new White Paper on research, scheduled to be presented in the spring of 2005. Among other things, the report recommends that Norway establish a special major research initiative in eScience. A number of individuals from Norwegian universities, research institutions, and business and industry contributed to the report.

Finances
Simula's aggregate operating revenues totalled MNOK 58.3 in 2004. Project revenues increased from MNOK 7.0 in 2003 to MNOK 10.1 in 2004. The net result for the year was a loss of MNOK - 2.35, to be covered by equity capital. When dealing with budgetary issues, the Board decided to use MNOK 2 of the company's equity for ongoing activities in 2004. The going concern assumption applies and is the basis for the annual accounts. The company has developed a satisfactory operating structure. No situation has arisen since year end that impacts the accounts as presented.

Administration and the working environment
Simula conducted an HSE survey among all employees in 2003 and the findings were presented in 2004. The survey indicated that the employees are highly motivated and enjoy good working conditions, but that there is room for improvement regarding internal information, performance appraisal interviews and feedback from the management. Measures have been implemented to bring about such improvements, and the Board considers it natural to conduct a new HSE survey in the autumn of 2005 to ascertain whether the measures have had the desired effects.

In 2004, Simula's administration worked to develop a new job structure that would enable Simula to hire researchers in tenured positions. It is common to have many temporary posts at research institutions, but Simula's formal status as a private company has made it natural to develop a structure that strengthens its chances of attracting highly qualified co-workers. The new structure implies that postgraduate fellows and postdoctoral research fellows will be hired for periods of up to four years. Researchers above the postdoctoral level who are not on leave from another tenured position can then be offered tenure according to more detailed criteria.

Employees and equal opportunity
At year end, Simula had 68 full-time and 13 part-time co-workers. Of the 68, 54 were men and 14 women, while 60 were Norwegian and eight were foreign nationals.

Simula aspires to hire more women in future. No work-related illnesses or accidents were reported during the year. Simula's activities do not pollute the outdoor environment.

Prospects
The Board would like to thank Simula's administration, researchers and other employees for all their invaluable efforts during the year under review. Special thanks go to Professor Morten Dæhlen, Simula's first Managing Director and subsequently Research Director of the Scientific Computing Department and Simula Innovation. The Board and administration look forward to continued close contact with Prof. Dæhlen in his new position as Academic Head of the Department of Informatics at the University of Oslo, which is an important partner for Simula.

The Simula's Board and administration: Back row from the left: Aslak Tveito, Magne Jørgensen, Jarle Nygard, Kjell Bratbergsengen, Lars Holden, Mette Vestli, Cecilie Ohm, Tor Skeie and Ragni Piene. Front row from the left: Berit Svendsen, Amela Karahasanovic, Tore Vorren and Harald Holm Simonsen (The Research Council of Norway).

April 12, 2005
The Board of Directors

Berit Svendsen
(Chairperson)

Kjell Brantsbergsengen

Lars Holden

Magne Jørgensen

Amela Karahasanovic

Cecilie Ohm

Ragni Piene

Tor Skeie

Mette Vestli

Tore Vorren

Aslak Tveito

Income statement
Resultatregnskap

	Note	2004	2003
OPERATING REVENUES Driftsinntekter	6	58 259 166	55 541 364
OPERATING EXPENSES Driftskostnader			
Personell costs Lønnskostnad	4,5	37 417 549	30 420 401
Depreciation of fixed assets Avskrivning varige driftsmidler	3	2 397 411	1 194 071
Other operating expenses Annen driftskostnad		20 923 004	24 845 174
TOTAL OPERATING EXPENSES Sum Driftskostnader		**60 737 964**	**56 459 646**
OPERATING PROFIT Driftsresultat		**-2 478 798**	**-918 282**
FINANCIAL ITEMS Finansposter			
Other interest income Annen renteinntekt		210 535	755 721
Other financial income Annen finansinntekt		2 140	2 742
Other interest expenses Annen rentekostnad		5 513	179
Other financial expenses Annen finanskostnad		83 232	159
TOTAL FINANCIAL ITEMS Sum finansposter		**123 930**	**758 125**
NET PROFIT/ LOSS Årsresultat		**-2 354 868**	**-160 157**
ALLOCATION OF PROFIT Disponering av årsresultat			
Transferred to equity Overført annen egenkapital		-2 354 868	-160 157
TOTAL ALLOCATED Sum disponert		**-2 354 868**	**-160 157**

Balance Sheet
Balanse

	Note	2004	2003
ASSETS Eiendeler			
FIXED ASSETS Anleggsmidler			
Fixed assets Varige driftsmidler			
Furniture, equipment, etc Driftsløsøre, inventar o.l.	3	5 350 047	5 828 567
Total fixed assets Sum varige driftsmidler		**5 350 047**	**5 828 567**
Financial fixed assets Finansielle anleggsmidler			
Investments in subsidiaries Investeringer i datterselskap		**1 356 300**	**0**
Total financial fixed assets Sum finansielle anleggsmidler	10	1 356 300	0
TOTAL FIXED ASSETS Sum anleggsmidler		**6 706 347**	**5 828 567**
CURRENT ASSETS Omløpsmidler			
Receivables Fordringer			
Customer receivables Kundefordringer		573 608	910 105
Other receivables Andre fordringer		4 230 955	1 733 035
Total receivables Sum fordringer		**4 804 563**	**2 643 140**
Bank deposits Bankinnskudd		**3 080 848**	**7 761 761**
TOTAL FIXED ASSETS Sum omløpsmidler		**7 885 411**	**10 404 902**
TOTAL ASSETS Sum eiendeler		**14 591 757**	**16 233 468**

Balance Sheet
Balanse

	Note	2004	2003
EQUITY AND LIABILITIES Egenkapital og gjeld			
EQUITY Egenkapital			
Payd-in equity Innskutt egenkapital			
Share capital Selskapskapital	7,8	1 500 000	1 500 000
Total paid-in capital Sum innskutt egenkapital		**1 500 000**	**1 500 000**
Earned equity Opptjent egenkapital			
Other equity Annen egenkapital	8	2 309 135	4 664 003
Total earned equity Sum opptjent egenkapital		**2 309 135**	**4 664 003**
TOTAL EQUITY Sum egenkapital		**3 809 135**	**6 164 003**
LIABILITIES Gjeld			
Short-term liabilities Kortsiktig gjeld			
Liabilities to credit institutions Gjeld til kredittinstitusjoner		136 816	0
Accounts payable Leverandørgjeld		2 960 074	4 448 789
Withholding tax, social security, VAT, etc. Skyldige offentlige avgifter		3 029 054	2 686 438
Other short-term liabilities Annen kortsiktig gjeld		4 656 677	2 934 239
Total short-term liabilities Sum kortsiktig gjeld		**10 782 622**	**10 069 465**
TOTAL LIABILITIES Sum gjeld		**10 782 622**	**10 069 465**
TOTAL EQUITY AND LIABILITIES Sum egenkapital og gjeld		**14 591 757**	**16 233 468**

Notes to the accounts

Note 1 – Accounting principles

The financial statements have been prepared pursuant to the regulations in the Norwegian Accounting Act of 1998 and Norwegian accounting standards.

Main rule for the valuation and classification of assets and liabilities
Assets intended for permanent ownership or use are classified as fixed assets. Other assets are classified as current assets. Receivables to be paid back within one year are always classified as current assets. The same criteria are applied to the classification of short- and long-term liabilities.

Fixed assets are valued at acquisition cost, but written down to their real value if the reduction in value is believed to be of a permanent nature. Fixed assets are depreciated systematically over the useful life of the asset. Long-term liabilities are recognised at their nominal values on the date the debt was incurred. Long-term liabilities are not revalued to actual value as a result of interest rate fluctuations.

Current assets are valued at acquisition cost or market value, whichever is lower. Short-term liabilities are recognised at their nominal values on the date the debt was incurred. Short-term liabilities are not revalued to actual value as a result of interest rate fluctuations.

Certain items are valued according to other rules, as explained below.

Foreign exchange
Assets and liabilities in foreign currencies are translated to Norwegian kroner at the mid-rates quoted by Norges Bank on 31 December.

Tangible fixed assets
Fixed assets are depreciated on a straight line basis over the expected useful life of the asset. Depreciation is generally distributed on a straight line basis over the expected useful life of the asset.

Receivables
Trade debts and other debts are valued on the balance sheet at their nominal value less provisions for anticipated losses on bad debts. Provisions for losses are based on individual assessments of the collectability of each receivable. In addition, if necessary, a general provision is made for anticipated bad debts on other receivables.

Pensions
A straight line earning profile is used to account for pensions and assumptions are made regarding expected salary upon retirement

Taxes
The company has no tax expenses as its activities are not considered taxable.

Note 2 – Financial market risk
The company has little exposure to financial market risk.

Note 3 – Capital Assets / Anleggsmidler

	IT equipment	Furniture & equipment	Total
Acquisition cost 1 Jan.	3 192 407	4 304 040	7 496 447
Acquired 2004	988 368	930 521	1 918 889
Acquisition cost 31 Dec.	4 180 775	5 234 561	9 415 336
Accumulated depreciation	2 186 284	1 879 005	4 065 289
Book value 31 Dec.	1 994 491	3 355 556	5 350 047
Ordinary depreciation	1 669 605	727 806	2 397 411
Depreciation in %	20 - 50%	20 - 33%	

Note 4 – Pension expenses

The company has a pension plan that covers a total of 64 people. The pension plan provides defined future benefits. Pension benefits depend on the individual employee's number of years of service, salary level at retirement age, and social security benefits. The collective pension agreement is financed by building up pension funds under the auspices of the Norwegian Public Service Pension Fund.

Note 5 – Payroll expenses, number of employees, benefits, etc.

Payroll expenses	2004	2003
Salaries	29 665 178	24 520 742
National Insurance contributions	4 435 116	3 610 399
Pension expenses	2 036 615	1 575 652
Other benefits	1 280 640	713 608
Total Sum	**37 417 549**	**30 420 401**
Average number of employees	58	48

Salaries and benefits to top management	Managing Director	Board of Directors
Salaries	887 023	172 000
Pension contribution	54 418	
Other benefits	41 619	

Auditor
Auditing expenses totalled NOK 36 000, while other auditing services came to NOK 16 000.

Note 6 – Operating income

The company's operating income was as follows (in NOK):

Research funding	57 174 062
Reimbursement for research fellows	1 030 104
Other income	55 000
	58 259 166

Note 7 – Share capital and ownership structure
The company's share capital consists of 1 000 shares with a nominal value of NOK 1 500 per share.

The shares are owned by:

The Norwegian State/repr. by the Ministry of Education and Research	80%
The Norwegian Computing Centre	10%
Sinvent AS	10%

Note 8 – Equity Egenkapital

	Share capital	Other equity	Total equity
Contributed equity	1 500 000	4 664 003	6 164 003
Profit/loss for the year	-	- 2 354 868	- 2 354 868
Equity at 31 Dec.	1 500 000	2 309 135	3 809 135

Note 9 - Bank deposits

The company had locked-in bank deposits of NOK 1 469 910 in connection with the lease and NOK 1 550 778 in restricted deposits relating to employees' withholding tax.

Note 10 Shares

The company owns all shares in the subsidiary Simula Innovation AS. The subsidiary earned a loss of NOK 154 118 in 2004. At 31 December 2004, the company's equity totalled NOK 1 196 182.

With reference to §3-2 of the Accounting Act, corporate accounts have not been drawn up.

Noter til regnskapet

Note 1 – Regnskapsprinsipper

Årsregnskapet er satt opp i samsvar med regnskapsloven 1998. Det er utarbeidet etter norske regnskapsstandarder.

Hovedregel for vurdering og klassifisering av eiendeler og gjeld
Eiendeler bestemt til varig eie eller bruk er klassifisert som anleggsmidler. Andre eiendeler er klassifisert som omløpsmidler. Fordringer som skal tilbakebetales innen et år er uansett klassifisert som omløpsmidler. Ved klassifisering av kortsiktig og langsiktig gjeld er analoge kriterier lagt til grunn.

Anleggsmidler vurderes til anskaffelseskost, men nedskrives til virkelig verdi når verdifallet forventes ikke å være forbigående. Anleggsmidler med begrenset økonomisk levetid avskrives planmessig. Langsiktig gjeld balanseføres til nominelt mottatt beløp på etableringstidspunktet. Langsiktig gjeld oppskrives ikke til virkelig verdi som følge av renteendring.

Omløpsmidler vurderes til laveste av anskaffelseskost og virkelig verdi. Kortsiktig gjeld balanseføres til nominelt mottatt beløp på etableringstidspunktet. Kortsiktig gjeld oppskrives ikke til virkelig verdi som følge av renteendring.

Enkelte poster er vurdert etter andre regler, og redegjøres for nedenfor.

Valuta
Pengeposter i utenlandsk valuta omregnes til balansedagens kurs.

Varige driftsmidler
Varige driftsmidler avskrives over forventet økonomisk levetid. Avskrivningene er som hovedregel fordelt lineært over antatt økonomisk levetid.

Fordringer
Kundefordringer og andre fordringer oppføres til pålydende etter fradrag for avsetning til forventet tap. Avsetning til tap gjøres på grunnlag av en individuell vurdering av de enkelte fordringene. I tillegg gjøres det for øvrige kundefordringer, om nødvendig, en uspesifisert avsetning for å dekke antatt tap.

Pensjoner
Ved regnskapsføring av pensjon er lineær opptjeningsprofil og forventet sluttlønn som opptjeningsgrunnlag lagt til grunn.

Skatter
Selskapet har ikke innarbeidet skattekostnader da virksomheten ikke er vurdert å være skattepliktig.

Note 2 – Finansiell markedsrisiko
Selskapet er i liten grad eksponert for finansiell markedsrisiko.

Note 3 - Anleggsmidler

	Datautstyr	Inventar, utstyr m.v.	Sum
Anskaffelseskost 1/1	3 192 407	4 304 040	7 496 447
Anskaffet 2004	988 368	930 521	1 918 889
Anskaffelseskost 31/12	4 180 775	5 234 561	9 415 336
Akk.avskrivninger	2 186 284	1 879 005	4 065 289
Bokført verdi 31/12	1 994 491	3 355 556	5 350 047
Ordinære avskrivninger	1 669 605	727 806	2 397 411
Avskrivning i %	20 - 50%	20 - 33%	

Note 4 – Pensjonskostnader

Selskapet har pensjonsordning som omfatter i alt 64 personer. Ordningen gir rett til definerte fremtidige ytelser. Disse er i hovedsak avhengig av antall opptjeningsår, lønnsnivå ved oppnådd pensjonsalder og størrelsen på ytelsene fra folketrygden. Den kollektive pensjonsavtalen er finansiert ved fondsoppbygning organisert i Statens pensjonskasse.

Note 5 – Lønnskostnader, antall ansatte, godtgjørelser m.m.

Lønnskostnader	2004	2003
Lønninger	29 665 178	24 520 742
Folketrygdavgift	4 435 116	3 610 399
Pensjonskostnader	2 036 615	1 575 652
Andre ytelser	1 280 640	713 608
Sum	**37 417 549**	**30 420 401**
Gjennomsnitt antall ansatte	58	48

Ytelser til ledende personer	Daglig leder	Styre
Lønn	887 023	172 000
Kostnader til pensjonsordning	54 418	
Annen godtgjørelse	41 619	

Revisor
Til revisor er utbetalt kr. 36.000,- for revisjon og kr. 16.000,- for annen bistand.

Note 6 – Driftsinntekter

Selskapets driftsinntekter fordeler seg som følger:

Tilskudd til forskning	kr. 57 174 062
Refusjon for stipendiater	kr. 1 030 104
Øvrige inntekter	kr. 55 000
	kr. 58 259 166

Note 7 – Aksjekapital og eierstruktur

Selskapets aksjekapital består av 1 000 aksjer à kr. 1 500,-.

Aksjene er eiet av:

Den norske stat v/Utdannings- og forskningsdepartementet	80%
Stiftelsen Norsk Regnesentral	10%
Sinvent AS	10%

Note 8 - Egenkapital

	Aksjekapital	Annen egenkapital	Sum egenkapital
Tilført egenkapital	1 500 000	4 664 003	6 164 003
Årets resultat	-	- 2 354 868	- 2 354 868
Egenkapital 31/12	1 500 000	2 309 135	3 809 135

Note 9 - Bankinnskudd

Av innskudd i bank er kr. 1 469 910,- bundne midler i forbindelse med inngåtte leiekontrakter og kr. 1 550 778,- er bundne midler vedrørende ansattes skattetrekksmidler.

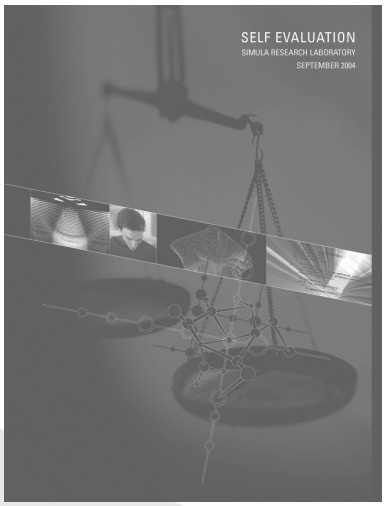
Note 10 - Aksjer

Selskapet eier alle aksjer i datterselskapet Simula Innovation AS. Resultatet i datterselskapet ble negativt med kr.154 118,-. Selskapets egenkapital pr. 31/12-04 var kr. 1 196 182,-.

Under henvisning til regnskapslovens § 3-2 er konsernregnskap ikke utarbeidet.

The evaluation of Simula Research Laboratory

Simula was scheduled for evaluation in autumn 2004. The Research Council of Norway appointed a committee consisting of five internationally respected professors to undertake the task. Simula's funding is linked to a 10-year contract with the Research Council of Norway that runs from 2001 to 2010. The contract requires that Simula be subject to a mid-way evaluation to ensure the desired professional progression. This evaluation will form the basis for negotiations regarding the prolongation of the contract with the Research Council.



Prior to the evaluation proper, Simula was to perform a self-evaluation. The Committee's assessment of Simula's professional progression was based on prepared materials as well as a site visit that included presentations of all the departments. In 2004, a great deal of attention was devoted to this self-evaluation; ensuring that all employees felt a sense of ownership regarding the report was considered to be an important factor for ensuring a good result.

Simula aspired to make a thorough report that presented its results with a view to research, education and innovation, as well as an evaluation of those results. The upshot was a 311-page report, which considered Simula as a whole, then its three departments and its subsidiary Simula Innovation AS.[1] The report describes how Simula is organised and what it does. It also discusses Simula's plans for the future and its focus. It was also important to illustrate the diversity of Simula's partners at the national, as well as the international, level. Accordingly, we invited 'letters of support' from our closest partners. Some quotations from these letters are reproduced on the next page.

The entire Simula staff was more or less involved in compiling the report. All employees were given an opportunity to submit opinions and suggestions for improvements as the work progressed. Combined with ample information, this helped all employees to become involved in the evaluation and enabled them to understand how much it means for our continued existence as an ICT research centre.

The CVs and publication lists of our scientific staff were attached to the self-evaluation report.

When the Evaluation Committee presented its results, it made the following comments regarding Simula's self-evaluation: *"We commend the self-evaluation document produced as a thorough and accurate assessment of the current state of the laboratory, with nice balance of awareness of strengths and weaknesses."*

The Committee's Evaluation Report also contained some clear general observations:

- *The Evaluation Committee is impressed with the progress and level of activity achieved at the Simula Research Laboratory in the comparatively short time since its foundation.*
- *The Evaluation Committee fully supports the current strategy of increasing visibility by promoting the publication of results in high quality journals.*
- *The Evaluation Committee does feel that the Simula Research Laboratory's strategy is somewhat conservative.*
- *The evidence from the external collaborations is that the laboratory is thriving; both in terms of the number of links and the quality of the external organizations involved.*
- *The range of visitors to Simula give clear evidence that the academic environment is attractive.*
- *We regard the total number of PhD students per staff member as low by the standards of world-class academic laboratories.*
- *The Evaluation Committee believes that Simula has been well served by its Scientific Advisory Board.*
- *The Evaluation Committee has been impressed by the quality and coherence of the planning involved in the launch of Simula Innovation, and of the enthusiasm it has generated.*

The Committee also made a number of recommendations which Simula will be addressing now and in future:

- *The Evaluation Committee recommends that the Simula Research Laboratory continues to increase the visibility of this broader range of measures.*
- *The Evaluation Committee recommends that the Simula Research Laboratory revisit its strategy, extending its horizon beyond the five-year point and concentrating on likely changes of focus.*
- *The Evaluation Committee recommends that Simula raises its postgraduate student targets and that it seek additional resources from the Research Council or elsewhere to make this possible.*

[1] The self-evaluation report is available upon request from kristin.borte@simula.no

"I was extremely impressed with the software engineering research being undertaken at Simula. I do not know of any other research group that has managed to achieve such an excellent combination of methodological rigour and practical relevance. I am convinced that the Simula Laboratory Software Engineering Group is now the benchmark for excellence in empirical software engineering."
Professor Barbara Kitchenham, Keele University (UK)

"At SUN we have high regards of the ICON research group at Simula. Their deep understanding of Interconnection networks in general and Infiniband in particular is highly appreciated. Their ability to combine academic rigor and knowledge with practical solutions to problems faced by industry is impressive.
Furthermore their wide net of contacts with academia in the field worldwide is of great value to us. We therefore conceive the ICON team to be among the best and most relevant academic research groups in the world in their field."
Eivind Rongved, Director of Engineering, SUN Microsystems

Quotations from letters of support

"I see very few projects world-wide of similar scope and potential impact as those of SC. The combination of modern programming tools and computational mathematics is rarely found at academic institutions usually focusing on only one of the two key components. SC at Simula thus has a unique possibility of advancing computational simulation of real world phenomena."
Professor Claes Johnson, Chalmers University of Technology, Göteborg University

"The Simula Lab is using a rigorous approach based on physical first principles, and has identified the key numerical and computational obstacles that need to be addressed. I believe that the Simula Lab is perhaps uniquely qualified to achieve these goals and to make a significant contribution to the field of computational cardiac biology in health and disease."
Professor Andrew D. McCulloch, University of California, San Diego

"The scientific competence of the Scientific leaders of SC Langtangen and Tveito is very clearly demonstrated, in Diffpack and in an impressive output of scientific articles and books. SC with the present scope and goals thus has an excellent possibility of taking a leading role internationally: the competence, manpower and devotion is there and with a continuation of the quite substantial present funding, success is almost guaranteed. Clearly SC will in continued operation infuse a lot of impulse into the Norwegian scientific life."
Professor Claes Johnson, Chalmers University of Technology, Göteborg University

"In conclusion, I am very impressed with the accomplishments and plans of the Simula Research Laboratory. They are one of the leading computational science groups in the world, and they have produced with the support that they have received and are deserving of an increased level of support. If I were making such funding decisions, I would fund at a level that would maintain all their current activities and fund a second, major applications area. The synergy from such an approach would improve all aspects of the Laboratory."
Professor Cass T. Miller, University of North Carolina at Chapel Hill

"Although the Simula Labs have only recently been set up they have already made a major impact in software engineering, particularly their empirical research. This has resulted in many publications in the top journals such as IEEE Transactions on Software Engineering and the most prestigious conferences such as the International Conference on Software Engineering. In my view the work is consistently of high quality and demonstrates a scholarly approach to research."
Professor Martin Shepperd, Bournemouth University (UK)

"Within a few years, the SE dept. managed to impose its mark in the research community. Not only were numerous articles published in prestigious journals and conferences, but many of its members are now part of editorial boards and program committees. The SE dept. was also able to set up international collaborations with several other labs, including mine. All these achievements are remarkable, especially considering that many European academic institutions, even after many years of activities, have not yet achieved such visibility and influence."
Professor Lionel Briand, Carlton University, Canada

Directors' report 2004

Simula Innovation AS was founded on 4 May 2004 and became operational on 1 September 2004. The company is a wholly-owned subsidiary of Simula Research Laboratory AS (Simula). Its primary objective is to engage in research-based innovation, specifically, innovation linked to the research at Simula.

In 2004, the company explored a number of business ideas, which resulted in the establishment of two new enterprises: Silent Wings AS and vPos AS. It is still early days for both enterprises; the first sales are expected in Q1 2005. In an effort to improve the Group's innovativeness, the company has tried to strengthen Simula's industrial cooperation. Against this background, negotiations were initiated with Norsk Hydro regarding the establishment of a comprehensive Hydro-funded research project at Simula. The company has been actively engaged in network building and has established for example, close cooperation with Birkeland innovasjon (the Technology Transfer Office at the University of Oslo), IT Fornebu and the Department of Informatics at the University of Oslo. In connection with the evaluation of Simula conducted in autumn 2004, Simula Innovation received very good reviews.

For 2004, the company reported a turnover of NOK 2 122 562 and an operating loss of NOK -154 159. Equity totalled NOK 1 196 182 at 31 December 2004. Simula has pledged NOK 3 000 000 to the company in the form of an equity subsidy and revenues for the 2005 and 2006 fiscal years. It has been verified that the company fulfils the going concern assumption. The Board of Directors is not aware of any factors of significance that would affect the company's position and did not appear on the annotated income statement and balance sheet. Nor have any incidents come to light after the close of the fiscal year that would, in the Board's opinion, have a significant impact on an assessment of the company.

At year end, Simula Innovation AS had three employees. The company keeps track of employees' absence due to illness. There was little absence due to illness in 2004. The Board is of the opinion that the company has a good working environment. There were no women employed by the company in 2004, but the Board aspires to improve the percentage of women through growth. The company's activities do not pollute the environment.

For the Board of Directors of Simula Innovation AS

Ottar Hovind

Martha Kold Bakkevig

Anita Krohn Thrane

Per Kristian Jacobsen

Bjørn Fredrik Nielsen

Income statement
Resultatregnskap

	Note	2004
OPERATING REVENUES Driftsinntekter		
Sales revenues Salgsinntekter		2 122 562
TOTAL OPERATING REVENUES Sum Driftsinntekter		**2 122 562**
OPERATING EXPENSES Driftskostnader		
Personell costs Lønnskostnad	2,3	906 673
Other operating expenses Annen driftskostnad		1 370 048
TOTAL OPERATING EXPENSES Sum Driftskostnader		**2 276 721**
OPERATING PROFIT Driftsresultat		**-154 159**
FINANCIAL ITEMS Finansposter		
Other interest income Annen renteinntekt		100
Other interest expenses Annen rentekostnad		59
TOTAL FINANCIAL ITEMS Sum finansposter		**41**
NET PROFIT/LOSS Årsresultat		**-154 118**
ALLOCATION OF PROFIT Disponering av årsresultat		
Transferred to cover losses Overført til udekket tap		-154 118
TOTAL ALLOCATED Sum disponert		**-154 118**

Balance Sheet
Balanse

	Note	2004
ASSETS **Eiendeler**		
FIXED ASSETS **Anleggsmidler**		
Financial fixed assets **Finansielle anleggsmidler**		
Investments in shares Investeringer i aksjer	4	240 548
Total financial fixed assets **Sum finansielle anleggsmidler**		**240 548**
TOTAL FIXED ASSETS **Sum anleggsmidler**		**240 548**
CURRENT ASSETS **Omløpsmidler**		
Receivables **Fordringer**		
Customer receivables Kundefordringer		1 465 878
Other receivables Andre fordringer		124 795
Total receivables **Sum fordringer**		**1 590 673**
Bank deposits **Bankinnskudd**	7	**538 492**
TOTAL CURRENT ASSETS **Sum omløpsmidler**		**2 129 165**
TOTAL ASSETS **Sum eiendeler**		**2 369 712**

Balance Sheet
Balanse

	Note	2004
EQUITY AND LIABILITIES Egenkapital og gjeld		
EQUITY Egenkapital		
Paid-in equity Innskutt egenkapital		
Share capital Selskapskapital	5,6	200 000
Share premium reserve Overkursfond	6	1 150 300
Total paid-in equity Sum innskutt egenkapital		**1 350 300**
Earned equity Opptjent egenkapital		
Other equity Annen egenkapital	6	-154 118
Total earned equity Sum opptjent egenkapital		**-154 118**
TOTAL EQUITY Sum egenkapital		**1 196 182**
LIABILITIES Gjeld		
Short-term liabilities Kortsiktig gjeld		
Accounts payable Leverandørgjeld		460 035
Withholding tax, social security, VAT, etc. Skyldige offentlige avgifter		237 981
Other short-term liabilities Annen kortsiktig gjeld		475 514
Total short-term liabilities Sum kortsiktig gjeld		**1 173 530**
TOTAL LIABILITIES Sum gjeld		**1 173 530**
TOTAL EQUITY AND LIABILITIES Sum egenkapital og gjeld		**2 369 712**

Notes to the accounts

Note 1 – Accounting principles
The annual accounts have been prepared in accordance with the Norwegian Accounting Act of 1998 and generally accepted accounting principles for small businesses.
The company was founded on 4 May 2004.

Note 2 – Payroll expenses, number of employees, benefits, etc.

Payroll expenses	**2004**
Wages	755 092
Social security	113 446
Pension expenses	34 045
Other benefits	4 090
Total	**906 673**
Average number of employees	3
Benefits for leading employees	
Managing director	
Salary	242 643
Pension plan expenses	11 348
Other remuneration	-

Auditor
The auditor was not paid remuneration in 2004.

Note 3 - Pension expenses
The company's pension plan covers all three employees. The scheme is covered through the parent company.

The pension plan provides defined future benefits. Pension benefits depend on the individual employee's number of years of service, salary level at retirement age, and social security benefits. The collective pension agreement is financed by building up pension funds under the auspices of the Norwegian Public Service Pension Fund.

Note 4 – Shares

	Total	**Nominal value per share**	**Book Value**
Silent Wings AS	3 250	10,00	34 548
vPos AS	1 030	100,00	206 000
			240 548

Note 5 – Share capital and ownership structure
The company's share capital consists of 200 shares with a nominal value of NOK 1 000 per share.
The company is wholly-owned by Simula Research Laboratory AS.

Note 6 - Equity

	Share capital	**Premium reserve**	**Other equity**	**Total equity**
Contributed equity	200 000	1 150 300	-	1 350 300
Net profit/loss 2004	-	-	-154 118	-154 118
Equity at 31 December	200 000	1 150 300	- 154 118	1 196 182

Note 7 - Bank deposits
The company has NOK 113 168 in restricted bank deposits relating to employees' withholding tax.

Noter til regnskapet

Note 1 – Regnskapsprinsipper
Årsregnskapet er satt opp i samsvar med regnskapsloven og god regnskapsskikk for små foretak.
Selskapet ble stiftet 4. mai 2004.

Note 2 – Lønnskostnader, antall ansatte, godtgjørelser m.m.

Lønnskostnader	**2004**
Lønninger	755 092
Folketrygdavgift	113 446
Pensjonskostnader	34 045
Andre ytelser	4 090
Sum	**906 673**
Gjennomsnittlig antall ansatte	3
Ytelser til ledende personer	
Dagligleder	
Lønn	242 643
Kostnader til pensjonsordning	11 348
Annen godtgjørelse	-

Revisor
Revisor har ikke mottatt godtgjørelse i 2004.

Note 3 – Pensjonskostnader

Selskapet har pensjonsordning som dekker alle tre ansatte. Ordningen er dekket gjennom morselskapet. Ordningen gir rett til definerte fremtidige ytelser. Disse er i hovedsak avhengig av antall opptjeningsår, lønnsnivå ved oppnådd pensjonsalder og størrelsen på ytelsene fra folketrygden. Den kollektive pensjonsavtalen er finansiert ved fondsoppbygning organisert i Statens pensjonskasse.

Note 4 – Aksjer

	Antall	**Pålydende pr. aksje**	**Bokført Verdi**
Silent Wings AS	3 250	10,00	34 548
vPos AS	1 030	100,00	206 000
			240 548

Note 5 – Aksjekapital og eierstruktur
Selskapets aksjekapital består av 200 aksjer à kr. 1.000,-.
Aksjene er i sin helhet eiet av Simula Research Laboratory AS.

Note 6 - Egenkapital

	Aksjekapital	**Overkursfond**	**Annen egenkapital**	**Sum egenkapital**
Tilført egenkapital	200 000	1 150 300	-	1 350 300
Årets resultat	-	-	- 154 118	- 154 118
Egenkapital 31/12	200 000	1 150 300	- 154 118	1 196 182

Note 7 - Bankinnskudd
Av innskudd i bank er kr. 113 168,- bundne midler vedrørende ansattes skattetrekksmidler.

A productive year

Professor Olav Lysne, Research Director

2002 and 2003 were hectic years in the ND Department. In 2002 a new research strategy was developed, and in 2003 we worked on implementing this strategy by setting up and staffing research projects. By the start of 2004 most of this work had been completed. Three projects had been defined and staffed, and all were progressing steadily towards our goal of a good volume of high quality scientific publications. Although the projects were at different levels of maturity at the time, they have all been successful in their respective fields. We perceive 2004 to be a very good year for the ND Department, as all activities have shown sharp increases in registered publications.

The ICON project addresses quality of service, including fault tolerance, effective routing and the topologies of switch, router, system and storage area interconnection networks. The ICON team took an important step forward in 2004 in getting several papers accepted to a journal in the IEEE Transactions series. This group also produced the first approved patent at Simula Research Laboratory. The last year has shown a significant increase in industrial cooperation for the take-up of results in this activity. Such cooperation will continue to be given significant priority in 2005.

The QuA project is investigating new ideas to enable a wide variety of multimedia and real-time applications to be constructed from off-the-shelf components. The architecture allows programmers to separate aspects of externally observable service behaviour and performance from the way in which a service is implemented. In 2004, a new European project called MADAM started, coordinated by the QuA team at Simula. This project is described separately.

The VINE project works on backbone and access networks. The main emphasis of the project is techniques and methods for providing network resilience. In 2003, the project was initiated and staffed by two research scholars and a postdoctoral researcher. This year it has attained some level of maturity, both in production and publication of results. This activity was received very well by the evaluation committee and we have great expectations for its further development.

In 2005, we will continue working in the same areas. At the same time, we will take strategic decisions as to the direction of the department over the next five-year period. It is clear that there are many areas of research regarding Networks and Distributed systems that we do not presently cover. On the other hand, the field is wide, so we need to choose just a few areas of focus for our department. The current project structure is a natural starting point for these discussions.

Addressing the challenges of the mobile information society

Solutions orginating at Simula constitutes the core of a middleware software environment for mobile adaptive applications that is being developed in the EU project MADAM.

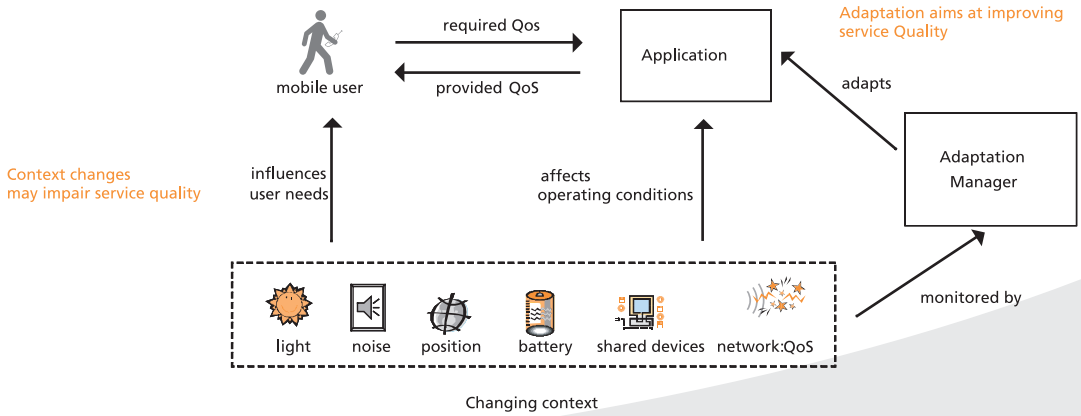
When you view the website of your favourite newspaper to receive information about the latest events, you expect it to display in a readable manner, regardless of the type of screen upon which it is displayed. You may be using your big office screen, or a smaller laptop screen, or perhaps even a mobile smartphone. Whatever your particular case, the text and images are presented to you in the optimal way. The browser you are using adapts the information provided by the website to give you the best possible reading experience, consistent with the hardware you are using and your method of viewing.

On the train you will soon be able to connect your PC to the internet. At the station it may connect to the wireless local area network present there. As the train moves along, the connection may be transferred to the urban UMTS or 3G mobile phone network and later, as the train moves into rural surroundings, you will be using data communication over the GSM network, as today. The technology ensures that your Internet connection will differ at different stages of your journey. The application that you are using to connect to the Internet needs to understand the various physical environments, and adapt as necessary to ensure that you get optimal performance as the conditions vary.

The idea of the MADAM project is that all such adaptations can be handled by middleware. Middleware is a software layer positioned between the applications and the operating system. Middleware is concerned with providing useful building blocks (middleware services) for the construction of distributed applications. In the example of the train journey, your web browser need only ask the MADAM middleware for the "Network connectivity service". At any time the middleware finds out what networks are available, and provides a networking component for the best available network. In this way, the application need not know about the changes in the environment. The user will observe changes as differences in performance caused by the faster and slower technologies.

The MADAM project will build middleware technology that supports such adaptations. It will also provide support for the development of adaptive applications within standard software design tools, to enable software engineers to build mobile applications with support for automatic adaptation more easily. These developments will finally be tested with two real world applications.

The principles of MADAM are summarized in the figure below. The term context denotes the operating environment of a mobile application. When people are moving around while using handheld networked devices, significant variability is introduced in the operating environment for the provided services. Furthermore, users change their preferences for particular interfaces when on the move because light and noise conditions change, or hands and eyes are busy with other things. Dynamic adaptation is required in order to retain usability, usefulness, and reliability of the application under such circumstances. Existing software development methodology and middleware technology are not designed to support such dynamic adaptivity.



The main principles of the middleware to be developed by the project are, to a large extent, based on results from the QuA project of the ND department:

- Component-based architectures and reflection are the bases for dynamic service and application adaptation and reconfiguration.
- Decision making about adaptation and choice of application or middleware service configuration is managed by the middleware platform.

Reflective systems allow an application to access a representation of itself, and ensure that changes made to the self-representation of the application are reflected in the implementation of the application itself. Typical changes that can be performed on the self-representation model of an application include replacing a software component with another that performs the same type of service but may make different assumptions about the operating environment; or changing the composition of software components that constitute the application. Reflection opens up the possibility of an application- and platform-independent approach to recomposition and adaptation, rather than being tied to an application-specific or ad-hoc approach.

The main contribution of the QuA project to the MADAM middleware architecture is our approach to achieving a clean separation between code that implements business logic and code that implements adaptation strategies and mechanisms. Application domain experts specify business properties, and adaptation experts provide specialized platform services for domain-specific adaptation management. The value of this model of computing can be measured by reduced time-to-market and lower costs for the production and maintenance of applications.

Under this approach an application or a middleware service is modelled as a set of variants. Each variant is defined as a configuration of middleware and/or application level software components that makes specific assumptions about operating environment conditions, such as available physical computing resources and user preferences. Application and service variants are discovered dynamically and selected during runtime by the middleware provided adaptation manager according to a given adaptation policy, and the application or a relevant middleware service is adapted or reconfigured accordingly.

The MADAM project is a European initiative that has been recognised and funded by the European Commission's research programme for Information Society Technologies. The other research partners in MADAM are SINTEF (N), the University of Cyprus, and the University of Kassel (D). The industrial partners are Birdstep (N), Condat (D), Integrasys (E) and HP (I). The project started in September 2004 and will run for 2.5 years.

Computations for science and industry

Joakim Sundnes,
Research Director

The Scientific Computing Department develops numerical methods and software for solving partial differential equations (PDEs). Its aim is to develop efficient, reliable and maintainable software for solving mathematical problems in selected application areas.

The SC department had a fruitful year in 2004, with most activities geared towards the evaluation that was scheduled for November. A strong focus on finishing on-going research projects resulted in a considerable increase in the number of submitted publications, and the senior researchers were heavily occupied with the work on the self-evaluation report. To some extent these efforts changed the priority of the department's normal activities, but were crucial for securing a successful evaluation.

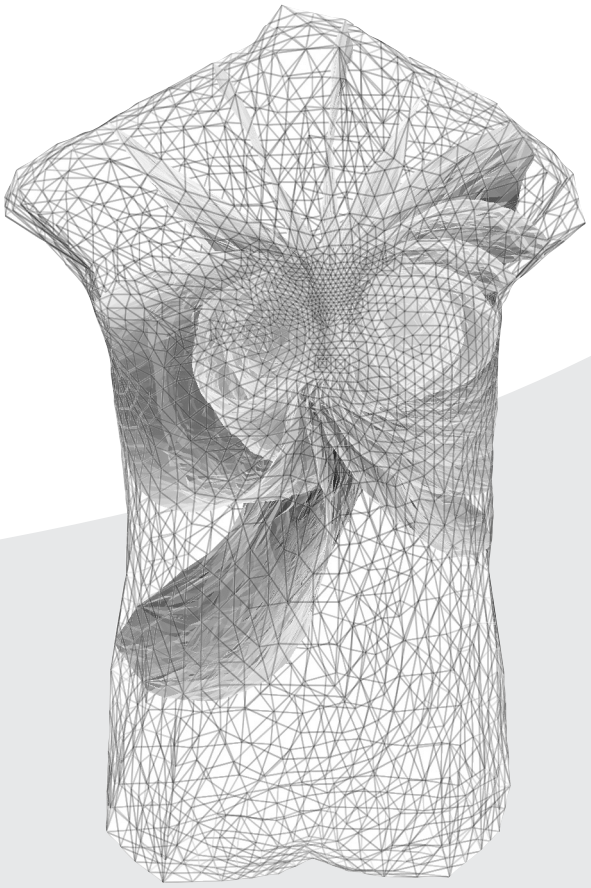
Despite this diversion of focus, in parallel with the work on the self-evaluation report there have been a number of interesting developments in the two projects of the department. *The Software for PDEs* project has continued its focus on generic software tools for solving partial differential equations, but has also initiated large-scale collaboration with an industrial partner, related to simulations of geological processes relevant for the petroleum industry. Still in its planning phase, this activity is likely to begin in 2005, and form the basis for a project group in *Computational Geosciences*.

The *Cardiac Computations* project has, for many years, worked with the electrical activity in the heart, particularly with respect to its relation to ECG recordings. Recently, the scope of this project has been increased to consider, in addition, the mechanical properties of the heart muscle; particularly their relation to the electrophysiology. An activity in the CC project that has shown particularly good progress through 2004 is the work on the inverse problem of electrocardiology. For 2005, this activity will be organized in a separate project named *Inverse Problems*, the goal of which is to compute the condition of the heart based on measurements of the electrical potential on the body surface.

The focus of this year's annual report is on the mechanics part of the Cardiac Computations project, which was expanded substantially in 2004 following an Outstanding Young Investigator (YFF) grant awarded in June.

Computing the mechanics of the heart

The *Cardiac Computations* project has recently been expanded to consider the mechanical behaviour of the heart muscle, in addition to the electrophysiology. The long term ambition for the project is to perform realistic simulations of a complete heart beat, including electrophysiology, muscle contraction and blood flow.



The contraction of the heart muscle is initiated by the electrical activation of the muscle cells. An electrical signal propagates through the tissue, which activates each cell and causes it to contract, and the resulting deformation is a result of this active contraction in combination with the passive mechanical properties of the tissue and the resistance from the blood in the heart cavities. Performing simulations of this process involves challenges on a wide range of levels, from developing mathematical models based on experimental data, to the implementation of computer algorithms for solving large systems of non-linear equations. The natural role for the Scientific Computing Department is to focus on the computational aspects of the problem. We will base our work largely on existing, published mathematical models for each of the processes that occur in the heart, and combine these to form a model for the complete heart beat. The models for the sub-processes are quite challenging to solve by themselves, and combining them results in a highly complex mathematical model. Solving PDE systems that describe complex physical processes has been a research area in the Department for many years, and combined with our experience in the electrophysiology, this leaves us well-placed to contribute to this field.

Computer simulations of the mechanical activity of the heart have a large number of possible applications. Computer modelling of biological processes in general is a rapidly increasing field, which has the potential to increase dramatically our understanding of the detailed mechanisms of living organisms. Given the clinical importance of the heart, an improved understanding of the mechanisms that underlie its function is, in itself, an important goal.

There are also more direct clinical applications of simulations of the activity of the heart. Many heart diseases are known to introduce changes in both the electrophysiology and the mechanical properties of the tissue. On the cellular level, many of these changes are well-studied, but because of the complex interaction between electrophysiology and mechanics, it is difficult to determine their role in the changes observed at the tissue and organ level. Various changes at the cellular level are easily added to the mathematical models, and may provide new insight into how the different mechanisms interact and affect the function of the heart muscle. Heart problems such as infarctions represent a huge health problem, and an improved understanding of their underlying mechanisms may have important implications for medical practice. By including the blood flow in the simulations, it is possible to obtain a direct link between the mechanisms at the cellular level and clinically relevant parameters, such as blood pressure and cardiac output. Since both heart diseases and drugs typically work on the level of cells, computer simulations may be particularly valuable for drug development, since known effects at the cellular level can be combined to predict their outcome at the level of the complete organ.

More realistic experiments in software development

Professor Dag Sjøberg, Research Director

The Software Engineering (SE) Department has established new principles for carrying out realistic experiments in its field, developed as a result of several years of direct experience. The department's researchers have replaced students with professional system developers, traded in their paper and pencils for professional tools, and moved out of the classroom and into the workplace. The point is to conduct experiments of direct relevance for industry. While such experiments are demanding to organise and can involve higher risk, they offer important new insights into significant problems to the research community, industrial user groups and society in general.

The research conducted by the SE Department is motivated by the desire to help the private and public sector IT industry to develop better IT systems, using fewer resources. The group is concerned with the technical, organisational and human issues that affect the processes of systems development.

The main objective is to enhance empirically-based knowledge about the effect of different models, methods, techniques and tools on processes and products.

The research revolves around three themes:

Software development effort estimation
This research aims to improve existing models and develop new models, processes and tools for the estimation, planning and risk analyses of software projects.

Object-oriented analysis and design
This research aims at evaluating the impact of object-oriented analysis and design technologies on various software quality attributes, e.g. comprehensibility, changeability and correctness.

Methods for realistic experiments
To maximise research authenticity, the department conducts controlled experiments that involve professionals solving real tasks on real systems. The department is developing sophisticated experimental data-capture platforms that minimise overhead.

Avoiding Overruns in Public Software Projects

Effort overruns, abandonment, lawsuits, system breakdowns, and other problems appear to be the rule, rather than the exception, where public software projects are concerned. However, is this appearance generated simply by the transparency of public projects, which renders them easily accessed and criticised by the media and the general public? Do public projects really face larger effort overruns than private projects? Or is this just a myth?
In order to address this problem, we conducted a survey that compared effort overruns, and other factors relevant for software engineering project managers, of public and private software projects in Norway. We found that there are, indeed, causes for concern for those involved in public projects. These projects had effort overruns of a significantly greater magnitude than had private projects.

State of Practice
Effort overruns appear to be frequent in software development projects, whether public or private. In fact, a recent review of all surveys on software estimation found that 60-70% of all projects face effort overruns. The average magnitude of effort overruns is reported to be 30-40%. Independently of when or where the survey was conducted, studies on software estimation found the frequency and magnitude of effort overruns to be the same.

Terminology:
Effort estimate = The most likely number of work-hours believed to be necessary to complete a project, as assessed by the managers and developers responsible for delivery.
Effort overrun = The proportion of the actual effort that exceeds the initial estimate.

A Survey on Effort Overruns in Public and Private Software Projects

Between February and November 2003, the Software Engineering Department conducted a survey (BEST-Pro) on estimation practices in the Norwegian software industry. A total of 18 software companies participated.
It seems as though projects undertaken for public clients encountered more problems than those performed for private clients with respect to being completed according to the estimated effort. Eighty-three percent of the public projects encountered effort overruns, compared with 71% of the private projects. More interesting is that the average effort overrun was 67% for projects that had a public client, while it was 21% for projects with a private client.

Reasons for Effort Overruns in Public Software Projects
In order to explore the observed differences, and offer advice to software engineering project managers and clients, we use information from research reports on public projects, feedback from professionals, and our previous experiences, in addition to results from our survey.
When we compare the information from all our sources, the main differences between public and private projects appear to be on the organizational and individual levels.

Organizational level
The public sector has a set of structural and organizational characteristics that differ from private business. These differences may have negative effects on the probability of success of software projects:

- *Regulations on procurement*. In countries subject to European Union law, public projects over a certain value are subject to extensive procurement procedures. The goals of these regulations are to stimulate competition and avoid "under the table" deals. However, the result is that many public clients feel pressured to choose the lowest offer, whether constrained by legislation or not.
- *Regulations on development processes*. Until recently, most standard IT contracts provided by the Directorate of Public Management have been based on the sequential waterfall model. Many public clients have believed that it is too difficult to use incremental and evolutionary development and to split a project into several smaller deliveries, which is highly recommended by independent reports.
- *Difference in business culture of the private contractor and the public client*. Most development work in public projects is done by outside contractors. Often, there will be a clash of culture between a private contractor and a public client.
- *One-of-a-kind systems and preference for new technology*. We have observed a tendency to opt for new and advanced, instead of old and proven, technologies in public projects.

Individual level
The public sector has a reputation for not being able to attract professionals who are skilled in technology and project management. We do not claim that professionals in the public sector are incompetent or negligent; it is, rather, a fact that there seems to be a poor mix of competences that is not so apparent in private enterprises:

- *Lack of project managers*. A good project outcome also depends on a good internal project manager. A common limitation in the public sector is that there is a lack of good, business-oriented, project managers, since there often is no career path for internal project managers in public institutions.
- *Lack of IT skills in organizations*. The OECD report stated that a recurrent problem is the lack of IT skills in the public sector. Using government statistics, the Norwegian Directorate of Public Management found that only 0.07% of over 100,000 government employees hold a Masters degree in computing.

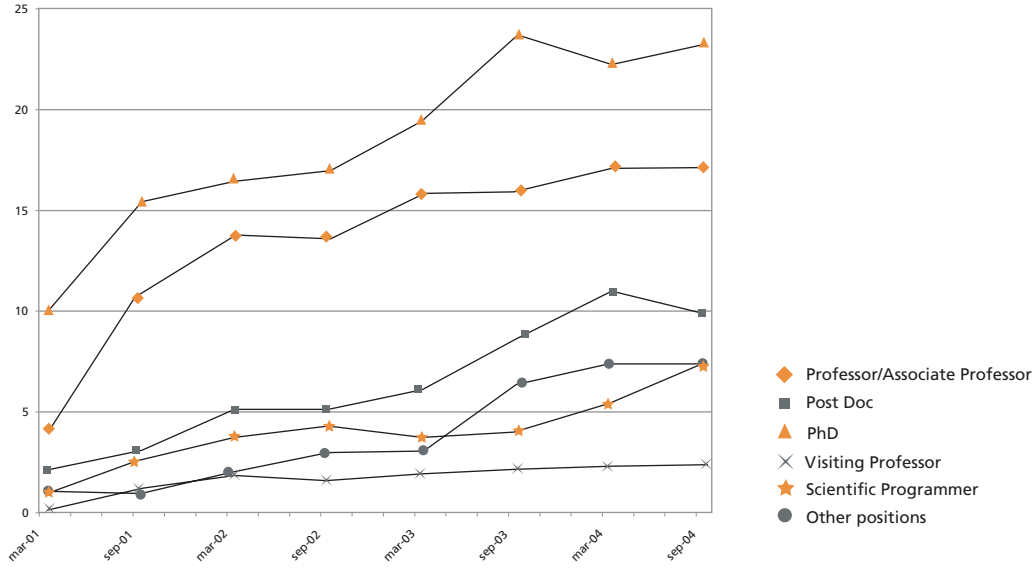
Conclusions
Our empirical findings indicate that the average effort overrun in public sector software projects is significantly higher than in similar projects in the private sector. The challenge for the public sector, and their providers, is to get to grips with the problems, and to do so in a convincing way. To do so, we propose the following series of actions:

- A change of attitude, involving a realization that the public sector is, increasingly, a software-based sector, and hence needs to address software issues more seriously.
- Increased awareness of the need for software competence when specifying, choosing and developing solutions. If such competence is not available, outside help should be hired.
- Implementation of mechanisms to learn from experiences from previous projects (post-mortem evaluations).
- Reduction of project size and risk, e.g. through the use of incremental development models.
- Increased use of evaluation of bids according to value for money, as opposed to price being the only criterion.
- Initiation of activities to improve the processes of software development.

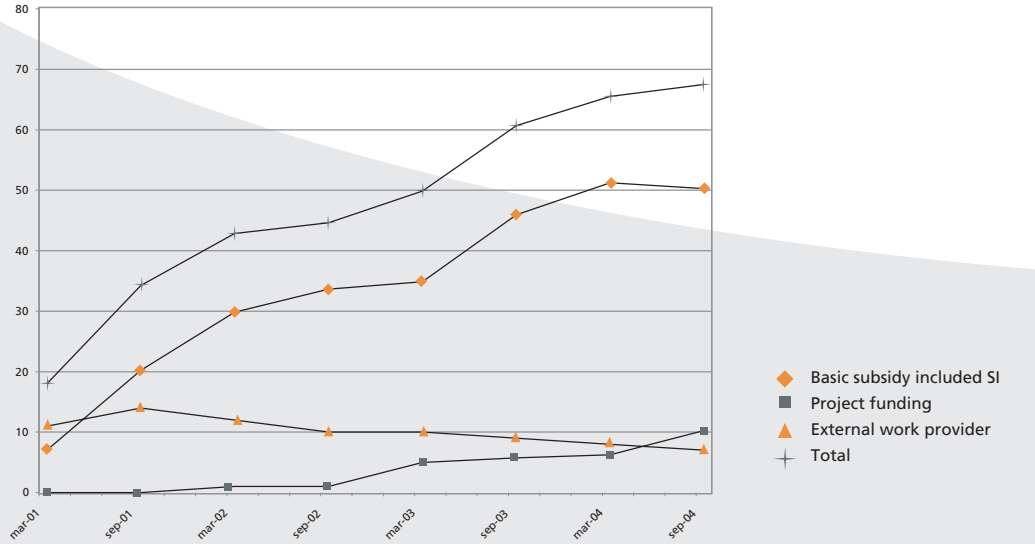
We believe that such action is required if the ever-increasing ambitions of electronic government are to be achieved.

Consequences of the BEST-Pro Survey
Intriguingly, the findings from our BEST-Pro survey contributed to a debate in the Norwegian media. The results made the headlines in Norway's leading newspaper, Aftenposten. This led to an interest in public project overruns, which in turn generated a discussion in the Norwegian Parliament. We were invited to present our results to several government departments, the Office of the Auditor General of Norway, and several seminars and interested software companies. The debate continued in Aftenposten, Computerworld, Dagsavisen and other media, and this has generated an increased focus on software estimation research in Norway. However, public awareness alone is not sufficient for action; such problems have been identified previously, and professional advice has been repeatedly ignored. On a larger scale, the decision makers should seek to implement policies that stimulate the improvement of processes internally, and enable mechanisms to operate that will reduce the focus on price in software procurement.

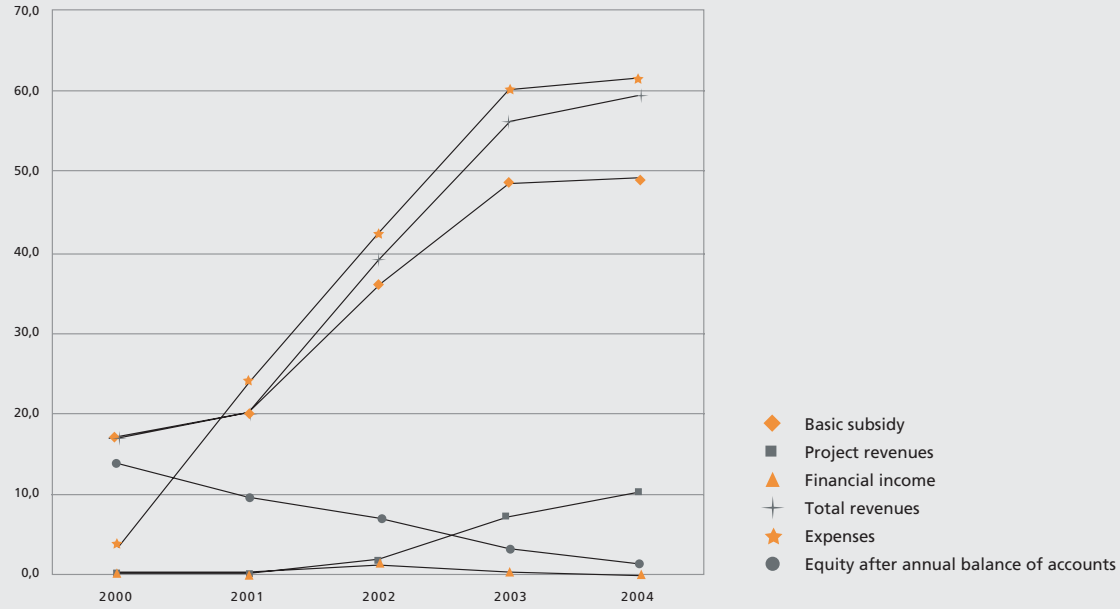
Employees 2001 - 2004



Funding 2001 - 2004



Simula revenues and expenses



Doctorates (Dr. Scient)	Supervisors	Thesis	Date
Ole-Christoffer Granmo	O. Lysne/F. Eliassen	Toward Controlling Accuracy and Timeliness in Video Content Analysis	October 2004
K.J. Moløkken-Østvold	M. Jørgensen T. Dybå	Effort and Schedule Estimation of Software Development Projects	December 2004
Ola Skavhaug	A. Tveito/B. F. Nielsen	Numerical Methods and Software with Applications in Computational Finance	April 2004
Ingebjørg Theiss	O. Lysne	Modularity, Routing and Fault Tolerance in Interconnection Networks	June 2004
Ariel Almendral Vazquez	B. F. Nielsen L. Holden/A. Tveito	Financial Derivatives Under Generalized Black-Scholes models; the PDE approach	December 2004
Masters (Cand. Scient)	**Supervisors**	**Thesis**	**Date**
Geir Berset	J. Ø. Aagedal F. Eliassen	Strategic Management to Support Quality of Service	May 2004
Per-Idar Evensen	M. Dæhlen /Ø. Hjelle	Visualisering av trianguleringer og trianguleringsprosesser	December 2004
Trond Gaarder	H. P. Langtangen	VoluViz: An Interactive Volume Visualization Application	June 2004
Anette Gjetnes	M. Dæhlen	Visualisering av Haar-transformerte volumetriske datasett	August 2004
Tanja Gruschke	M. Jørgensen	Empirical studies on software development effort uncertainty assessment: The role of outcome feedback in the learning process	December 2004
Ove Hansen	D. Sjøberg	A Survey of Controlled Software Engineering Experiments with Focus on Subjects	August 2004
Zlatko Hodic	X. Cai H. P. Langtangen	Diffpack GUI; A portable and fully interactive application	March 2004
Therese Hultmann	O. Skavhaug H. P. Langtangen	Code generation for Palm OS 4	December 2004
Martin Jensen	O. Skavhaug H. P. Langtangen	QGEN: A Python to Qt/C++ translator	December 2004
Simen Kvaal	H. P. Langtangen	The time dependent Schrödinger equation for a single charged particle	June 2004
Nils-Kristian Liborg	D. Sjøberg A. Karahasanovic	A Study of Threats to Validity in Controlled Software Engineering Experiments	August 2004
Lars Sveen Lundby	J. Ø. Aagedal	QoS Monitoring Framework	November 2004
Sveinung Myrlid	O. Skavhaug H. P. Langtangen	Kodegenerering for Palm OS5	October 2004
Frank-Olaf Sem-Jakobsen	T. Skeie	Quality of Service in Virtual Cut-Through Networks	March 2004
Håkon Ursin Steen	M. Jørgensen	Reporting framework-based software process improvement - A quantitative and qualitative review of 71 experience reports of CMM-based SPI	December 2004
Michal Marek Stefanczak	G. T. Lines /A. Tveito	Database Solutions for Biological Systems	December 2004
Øyvind Sønes	O. Skavhaug H. P. Langtangen	Code generation for Ipaq Linux	October 2004
Nina Sørsdal	T. Jensen /T. Skeie	Service Level Agreements between actors	September 2004
Magne Westlie	K.-A. Mardal H. P. Langtangen	Utvikling av et Python grensesnitt til Diffpacks C++ biblioteker	March 2004

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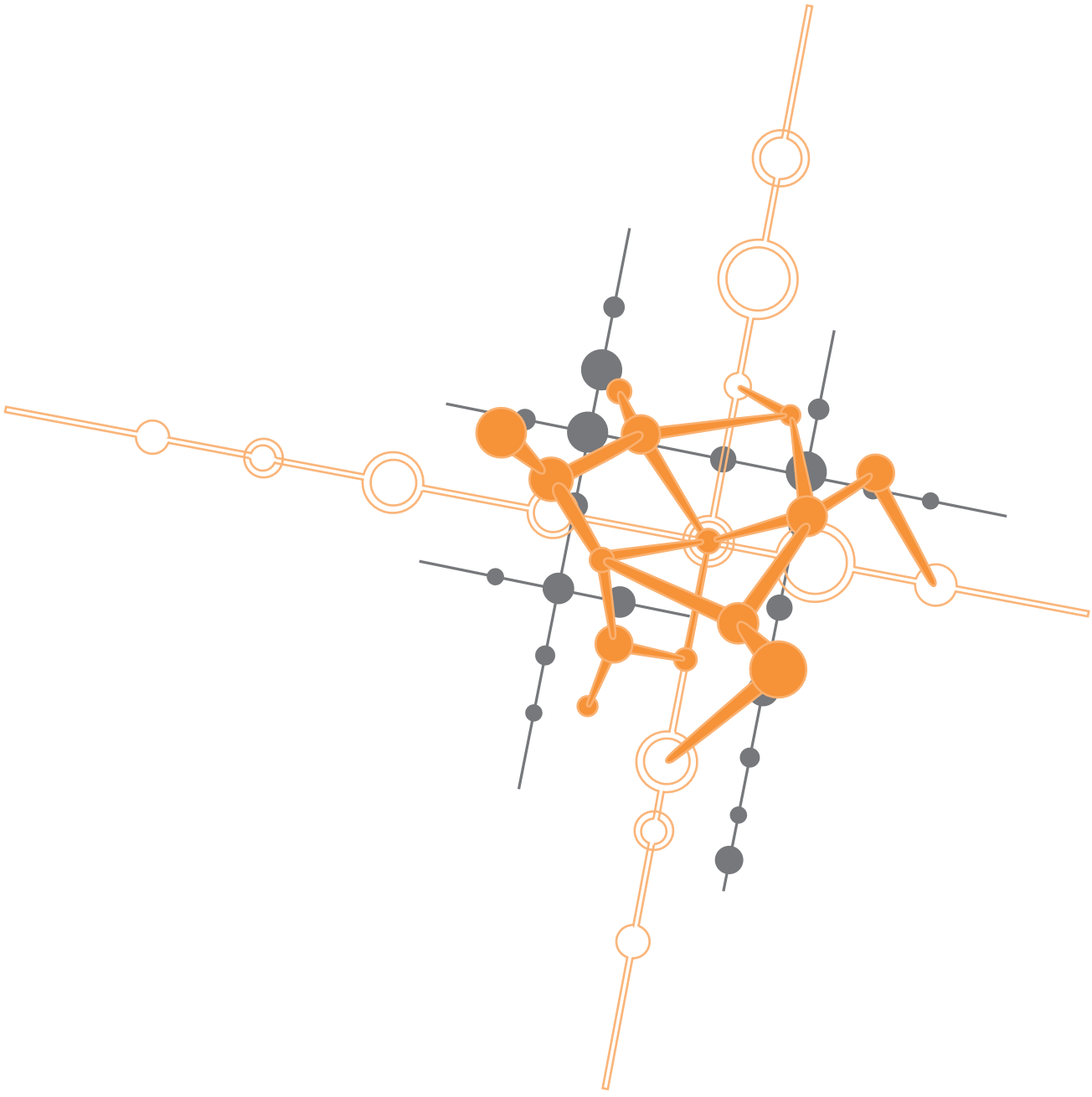

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PhD Theses

2. O. C. Granmo. *Toward Controlling Accuracy and Timelines in Video Content Analysis*. PhD thesis, Department of Informatics, University of Oslo, 2004.

3. K. J. Moløkken-Østvold. *Effort and schedule estimation of software development projects*. PhD thesis, University of Oslo, 2004.

4. O. Skavhaug. *Numerical Methods and Software with Applications in Computational Finance*. PhD thesis, Department of Informatics, University of Oslo, 2004.

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Evaluation of the Simula Research Laboratory

Report of the Evaluation Committee Investigation

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www.forskningsradet.no/english
The report can be ordered at:
www.forskningsradet.no/bibliotek/publikasjonsdatabase/
or green number telefax: +47 800 83 001
Printing: The Research Council of Norway
Number of copies: 250
Oslo, November 2004
ISBN 82-12-02017-7

The Research Council of Norway

To the Research Council of Norway

The members of the Evaluation Committee reviewing the Simula Research Laboratory submit the following report. The views presented in this report are the unanimous opinion of the members of the Evaluation Committee, and the members of the Evaluation Committee are fully in accord with regard to the assessments, recommendations and conclusions stated in the report.

Professor Martin Berzins
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Contents

1. Executive summary and recommendations

The Evaluation Committee is impressed with the progress and level of activity achieved at the Simula Research Laboratory in the comparatively short time since its foundation. The organization has succeeded in generating a vibrant research culture and is now operating as a highly effective research unit with growing international recognition. We commend the self-evaluation document produced as a thorough and accurate assessment of the current state of the laboratory, with a nice balance of awareness of strengths and weaknesses.

The Simula Research Laboratory offers a unique environment that emphasizes and promotes basic research while still covering the broader landscape from postgraduate teaching to commercialization. The organizational and funding framework allows basic research to take centre stage, without any domination by constraints from pursuit of external funding typically found in industrial research institutes, or from the heavier teaching commitments found in the Universities. This emphasis gives the laboratory the opportunity to be highly productive in its chosen areas, but clearly the resources available can only cover a limited number of such areas, and the strategic choice of these areas is of vital importance.

The Evaluation Committee fully supports the current strategy of increasing visibility by promoting the publication of results in high quality journals. Indeed, we believe that this is the only realistic performance measure to apply in a group that is still establishing itself on the international stage. However, we are aware that the laboratory has considered a broader range of uptake measures for the future, including uptake of artefacts such as open source software or transfer to commercial activity via the Simula Innovation subsidiary. The Evaluation Committee **recommends** that the Simula Research Laboratory continues to increase the visibility of this broader range of measures.

Building up a research group of international standing takes time. It is not unreasonable for there to be a period of five years or more from the inception of a new research activity to the appearance of significant results in respected archive quality journals. We believe, therefore, that, since the main research areas are progressing well, it would be premature to propose major changes in direction.

However, the Evaluation Committee does feel that the Simula Research Laboratory's strategy is somewhat conservative. It is appropriate to continue with the current directions at present, but we would have liked to have seen more discussion of the likely evolution of the target areas on a five year timescale and beyond. Some of the departments are more farsighted than others. The Software Engineering Department has a vision of its activity as a grand challenge, which we applaud; the Scientific Computing Department has concentrated on the medium term, and the Networks and Distributed Systems Department is currently primarily concerned with tactical issues. The Evaluation Committee **recommends** that the Simula Research Laboratory revisit its strategy, extending its horizon beyond the five-year point and concentrating on likely changes of focus. It is important that this process should take a strategic view for the laboratory as a whole, should consider renewal of the research base, and should not be bound unduly by the current departmental structure. Formulating the strategy in terms of Grand Challenges is an effective way of articulating the longer-term view.

We have some concerns about the current balance of resources between senior staff and postgraduate students. We regard the total number of PhD students per staff member as low by the standards of world-class academic laboratories, and are particularly concerned by this

when considering that postgraduate education was one of the main stated objectives in establishing Simula. We believe that the number of PhD students should be at least doubled over the next contractual period, although we appreciate that candidates must be selected with care and so do not expect an immediate step change. It may be necessary to look outside Scandinavia for these additional students. The Evaluation Committee **recommends** that Simula raises its postgraduate student targets and that it seek additional resources from the Research Council or elsewhere to make this possible.

The Evaluation Committee believes that Simula has been well served by its Scientific Advisory Board. The laboratory has received good advice and the interactions between Simula and the Scientific Advisory Board seem to have been positive and have established clear goals. We hope that the laboratory will continue to be guided by this board, that its level of involvement will be maintained, and think that its membership should evolve to reflect the changing activities of the laboratory in future.

We feel, however, that the constitution of the Board of Directors could be improved. At present it is dominated by institutional interests, and, with the notable exception of the Chairman, has little industry involvement. We believe that the Board would be strengthened by further industry participation, particularly from those Norwegian knowledge-based industries likely to be able to identify challenges and exploitation areas. The Evaluation Committee **recommends** that the Board of Directors should be reconstituted to include at least two further members with industry backgrounds, even if this means reduction in the academic representation to achieve a workable size. Alternatives could be considered, such as an additional Industrial Advisory Board, but, given the small size of Simula, it is not clear that such an additional structure would be justified.

The Evaluation Committee has been impressed by the quality and coherence of the planning involved in the launch of Simula Innovation, and of the enthusiasm it has generated. We believe that the remit of this unit is important in achieving National benefits from the activities at Simula, and we look forward to seeing its activities develop. We hope that its target of extending the core contractual funding to up to 30% of the total can be achieved, and feel that this target is appropriate, in that it will promote relevance without diluting the special nature of Simula as a basic research laboratory.

The Evaluation Committee has noted that the initiative to create the Simula Research Laboratory formed part of a broader vision for the Fornebu site. This vision foresaw substantial investment in new knowledge-based industry centred on the site and a key role for laboratory in interacting with that industrial base. However, with the notable exception of Telenor, this development has not happened. The result of this is that, whilst the laboratory has established a stimulating working environment in a distinctive building, it is currently disadvantaged by its location, which places an unnecessary barrier to collaboration with the business Centres of North and East Oslo and limits the involvement of graduate students from the University.

The Evaluation Committee is aware that discussions that might lead to a revitalization of the Fornebu initiative are in progress, and that Simula are well placed to play a major role should this happen, but we believe that the Simula Research Laboratory would benefit from relocation if the current initiatives are unsuccessful. The Evaluation Committee therefore **recommends** that the position should be reviewed after the situation has become clear, and certainly within a period of twelve months, with a view to supporting the relocation of the

laboratory if the Fornebu Science Park will not be revitalized; the move should probably be to space adjacent to the University.

Finally, the Evaluation Committee has noted the concerns expressed in the self-evaluation document that the end-date of the current contract will generate uncertainty and depress morale as the second five-year period progresses. We are well aware of the importance of maintaining morale and avoiding distraction from the research goals and so we agree that this is a real threat. It would have a severe impact on the organization if key personnel were to be lost as the end of contract approaches. The Evaluation Committee **recommends** that the Simula Research Laboratory be funded for the next 5 years. Furthermore, to ensure long-term continuity, the Evaluation Committee **recommends** that the Simula Research Laboratory be placed on a rolling 5+5 year contractual basis. An evaluation should be performed at the mid-point of this contract, examining performance and plans for a further ten years. If the evaluation is sufficiently positive, the contract should be extended, so that the laboratory never has less than a five-year planning horizon.

2. Simula Research Laboratory evaluation

2.1 Research assessment

2.1.1 Level of research

The Simula Research Laboratory has achieved a high level and quality of research output. One of the groups from which it was formed had previously been rated as excellent, and the others as good. We confirm that the best department is still excellent, and that the others are improving. We rate the Scientific Computing Department as excellent. The Software Engineering group is very good, and if it can maintain its current level and quality of output will soon also be internationally acknowledged as excellent. The Networks and Distributed Group is good, with some very good elements, and has the potential to reach higher levels if it can increase the visibility of its work so far.

Over all, the upward trend is very encouraging and bodes well for the future. The publication rates in all departments have increased significantly in 2004. This both reflects the increasing level of maturity of their work and also perhaps indicates an awareness of the evaluation process.

2.1.2 Importance of research fields

The process by which the original groups were chosen to form the Simula Research Laboratory was one of selection from the best available groups in Norwegian Universities. The fields in which the departments operate are, individually, important, but there are many areas that are not represented. The departments are quite small; they do not claim to cover all aspects of their respective fields, but are striving for excellence in specific topic areas. Thus they are operating in important fields but could make no claim to cover all the important aspects of their areas.

2.1.3 National and international scientific collaboration

The evidence from the external collaborations is that the laboratory is thriving; both in terms of the number of links and the quality of the external organizations involved, there is clear evidence that Simula is operating as an equal with many of the best institutions in the field. The portfolio of letters of support gives impressive support for this view.

2.1.4 Contribution to education at MSc and PhD levels

Making a significant contribution towards postgraduate education is one of the three main objectives of the Simula Research Laboratory; it takes time to build up student numbers, and the record of recruitment and graduation so far is healthy. The Evaluation Committee feels, however, that the total numbers of PhD and MSc students have not yet reached the level that should be expected of an active research laboratory in a science or engineering discipline. We would expect most staff members who are entitled to supervise students to have at least two or three PhD students and an involvement in a larger number of MSc projects. We hope that these targets can be met by all departments within the next few years.

This increase in student numbers may imply a need for additional resources; whilst the Simula Research Laboratory should strive to attract industry funding for graduate students, it must look to the Research Council for at least some of the necessary support. We hope that the Research Council will be able to respond to this, because the kind of high quality environment provided by Simula is one way to make graduate education attractive to potential students, and so help to encourage uptake of postgraduate places in these key skills areas.

2.1.5 Attractiveness

The range of visitors to Simula give clear evidence that the academic environment is attractive, although we were given anecdotal evidence that the geographical location may not be ideal from this point of view. However, visitors do not seem to have been deterred, and we believe that the amount of joint work reported makes it clear that Simula is regarded internationally as a productive research partner.

2.1.6 Relevance to Norwegian industry and society

We believe that Simula can benefit Norwegian industry in a number of ways. By producing a stream of high-grade PhDs, it can help to increase the quality and level of skills of the workforce; by engaging in industrial collaborations it can help solve problems and introduce new ideas into the industry and so increase competitiveness. We have noted that there is now no large native systems vendor in Norway, so the most productive interactions are likely to focus on software or on specialist sub-systems. This includes strengthening of the Norwegian software industry and the support of major primary industries by improving the quality of the software they use. We also see relevant benefit in the potential for start-ups, in both the product and the services areas.

The benefits to society will come, we believe, primarily via the contribution to industry. Strengthening the industry will provide secure employment and additional resources capable of contributing to quality of life in a broader sense.

2.1.7 Business establishment

The plans for exploitation of business opportunities are closely coupled to the development of Simula Innovation, which we address in section 3.4. We are impressed with these plans and believe that they provide a sound framework for the establishment of new businesses.

2.1.8 Research plan and strategy

The Evaluation Committee believes that the research strategy should be more adventurous and should cover a longer planning window. The current strategy concentrates on consolidation and completion of the original vision of the three departments. This is quite understandable, since the Simula Research Laboratory is still completing its initial steps, and so the direct consequences of them loom large in the management's thoughts. However, we believe that the laboratory needs to think in terms of a changing portfolio of projects and interests, and it is not too soon to start addressing the intellectual renewal process. We must make it clear that this does not imply any sudden change of direction; a good start has been made, and it would be counter-productive to attempt short-term retargeting. However, it is clear that, in five years time, some of the current focus areas will have been well explored and that plans need to be made now for how the next generation of initiative is to be nurtured.

The Evaluation Committee believes, therefore, that it would be timely to consider both the process for, and direction of, longer-term renewal, and that this needs to be addressed from both departmental and complete laboratory perspectives.

2.2 Management assessment

2.2.1 Recruitment

One issue that concerns the reviewers is that there is no clear mechanism for renewal and academic regeneration of Simula as a whole. While this is clearly not an issue at present as the academic leaders are all very research active, it may become one in the future as the present staff age gracefully together. One solution to this may be for Simula and the University of Oslo to consider options for involvement with varying time percentages split between the organisations. This would allow both organisations to take into account the varying needs, career paths and aspirations of all concerned.

2.2.2 Department organisation and scientific leadership

One general issue that arises across all the departments is that the senior academic figures have little or no management training; while this is perhaps not such an issue in an academic environment such as a University, Simula is functioning in a way that is closer to a research business model and so should think about ensuring that its leaders have access to as much management and leadership training as they think is useful. For example, the response across the whole of the organisation to the assessment and feedback process has not been good; this should be easy to remedy.

3. Research Departments evaluation

3.1 Networks and Distributed Systems Department

The Networks and Distributed Systems Department is organized into three projects, ICON, VINE, and QuA. The ICON project is concerned with fault-tolerant interconnection networks, supporting, for example, Storage Area Networks. The VINE project is investigating resilient Internet routing mechanisms. Finally, the QuA project is investigating the design of Quality of Service (QoS) aware component-based middleware for distributed applications.

3.1.1 Assessment of department's scientific contributions

The ICON project has produced very good research results, including publications, specific interconnect designs, and simulation and verification of the design proposals. The group has gained international recognition, and is well connected to an industrial partner, namely a division of SUN Microsystems located at Oslo. The project members are also involved in the EU project (SIVSS), indicating close cooperation with other European partners.

The VINE project has started only very recently. It is, therefore, too early to judge the scientific quality of the project. However, given the quality and the experience of the researchers involved, we judge that this project will progress productively in the near future. The project addresses resilient Internet routing protocols, which is clearly a very important and relevant area. However, it is not clear that the team has so far identified the key novel approach that is to make their contribution internationally significant.

The QuA project is working on the design of a software architecture for flexible composition and configuration at load or execution time of software components to meet specific QoS requirements of real-time distributed applications, e.g. video streaming etc. After a slow start, the project is now entering a very productive phase, with an increasing number and quality of research publications. The project has produced a software prototype to support their architecture (the QuA platform), which is being made available on an Open Source basis. They are applying this to a range of applications, some of which, such as the on-the-fly video feature extraction, are significant developments in their own right. The group participates, as a coordinator, in a newly formed EU STREP project, MADAM.

We judge that these three projects cover a range of topics in the area of networks and distributed systems. However, it should be noted that this research area is currently very active with many other important subfields that are currently not covered within Simula. These areas range from fundamental topics such as distributed algorithms, or provision of high availability and fault tolerance, to more system-oriented areas such as ad hoc and mobile networks, sensor networks, self-organizing large scale distributed systems including future overlay networks and P2P systems, and large-scale GRID systems.

Given the current level of resources available for the Networks and Distributed Systems Department, we do not believe it is possible to see a major extension of activities, and it will never be possible to cover the full spectrum of networking and distributed systems problems; indeed, it would be desirable to be more selective in the longer term, allowing concentration of resources on perhaps just two key areas.

3.1.2 Adequacy between production and financing

Although the Networks and Distributed Systems Department has a reasonable proportion of the total Simula resources, the conduct of three largely unrelated research projects mean that these resources are thinly stretched. There is a need for either additional external resources or a further integration of activities. One possibility would be to complete the harvesting of the ICON results and to transfer expertise to VINE. Concentration on VINE would also have the advantage of leading to a distinct Norwegian Centre of Excellence in the Internet technologies area. We also believe that this emphasis is most likely to lead to ideas that can be exploited by local industry.

As in many similar groups, shortage of resources has led to an emphasis on simulation; this is not in itself a bad thing, but does make close cooperation with industry of great importance to calibrate simulation with information from practical exemplars. The evaluators noted the positive attitude of the group to the publication of complete details simulation models and test cases to enable reproduction of their results by other groups.

3.1.3 International cooperation

Existing collaborations are quite strong, and we note particularly the industrial collaborations with SUN and Telenor (although cooperation which depends on the divisional placement decisions of a multinational company has the higher risk). QuA is currently weak on industrial collaborations but has good contacts with academic groups, both nationally and internationally; we noted however, that collaboration was not as strong with the University of Oslo as we might expect.

Both ICON and QuA are involved in significant European projects, giving them increased visibility.

The QuA project has identified stronger linkage with Grid activities as a strategic target, but we are not convinced that this is a broad enough view. We would wish to see enhanced linkage of the component work with service composition activities in general. There is also a potential for stronger interaction with SINTEF on the link between component configuration and Model Driven Development.

3.1.4 Recruitment

In general, recruitment has been successful and an effective team has been assembled. However, it would be good to strengthen the general internetworking expertise within the department by recruitment at the postdoctoral level.

3.1.5 Balance between categories of employees

The number of PhDs in this department is higher than the Simula average; however, many other comparable laboratories have more associated students, and so opportunities to increase the number of students to some extent should be sought.

3.1.6 Department organisation

One of the weaknesses of this department is that it is really two groups in one, with two effective leaders; there is not much sharing at intellectual level between the networking and the distributed systems aspects. This makes it difficult to assess the group as a single entity and there is a need to ensure both aspects given equal visibility. It would be better if the evolution of the particular interests could result in better integration, but it is not clear how this can currently be achieved. Management of the laboratory might be simplified by dividing the department into two smaller groups, each with their own focus. This might also lead to a higher assessment of their work, as assessing the department as a whole is bound to lead to comments about lack of cohesion.

3.1.7 Scientific leadership

The quality of scientific leadership is high; the leaders of the individual sub-projects each have a clear vision and a good working relationship with their respective teams. Development of the ideas in VINE is at an early stage, so it is premature to judge these aspects.

3.1.8 Research plan and strategy

The strategic plans presented for this department were not strong. There was undue emphasis on following through existing activities and on being responsive to perceived requirements from Telenor. There was only weak interaction between the networking and distributed systems aspects and there were no common goals between them. We acknowledge that the activities in this department are at different levels of maturity, but would like to have seen them placed within a more coherent programme.

We believe that it is important to have a more specific focus integrating the work of ICON and VINE, and that, after a period of harvesting the current results, emphasis should move towards the rapid development of a coherent programme for VINE.

We favour concentration on VINE because it has a clear exploitation route by collaboration with the telecommunications sector, and this avenue should be pursued.

QuA needs to invest in stronger exploitation links with industry by building up further collaborations. However, in the longer term, there is significant potential for collaboration with the smaller organizations in the software sector, particularly those prepared to offer bespoke platforms or tools directed at the management of component frameworks. Application of the QuA architecture to corresponding aspects of service integration (e.g. in flexible web services) would also be a productive direction.

3.2 Scientific Computing Department

3.2.1 Assessment of department's scientific contributions

The department has a high level of scientific output mostly concentrated in refereed journals and proceedings, but also including software. Both the activities in Software for PDEs and Cardiac Computation are led by distinguished and internationally recognised academics with high levels of publications.

It is worth noting that the research groups represented here were rated as “excellent” in the evaluation of ICT in Norway in 2001. Since then, for example, Professor Langtangen has not only written two single-authored books but has also produced 11 journal papers, 12 book chapters and conference papers and one edited book with Professor Tveito, who also has a similar number of publications. In line with other groups the publication rates have increased significantly in 2004.

During the evaluation period the group has graduated 20 M.Sc. students and 4 Ph.D. students. It is also interesting to note that the research on scripting-based software has had a good educational impact through a popular course at the University of Oslo.

The letters of support are strong and clear in their evaluation of the group’s work as being at a high international level of excellence. The letter from Professor David Keyes is particularly supportive of both the PDE software project and the Cardiac Computation project. The evaluation panel agrees with and endorses this view. One possible qualification is that competing international groups have still closer ties to applications expertise and this may be an issue in the future.

3.2.2 International cooperation

The Scientific Computing group has a good range of collaborations with international groups. This is particularly true of the links with the groups of Professor Peter Hunter in New Zealand and Professor Andrew McCulloch in San Diego. Both these groups are world leaders in cardiac modelling. These collaborations are still in their early stages and of considerable scientific benefit, but have yet to produce significant numbers of publications or joint software. Given the group’s lack of bioengineering expertise it is important that they collaborate with groups such as these to ensure that they have access to domain expertise.

3.2.3 Recruitment

The scientific computing group was recruited as a whole with already good standing and reputations. More recently two new staff have been hired as research scientists possibly to work on the expected new contract with Norsk Hydro.

3.2.4 Balance between categories of employees

The group consists of eight senior researchers, two postdoctoral researchers, six students and a number of part-time researchers and visitors. Although not particularly large, the group has a good balance of employees, sufficient critical mass and good academic leadership.

The Scientific Computing group could expand to have more Ph.D. students. This would increase the educational impact of the group and also broaden its research base. The stated justification for the relatively low number at present is that the group has concentrated on post-doctoral researchers in order to build up a strong software and science base. The forthcoming contract with Norsk Hydro will, if signed, lead to a number of further researchers working in this area.

3.2.5 Department organisation and scientific leadership

The Scientific Computing group has a dual command structure, based on project leaders and principal investigators who are the senior academic figures (Langtangen and Tveito). This is designed to relieve the scientific leaders of the administrative burden associated with the projects and is felt to be a good approach. One issue that has arisen across Simula is that of the level of management feedback through the review process. If this activity wishes to remain an international leader it is important for staff to get constructive and realistic feedback and for the quality of academic leadership to reflect the quality of academic research.

In the area of hardware infrastructure Simula has an adequate supply of high performance computing resources for the initial development of software. In terms of conducting larger scale experiments and proof of concept simulations there is a clear need for access to large scale parallel computing resources. This is an issue because many competing international groups have routine access to local parallel computers with hundreds of processors (and even possibly to thousands of processors remotely situated). We hope that current efforts to reorganise high performance computing in Norway will help in this respect.

3.2.6 Research plan and strategy

The departmental strategy is to continue to focus activity in the two key areas of scientific endeavour. These areas are Cardiac Computations and Software for Partial Differential Equations. This reflects the advice given by the International Evaluation Committee for ICT Research in Norway. These areas are a good fit with the skills of the research groups and have the potential to continue to make a significant impact. For example in the area of Cardiac Computation the group has the possibility to make an impact on healthcare in general and Norway in particular. This will however require the expansion of the already existing medical component of the project to include links to bioengineering and medical researchers. Examples could include helping surgeons to plan operations and with the design of devices to aid the working of the heart.

In the area of software for partial differential equations the applicability and use of the software is a key measure of its success. At present the software being generated by the group is being used on a number of exciting research projects. The overall route for software dissemination is slightly more complex because Diffpack is owned by an external company. The department's desire to distribute open source software is regarded in a very positive way by the review team.

The move towards solving complex multi-physics and multi-scale problems is a positive one and is in line with international trends. At the same time, as indicated in the self-evaluation, it is important to make sure that sufficient modelling expertise is available to ensure that the foundations of the computational work are as sound as can be. It is thus important that the group strengthen and extend existing work with domain-specific mathematical modelling experts in areas such as bioengineering and geophysics.

The proposed new project with Norsk Hydro, seems to be, at the time of review, very close to having its funding confirmed. This is an exciting and very positive step forward. The department and Simula Innovation are to be applauded for moving in this direction. The project as outlined will lead to significant new applications challenges and allow the group to

work on new projects that are both scientifically challenging and helpful to an industry that is important for Norway.

3.3 Software Engineering Department

3.3.1 Assessment of department's scientific contribution

The Software Engineering Department is involved in a large scale benchmarking activity to evaluate software engineering processes in practice. The department conducts empirical studies of different forms (student or practitioner experiments, case studies etc.) in Norway and abroad to get a better understanding of what is the practice of software engineering and as a means for achieving the goal of supporting software process improvement. In the first phase, the department aimed to provide such support in three ways:

(a) through guidelines for situated Software Engineering (which technology, process, tool etc. to use in a given Software Engineering project situation);

(b) by developing theories for cost estimations; and

(c) by improving OO analysis and design methods.

The Evaluation Committee supports this pioneering benchmarking initiative, which is unique in the world and certainly worth taking to bring out evidence about exactly what the practice of software engineering is today. The impact of such large, realistic and in-depth empirical studies on the software engineering community is potentially of great importance. The Committee was impressed by the empirical findings and considers the scientific contribution of the Software Engineering Department to be at a high level. Given the size of the group and its recent formation, the rate of publications in leading journals and in international conferences in the field is remarkable. The Simula Software Engineering Department is internationally recognised to be one of the experts on empirical software engineering and possibly the only group in which this is a major focus. Letters of support confirm this view. The Committee also acknowledged the fact that the presentation of these studies in Norwegian newspapers and journals contributes to a very positive image for Simula in Norway and is of practical benefit to the software industry. Finally, the Committee appreciated the way the research plan was presented by the department as a 'Grand Challenge'. We recommend, given its level of ambition and its multidisciplinary aspects that the group launch a corresponding project on a larger scale, for instance at the European level.

3.3.2 Adequacy between production and financing

The group conducted a large number of experiments (54), produced 26 journal papers and 68 conference papers in the first four years of existence; it has given 22 seminars or courses and written 33 articles in newspapers. These are exceptional achievements, particularly when considering the increases in number and quality of the publication. The Committee appreciated the effort made in the presentation to demonstrate the quality of their work by using established yardsticks for the assessment of systems and software engineering scholars and institutions. We recommend that the Simula Research Laboratory continues and, if possible, increases the financial support provided to this department. This is particularly important as the activity has the potential to make a significant impact on the Norwegian software industry and to increase its competitiveness.

3.3.3 International cooperation

The Software Engineering Department has an international visibility particularly in the empirical research community and has established much international cooperation. One of the supporting letters, from Professor Kitchenham, states that the author will ensure that two groups that she is associated with collaborate with this activity. The Committee encourages the department to strengthen international cooperation with a view to achieving the Grand Challenge mentioned above and in particular to increase activity within the EU, possibly through a network of excellence.

3.3.4 Recruitment

The department has grown from six persons in 2001 to 14 persons in 2004. The recruitment was done in a controlled manner with the policy of preferring scientists with industrial experience, which is wise, given the empirical nature of the research. The Committee believes that the policy of employing professionals to undertake the management of experimental projects is a good one. It avoids research leaders being distracted from their main research activity.

3.3.5 Balance between categories of employees

As noted for the other departments, the Committee suggests an increase in the number of PhD students. We are aware of the difficulty of recruiting enough Norwegian students in certain areas and suggest international recruitment with appropriate financial support. This will increase both the breadth and depth of the research of this department.

3.3.6 Department organisation

The department is organised in three research groups and one support group. It is clear that this organisation is flexible, that there exists a good ‘esprit de corps’ among the members of the department and that work is done according to a shared strategy. The Committee encourages the department to maintain this approach in the future.

The three research groups correspond to the three software engineering areas to which the department wants to contribute by improving the observed software engineering practice. These groups are, as mentioned above, relatively small in size. The advantage of this is that the groups are focussed with little administrative overhead. This may also be a disadvantage, however, in that the groups may be vulnerable if people leave. Given the relatively small size of the research groups it may be important to recruit new academic staff to ensure their continuing critical mass.

Some thought should be given to the structure of this activity, particularly if the work continues to grow in importance. This may involve recruitment and/or forming groups in new areas of software engineering in which the department would like to see research.

3.3.7 Scientific leadership

This department is the smallest of the three groups and also has a high degree of cohesion and interaction. The common values of the senior academics with regard to organizing and conducting research help to provide a stable and supportive environment. The novel nature of

the work and its comparatively recent inception means that there is still work to do in terms of obtaining an academic profile commensurate with the quality of the research. It is important that the group continues to serve on program committees and that it expands its editorial board memberships.

3.3.8 Research plan and strategy

The Evaluation Committee was not completely convinced by the analogy between the Human Genome Project and the proposed Software Engineering Department research plan but it was impressed by the breadth of their vision. We agree that the group should continue to improve their innovative way of conducting empirical studies with continuously greater realism and quality. In particular their involvement with industry and with researchers from a variety of other fields will be of benefit to their research. The move towards more international studies is also important in what is now increasingly a global industry. Finally it is of critical importance that the theoretical work that is proposed should be carried out, as this will provide a solid framework for both present and future work; but it may require further resources in order to be completely successful.

3.4 Simula Innovation evaluation

Creation of a suitable innovation environment is a primary goal of the initiative that created the Simula Research Laboratory; we believe that the creation of a separate organization to enable the pursuit of this goal is not just an accounting convenience, but really reflects the laboratory's commitment to innovation and business creation.

The negotiations with Norsk Hydro, which we hope will reach a successful outcome soon, illustrate the strong role that Simula Innovation will be able to play in stimulating research and identifying productive new directions that can benefit Norwegian industry.

We hope that Simula Innovation will help to strengthen the laboratory as a whole, by increasing relevance and identifying new problems that have a clear path to exploitation.

3.4.1 Skills in planning exploitation

The Evaluation Committee found the presentation of the innovation strategy very impressive; in particular, it felt that the creation of the EFFECT model was a major strength. We noted the collaboration with the University of Oslo on innovation support as being a particularly positive step.

We believe that the provision of training on the exploitation process may help to focus scientific ideas, but feel that there is a need to build up awareness over a period of time. The reports that there is an increasingly active innovation culture are encouraging.

3.4.2 Financial resources

Successful innovation depends on the availability of suitable seed funding at the right stages in the process, and the indications that suitable mechanisms for this are being put in place are welcome. The introduction of measures to provide support for innovation by the Research

Council will help, but innovation is a continuing process and so needs a continuous funding stream; this implies exploring a wide range of possible sources of funding.

We would wish however, to make it clear that we have been asked to perform this evaluation as technical experts; we are not business analysts and cannot speak authoritatively on this topic.

3.4.3 Marketing knowledge

The Simula Innovation staff showed a broad background and awareness of the Norwegian situation; however, it may be harder to track the full range of international opportunities, and there should be a willingness to use external experts where there are gaps in the available expertise.

3.4.4 Contact with investors

Again, this area is peripheral to our competence as a group. The analysis and contact list presented sounded promising, but there is insufficient hard evidence for us to be confident.

However, we noted the link with the University as a potential strength and the claim of links with all major venture capital organizations and some other major investors as a potential strength if it is well founded.

4. Evaluation Committee Membership

Professor Martin Berzins	University of Utah, USA
Professor Bertil Gustafsson	Uppsala University, Sweden
Professor Seif Haridi	Swedish Institute of Computer Science
Professor Peter F. Linington	University of Kent, UK
Professor Colette Rolland	University of Paris-1, Sorbonne, France

Appendix:
Mandate for the evaluation of Simula Research Laboratory

The objective of this evaluation is to give the Research Council of Norway an impartial and complete report on the activity at the Simula Research Laboratory (Simula). The evaluation will be used to determine the future financing of the centre.

The evaluation shall include:

1. An overall evaluation of the centre including administrative and leadership aspects.
2. An evaluation of each of the departments and their scientific production.
3. An evaluation of the scientific plans for future research at the centre.

The basis for the evaluation will be:

- The original research plan for Simula.
- A self evaluation from Simula including lists of scientific pulications and the 5 most important publications from each of the research groups.
- A plan for the scientific activity in Simula for the next 5 years.
- A site visit to Simula.

The Committee is asked to evaluate the scientific results achieved, their importance and their quality including both national and international cooperation. The committee is also asked to evaluate the organisation and leadership of the research groups.

We specifically ask the committee to address the following issues:

Simula Research Laboratory

1. Does Simula Research Laboratory conduct research at an international level?
2. Does the research at Simula Research Laboratory address fields that are accepted as important internationally?
3. Is there a satisfactory degree of scientific cooperation between the Simula Research Laboratory and international and national research centres?
4. What is the contribution from Simula Research Laboratory regarding education at the MSc and PhD level in informatics?
5. Does Simula Research Laboratory appear to be an attractive research partner for the best researchers in Norway and respected international researchers?
6. Is the research of Simula Research Laboratory relevant for Norwegian industry and society?
7. Has the Simula Research Laboratory worked actively to promote the establishment of businesses based on the research in the lab?
8. Comment on the research plans for the next five years.

Research Departments

1. Present an assessment of the department's scientific contributions.
2. Is the scientific production reasonably large in view of the available financial resources?
3. Does the department actively cooperate with international research groups?
4. Is the recruitment of scientists to the department satisfactory?

5. Is there a reasonable balance between various categories of employees; PhD students, post docs. researchers and professors?
6. Is the department organised in a reasonable manner?
7. Is the scientific leadership working properly?
8. Comment on the research plans and strategy for the department.

Simula Innovation as

1. Does Simula Innovation possess the necessary skills to turn research to business?
2. Does Simula Innovation have the ability to obtain necessary financial resources?
3. Does Simula Innovation have access to people with sufficient market knowledge?
4. Does Simula Innovation have good contact with investors?

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