Follow-up plan for the evaluation of basic research in ICT

Report from the follow-up Committee of the international report:
Research in Information and Communication Technology – An evaluation

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September 2013

Report from the Follow-up Committee of the international report: Research in Information and Communication Technology in Norway – An evaluation.

PhD Recruitment within ICT departments at UiO, UiB and NTNU 2006-2012

■ Norway ■ Europe ■ World

Year	Norway	Europe	World
2006	70	18	22
2007	56	16	48
2008	50	28	80
2009	44	24	58
2010	33	27	38
2011	30	18	39
2012	27	14	19
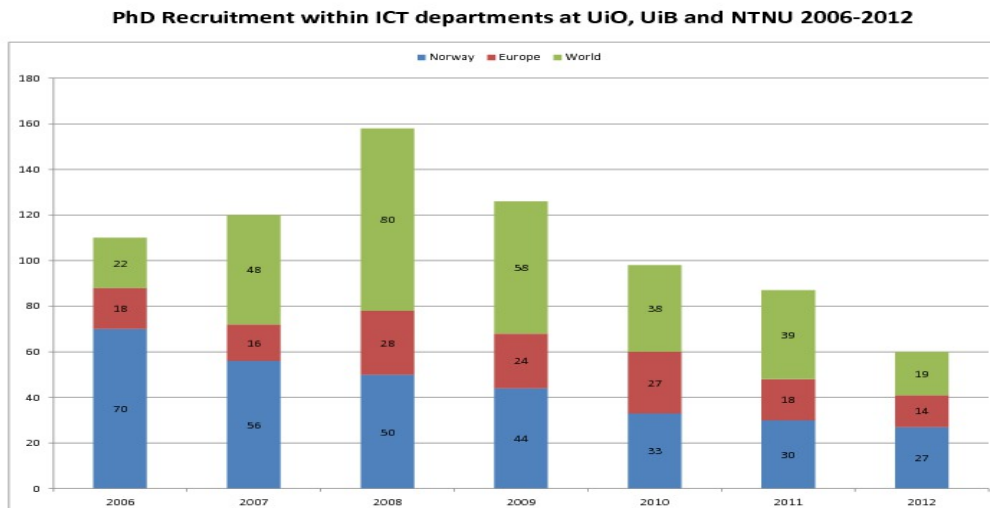
This figure shows that the number of Ph.D. degrees awarded in ICT will fall dramatically over the next 3-4 years. Moreover the trend will continue unless immediate action is taken.

Preface

The international panel, appointed by the Norwegian Research Council to evaluate ICT research in Norway, delivered its report "Research in Information and Communication Technology in Norway" in February 2012. In December 2012, the RCN appointed a committee to make recommendations for follow-up actions. The findings of the evaluation as well as the suggested actions proposed by the evaluated organizations in response to a request by the RCN, will serve as background. Beyond this, the committee will suggest any actions that it finds suitable within the broader context of its mandate.

The committee members:
Professor Petter E. Bjørstad, Department of Informatics, UiB - Chair
Professor Kristin Braa, Department of Informatics, UiO
Professor Monica Divitini, Department of Computer and Information Science, NTNU
Professor Bjarne E. Helvik, Department of Telematics, NTNU
Professor Andreas Prinz, Department of ICT, UiA
Professor Barbara Wasson, Department for Information Science and Media Studies, UiB

Dr. Harald H. Simonsen, at the Research Council of Norway has been acting as coordinator.

The committee has had 4 meetings.

Norsk Sammendrag:

Norge investerer mindre i forskning og utdanning innen IKT, enn EU og Nord Amerika. Samtidig har vi ambisiøse planer om å bruke IKT på stadig flere områder i samfunnet, ikke minst i grenseflaten mellom offentlig sektor og borgerne. En slik politikk vil ikke være bærekraftig i et lengre perspektiv. Dette er allerede synlig når IKT prosjekter overskrider sine budsjetter betydelig eller svikter i leveranse av service og funksjonalitet.

Det internasjonale panelet konkluderte at bare 5 forskergrupper i Norge fortjente beste karakter. Samtidig påpeker komiteen at Norge har internasjonal styrke i et antall områder som er større enn det en skulle forvente ut fra de relativt lave investeringene i forskning innen området. Videre ble det påpekt at nasjonal kompetanse på kritiske områder som datasikkerhet har falt under et kritisk minimumsnivå.

Denne komiteen påpeker at antall Ph.D. grader i IKT vil falle dramatisk i de neste 3-4 årene. Dette skyldes manglende finansiering av IKT forskning. I beste fall vil situasjonen bli bedre om 5 år, men slike store sykliske svingninger er skadelig for rekruttering av unge forskertalenter og for evnen til å utvikle sterke forskningsgrupper. Videre er det behov for økte investeringer innen grunnleggende forskning innen IKT for å sikre bærekraft innen IKT-området, Norsk økonomi og samfunnsliv.

De 4 forslagene som har høyest prioritet er:

1. Øyeblikkelig finansiering av 15 Ph.D. stipendiater for perioden 2014-2016.

2. Å sikre at et nytt forskningsprogram i IKT følger opp de internasjonale anbefalingene og at et slikt program prioriterer grunnforskning innen IKT.

3. At det etableres et forskningsprogram innen datasikkerhet.

4. At man tar i bruk SFI ordningen for å adressere viktige IKT utfordringer i offentlig sektor.

2 Summary

This report is a follow-up of the proposed recommendations by the international evaluation panel concerning Norwegian research in ICT. Only recommendations that apply to the national level have been considered. A list of actions is outlined in Section 5; these are placed in a priority order in Section 6. The report shows that the number of Ph.D. degrees to be awarded in ICT will fall sharply in the next 3-4 years. The 4 most important actions are:

1. To immediately finance 15 Ph.D. students for the period 2014-2016.

2. To ensure that a new research program in ICT will follow up on the international recommendations and, in particular, that it will generously fund basic research in ICT. This focus will over time give Norway the highest return on the investment in ICT research.

3. Establish a research program in cyber security.

4. Make SFI calls (Center for Innovation) in order to attack critical ICT challenges in the public sector.

3 Introduction

The RCN carried out an international evaluation of Norwegian research in ICT in 2011. The report by the international panel was published in early 2012.

The mandate from the RCN to the committee asks that the committee, in particular, considers the following points:

I.   Actions that will further develop and strengthen the research and the PhD education within ICT.

II.   Actions that promote national cooperation, coordination and division of work, as well as international research cooperation and incentives for increased mobility.

III.   Actions that can improve upon the current gender imbalance and promote recruitment of women, in particular to permanent faculty positions.

IV.   To help identify research areas within ICT that need to be strengthened.

V.   To give advice on what kind of actions that will be most effective in order to follow up on the advice given by the evaluation panel.

VI.   To give advice on other strategic actions that may contribute to further develop and strengthen ICT in Norway and thus increase the impact of ICT within strategic research topics of national importance.

The Ministry of Government Administration, Reform and Church Affairs (also responsible for a national ICT strategy) delivered its report Digital Agenda for Norway on March 22. 2013. This report observes:

"Research in ICT at a high international level of competence, is important for Norwegian industry and for the public sector. This applies to both basic (or generic) ICT research and more applied science within domains that are important for the private and public sector. ICT research and development of high quality is important for the creation of new businesses and increased creation of value.
In 2010, slightly less than 1000 diplomas were issued within ICT at the bachelor and master level in Norway. This number (in 2010) is only 50 percent of the volume in 2004. Despite the steady increase in demand for ICT in society, there has been no return to the 2004 level, as regards to the interest for education within ICT (at all levels)." (Page 87.)

We observe that fewer institutions offer ICT education in 2010, since study programs in ICT have been discontinued at many University colleges in Norway. Higher education in ICT is now mainly offered at Norwegian universities. However, there is reason to believe that the (average) quality of ICT education has been improved since 2004. This government report finds that an increase in volume is needed. An increased volume of ICT diplomas from the universities will have a direct effect on the volume of research in ICT at the same institutions, since the professors divide their time between teaching and research. In light of the findings by the International Evaluation Panel, there must be an uncompromising attention to improving the quality of this research, in particular, when decisions concerning the hiring of new faculty members are made. The best way to address this challenge is to provide more funding opportunities in support of basic ICT research.

The Ministry of Education and Research delivered its report "Long-term perspectives – knowledge provides opportunity" on March 8. 2013. This report discusses and makes recommendations on several issues with direct relevance related to the current evaluation of ICT. The report initiates a trial test of tenure track positions within the Science and Medical faculties in Norway. This action is

directly related to recommendation 7 below. The report points to the increased use of digital solutions in all public services and the need for improvements and increased competence in order to offer a uniformly high quality level of service. This observation supports our recommendation 3 below. The report is also clear when stating that thematic oriented research must not create barriers against (sub)disciplines, excellent research groups or important scientific initiatives. This remark is related to the evaluation of the RCN itself where it is suggested that a reasonable fraction of the budget for thematic programmes be reserved to fund the generic competence that is of critical importance for such research.

Finally, the Ministry of Justice and Public Security delivered its report "Terrorberedskap" (Terrorism Preparedness) on March 20. 2013. This report underscores the importance of ICT with respect to all aspects of national security (page 123-125), in particular, the critical factor of sufficiently high (internal) competence. This report is in line with and supports recommendation 10 on increased funding to research in the area of cyber security.

4 Overview of recommendations and formulation of goals

In this section, we refer directly to the 10 recommendations by the international panel. In order to make this report clear and readable, we will refer to these points by normal (Arabic) numbers and to the six points in our mandate by Roman numerals. We will refer to (relevant) input received from the evaluated institutions and then formulate the findings of the committee. Based on this, we define one or more goals that should be achieved for each issue. In the following section, these goals are made operational in the form of suggested actions.

1 *Develop a national ICT research strategy that focuses on technical excellence, that balances established and emerging areas, and that considers the peculiarities of the Norwegian industry and society besides the global international context.*

We do note that the Ministry of Government Administration, Reform and Church Affairs has been charged with the task of making a national ICT strategy, this work is expected to be completed by summer 2013. This strategy will be broad in scope and go well beyond what is asked by the international panel. This evaluation and the follow up work is largely decoupled from the work. There is a danger that the final strategy will fail to explicitly address a research strategy within ICT.

There is strong and broad support for such an action from Norwegian ICT organizations. We refer to the feedback from the evaluated organizations to the RCN:

SINTEF and SIMULA say that a long-term National program for ICT with specific focus on the fundamental challenges are needed. Proposals should be selected based on scientific merit.

 NTNU wrote a careful response to the evaluation that also captures the opinion of UiT, UiB and UiO. *"Establish a dedicated research program directed towards basic/enabling ICT technology. One of the great and often undervalued strengths of ICT is the technologies' ability to adapt to an almost endless array of societal and application domains, often in unexpected and surprising ways. The worth and power of generic ICT knowledge that can be transferred to give added value an new developments across many such domains should never be underestimated. Where the basic technological principles are more or less application independent, it therefore makes great sense to focus on generic principles in research - which can then afterwards be exploited to create value in many sectors. The*

alternative, which is to link ICT research exclusively to very specific application areas ("ICT for XXX", "ICT for YYY") is essentially dangerous, because there will be an inherent risk for scientific tunnel sight and for "reinventing the wheel" within the different separate domain."

Thus, this committee finds that the single most important action in response to this point, is the establishment of a new research program in ICT, in particular:

a   A relative funding volume at the same level as in EU, reflecting the broad impact of ICT on society as well as enabling breakthroughs in emerging disciplines such as the life- and nano- sciences.

b   A research direction with focus on broad themes that can engage quality ICT research in Norway and form the foundation upon which the development of a strong ICT sector can be built. This applies to the ICT industry as well as the advanced utilization of ICT technology in the public and private domain.

c   Success in a) and b) will result in an improved evaluation of Norwegian ICT in 2022.

2   *University departments and research institutes in ICT should be encouraged to compare their research focus, vision, and productivity annually with a set of leading peer organizations outside of Norway.*

The Universities in Tromsø and Bergen explicitly supported this recommendation.

This committee considers a stronger focus on international relevance when developing ICT strategies in Norway as good and important advice. Research in ICT is in its very nature, international and contributions from Norway must be seen in this perspective. Ultimately, such comparisons whether explicit or implicit, will help prepare and improve the quality of our research as it develops from now and forward to a new evaluation in 2022.

This committee agrees with the recommendation and strongly suggests that appropriate actions are taken at each institution.

3   *Develop or strengthen an innovation strategy and the supporting incentives –*
Both Simula and UiO point out that the SFI funding mechanism may be a very effective tool to achieve improvement in this area.

The committee agrees with this goal while observing the significant challenges to achieve it. A mechanism that will contribute is the use of SFI centers where both academia and industry go together to make progress within well-defined problem areas. The idea of funding Ph.D. projects between the government sector and the universities along a similar model as has previously been established with respect to the private sector (nærings-Ph.D.) should be initiated within the ICT sector. Furthermore, as a very logical step, there should be calls for SFI centers between the public sector and the universities within ICT. The committee finds that the largest demand for increased ICT competence and the corresponding potential for huge savings may be found within the government sector.

 Another important action would be to create incentives for mobility between academia and industry. Thus, it should be possible for faculty at ICT departments to also hold jobs/responsibilities in private

companies. This is today, not encouraged. Here, the situation is very different from say, the USA. (Where a Bill Dally can be CTO at NVIDIA and professor at Stanford Computer Science without much administrative fuss)

4   *ICT organizations should seek to better coordinate their educational offerings, flow of personnel, construction and support of facilities and advanced research infrastructure. For a small country like Norway, this has to be a balance between fostering healthy competition and achieving efficiencies of scale.*

A separate committee has been named by UHR (The Norwegian Association of Higher Education Institutions) to look into this. This committee, called MNT-SAK, is charged with a mandate to look into Cooperation, Division of work, and the Establishment of Focus areas for individual institutions.

5   *Increase national coordination of PhD education to ensure uniform quality and increase mobility, and to help establish networks among young researchers.*

The University of Oslo explicitly states that they would like to contribute in forming national Ph.D. research schools and help develop a better portfolio of Ph.D. courses. The University of Bergen supports this idea. NTNU would like to make such efforts have a more international scope.

The committee strongly supports actions in this area. National PhD schools are well recognized from the Ph.D. students and among the faculties to work well. Two *such school recently* have *received funding from the RCN one in the field of computer security and the "Norwegian PhD Network on Nanotechnology for Microsystems"*.

6   *Enhance awareness of the critical importance of mentoring and training of junior post-PhD researchers*

The committee fully agrees with this recommendation. However, this action seems best left to each academic institution*.*

7   *Ensure a reward structure for a research career in ICT that applies across the spectrum and, in particular, is sufficiently flexible to retain Norway's best talents without forcing them to enter into industrial careers.*

This issue is challenged by the rigid government salary structure. Remuneration should to a larger degree be based on academic performance and be more competitive.

There are signs that some form of tenure track positions will be initiated, however, it is too early to tell if this will provide much needed predictability for career development among talented, young faculty.

This committee believes that a realistic goal would be to initiate the new tenure track possibility announced very recently by the government. In order to be effective, the institutions that run good ICT departments should receive funding for a limited number of these positions. In return, the departments would guarantee the permanent positions that (often) will follow. This will help bridge the transition from faculty positions of those that are 60+ to a new generation, and help to improve upon the gender imbalance of today.

8   *Norway invests substantially in research institutes with activities in the ICT area. These institutes appear to be an underutilized resource for education, mentoring and research*

collaborations and incentives should be developed and implemented to help further develop this.

The committee does not support this recommendation fully. The responsibilities of the two parts – Universities and Research institutes should be maintained separately within this structure. That is, the responsibility for education should remain with the universities. The use of adjunct positions (Professor II) in order to draw upon talent from the Institute sector, should be strongly encouraged. Also, research collaborations between these parties should receive incentives. Today, there are negative incentives for research collaborations. The committee strongly recommends that joint publications between a university faculty and a scientist at a research institute should be credited (strongly) in both organizations.

9   *An international perspective is essential for Norway and strong international partnerships, providing basic technologies and expertise for the development of its own research, should be cultivated to balance insufficient critical mass in core areas supported in competition with other priorities in a country of its size.*

The committee agrees with this point of view. In line with this, stronger mechanisms should be put in place for forming international partnerships outside of the European Union, in particular with the USA. Additionally, the incentives from the Ministry for EU research projects are only in a very limited way noticed at the departmental level. To carry out research on a European research arena is exceedingly difficult unless the entire financial incentive can be used to maintain some level of competitiveness. (Example: A professor can finance 5 Ph.D. students on an ERC starting grant in Austria, the same grant will only support 2 Ph.D. students in Norway.)

10   *As an area of national importance, it is recommended that Norway consider initiating a strategic effort to increase national competence in cyber security.*

This advice received broad support from the institutions that participated in the evaluation. In particular, a partnership has already been established between SIMULA and the Selmer Center at the University of Bergen, thus responding to specific recommendations given to the two institutions. Additionally, the RCN has decided to fund a National Ph.D. school in this domain. The committee recommends that this area shall be selected as an area of national importance in a new ICT research program.

5 Recommended actions

Presentation of actions suggested by the committee, for clarity, the actions are presented relative to the 10 recommendations by the evaluation panel. The actions are listed with respect to priority in Section 6.

Action 1.1: 15 new PhDs in ICT in 2013

Description:

Immediately, allocate 15 new Ph.D. positions to ICT university research groups in Norway. It is critical that this action be carried out in 2013, with project start already in January 2014.

This action relates directly to item I, V and VI in the mandate.

Justification:

Due to the gap in financing of new projects between the Verdict program and a new ICT program (with start in 2015 or later), it is clear that there will be a significant drop in the number of (ICT) Ph.D.s granted. The top figure shows that the degrees granted will drop from around 140 (in 2012) to about 50 (in 2016), a reduction of more than 60 percent. The expected volume of research carried out in the same period will similarly show a correlation with this. This unfortunate trend comes at a time when several government reports call for an increase. In line with all recommendations, emphasis should be placed on projects targeting generic ICT research. This action will provide a bridge, thus changing the curve of the drop from V-shaped to U-shaped.

Unfortunately, the committee is unable to offer advice on how this action shall be carried out. The committee chair and Bjarne E. Helvik recommend that the evaluation report be used as a guidance for this allocation. The three members Kristin Braa, Monica Divitini and Barbara Wasson do not think that the evaluation can be used for such a purpose, as they want an open call. Andreas Prinz does not have an opinion on the issue.We stress that time is of the essence and that normal allocation procedures will fail to answer this challenge.

Financial implications:
Assigning a Ph.D. project with a financial scope of NOK 1 mill/year, this action would cost 15 MNOK in 2014. This cost should subsequently (for 2015 and 2016) be carried forward as an action in the new ICT program.

Responsible:
The Research Council of Norway.

Action 1.2: New national ICT research programme
Description:
Establish mechanisms to ensure that the new ICT program will connect good ICT research groups with broad issues of national importance. A link should be created between the follow-up of the ICT-research evaluation and the next planning phase of this program.

This action relates to item II, IV, V and VI in the mandate.

Justification:
This action is of utmost importance for the entire ICT research activity in Norway. All institutions that participated in the evaluation of ICT research emphasize this point as shown in Section 4.1 above. The initial draft document "Kunnskapsgrunnlaget" was revised to better reflect this after the hearing conducted on Nov. 29th. 2012. This was an important beginning, but this process must have continuous input from and interaction with the ICT research environment in the next phase of development.

Financial implications:
This action should be handled within the framework of a new ICT program.

Responsible:
The Research Council of Norway.

Action 1.3: Two-stage evaluations
Description:

Two-stage evaluations of all ICT research proposals to the RCN.

This action relates to item II, V and VI in the mandate.

Justification:

The number of successful applications within the "RCN open call" (proposals initiated by scientists) is in the range of 5-10 percent. The large number of rejected research proposals leads to waste of resources. Too many hours are spent on writing proposals that do not succeed. Most of this time would be better spent on doing actual research and/or teaching. Moreover, there is a clear trend that universities (at all levels) hire more and more non-scientific staff in order to improve (the non-scientific part of) the proposals that are submitted. There is (unfortunately) evidence that such "polishing" of proposals does result in an increased success rate, however this can easily become a spiralling effect that ends up diverting resources away from science. The committee will further recommend that the RCN revert to using expert referees and end the practice of only relying on panels as these cannot cover the broad range of ICT research in an unbiased manner.

Financial implications:

Would result in potentially big savings at the research institutions. A more careful evaluation of fewer proposals might not have a large negative effect at the RCN.

Responsible:

The Research Council of Norway.

Action 3.1: Nærings-PhD for public sector

Description:

Identify and create Ph.D. positions in a joint program between the public sector, the RCN and the universities on the same/similar principle as the current "nærings-Ph.D." has been established between the private sector and the universities.

This action relates to I, II, IV, V and VI in the mandate.

Justification:

Norway has a very a very large public sector and an ambitious plan to make this sector interact with its citizens using solutions based on ICT. If this shall succeed, the level of competence must increase substantially.

Financial implications:

The action should be initiated in target areas and then expanded. Proper incentives must be established. The financial implication will depend on volume.

Responsible:

The Research Council of Norway and the Ministries, followed by public agencies.

Action 3.2: SFI for public sector

Description:

Create calls for establishing SFI centres between government agencies and the universities in order to make significant progress on the effective use of ICT in the public sector.

This action relates to I, IV, V and VI in the mandate.

Justification:
Norway has a very large public sector and an ambitious plan to make this sector interact with its citizens using solutions based on ICT. If this shall succeed, the level of competence must increase substantially. There are too many examples of large ICT projects in this sector that have been hit by huge cost over-runs, as well as failures. The SFI mechanism has proven very effective within the ICT domain, it should be extended to problem owners in the government sector.

Financial implications:
The action should be initiated in target areas and then expanded. The financial implication will depend on volume.

Responsible:
The Research Council of Norway and the Ministries, followed by public agencies.

Action 3.3: More 20% positions

Description:
Increased mobility between the university ICT departments and both private and public sector. More extensive use of the 20 percent "position elsewhere" should be encouraged. However, better incentives for working 6-12 months (full time) outside of the universities must be established.

This action relates to I, IV, V and VI in the mandate.

Justification:
Experience from abroad (eg. Silicon valley) clearly demonstrates the value of mobility and interaction between academia and the private sector. This is particularly true for the ICT domain and can contribute to substantial value creation in society.

Financial implications:
Small, what is needed is more flexibility with respect to university employment and active steps to promote a culture for increased interaction and mobility. However, we point out that such an increase in mobility will not occur without significant incentives.

Responsible:
The Ministries and the Universities.

Action 4.1: Follow up MNT-SAK

Description:
Follow up the recommendations from the MNT-SAK project.

This action relates to item II and V in the mandate.

Justification:
Better coordination and cooperation between ICT institutions with respect to educational offerings will improve Norwegian ICT education and may increase ICT research capacity.

Financial implications:
Unknown, but likely quite small.

Action 5.1: Two new (inter)national ICT PhD schools

Description:
Establish two additional national ICT – Ph.D. graduate schools. At least one of these should have a strong international link.

This action relates to item I, II and VI in the mandate.

Justification:
This action will directly answer recommendation 5, it is also supported by the three largest ICT departments in Norway. The concept is well known and has demonstrated its value in other disciplines. The eVITA winter school (organized by SINTEF) is one possible example, but several alternative formats should be explored.

Financial implications:
The cost of such an action depends on the scope and format. The organizational cost, including the cost of invited speakers must be fully covered. In addition, one achieves better participation when the cost for participating Ph.D. students can be kept at a reasonably low level.

Responsible:
The Research Council of Norway.

Action 7.1: 25 tenure track positions for ICT

Description:
Establish tenure track positions and long term planning for young talents in ICT. Allocate 25 tenure track positions to the ICT departments with active research at universities and university colleges. Make 5 of these positions such that only female applicants are eligible.

This action relates to item III, V and VI in the mandate.

Justification:
a   A more predictable career path will secure our best talents for future academic jobs.

b   This action will represent a leap forward in the effort to achieve a better gender balance among ICT faculty.

c   The action will provide much needed growth in the capacity for ICT education and help reduce temporary employment. It will also help smooth the transition from ICT faculty age 60+ to a next generation that is about 20 years younger.

Financial implications:
About 25 MNOK per year for a 6 year period.

Responsible:
The Ministry of Education and Research.

Action 8.1: Reward structure for collaboration

Description:

Adjust the reward structure to encourage collaboration between Universities and Research institutes, Industry and International institutions.

This action relates to item II, IV and VI in the mandate.

Justification:

Today, the publication of a scientific paper carries a smaller (financial) reward when it has external co-authors. This practice should be reviewed in order to encourage collaboration with external parties (that receive no rewards). Also, the award of a research project, today carries a reward scheme that discourages collaborations and sometimes forces a less than optimal choice of project leadership etc.

Financial implications:

Only indirectly.

Responsible:

The Ministry of Education and Research.

Action 9.1: Collaboration with North America and BRICS

Description:

Incentives and actions to increase research collaboration with North America and the BRIC countries.

Renew and reform the current bilateral agreements with a strong emphasis on supporting direct scientific collaborations between individual scientists. Simplify the application procedures and make scientific quality the governing criteria.

Universities should be supported in building institutional relations with high ranked Universities.

This action relates to item II, V and VI in the mandate.

Justification:

The USA is still (by far) the most innovative and strongest force within ICT research. However, the funding opportunities for Norwegian research have been increasingly directed towards the research programs of the EU. In order to increase quality, a better balance is needed and this can only be achieved by creating new opportunities for joint collaborations with strong scientists in the USA.

Similarly, new incentives should encourage increased cooperation with the BRIC countries. The rationale is different, but equally important. These countries show a rapid development of their R&D sector and Norwegian scientists should position and develop strong networks now in order to not loose this opportunity that will be of high value in the near future.

Active institutional relations encourage and ease new collaborations, and a broader spectre of generic enabling technologies become available for applied work in Norway than can be provided by Norwegian research in isolation..

Financial implications:

The existing agreements are in need of revision. The financial commitments should be strengthened significantly, in particular with respect to the USA.

The Research Council of Norway.

Action 9.2: Better competitiveness within EU

Description:

Improve the Norwegian competitiveness in the EU-research arena.

This action relates to item II, IV, V and VI in the mandate.

Justification:

Two actions are needed:

a   Due to the exceptionally high cost of conducting research in Norway, compared with other EU-countries, the research teams in Norway that succeed must receive additional supportive funding from Norwegian sources.

b   The Norwegian volume of ICT research relative to other research should be increased to the same level as in the EU. To expect a return of ICT research grants that corresponds to the Norwegian share of EU funding is unrealistic unless our own funding is allocated similarly.

Financial implications:

The first point requires a strong signal to the institutions in order for the incentive payments to be   allocated to the research programs. The second point demands a change of research priorities in line with EU (and the rest of the world) to increase the relative share of ICT research in the budgets.

Responsible:

The Research Council of Norway and the Ministry of Education and Research.

Action 9.3: Improved co-operation with industries on EU funded projects

Description:

Establish meeting places where industries and universities may meet to discuss strategic use of targeted EU-funding (e.g. STREPs and IPs), as well as work division and co-operation in project (proposals).

This action relates to item II and VI in the mandate.

Justification:

Targeted EU projects are an arena that is suited for co-operation between industries and Universities. It is important to ensure that universities' EU engagement on «science for society » and «science for industry» types of projects also contributes to Norwegian industries and benefit the Norwegian society beyond the research activity per se.

Financial implications:

The first point, creating the mentioned arenas, can be done at a moderate cost.

Responsible:
The Research Council of Norway and the Ministry of Education and Research.

Action 10.1: Research agenda in cyber security

Description:
Establish a clearly defined research agenda within cyber security.

This action relates to item IV, V and VI in the mandate.

Justification:
The Internet has evolved to become a basic infrastructure in society upon which all other infrastructures depend. This has rapidly created a situation where society is more at risk due to insufficient understanding of, and investment in, cyber security. Several government reports referred to earlier, as well as the exceptionally strong recommendation from the evaluation committee, conveys a clear message that cannot be ignored. A long sequence of unfortunate incidents in recent years where critical systems have failed or turned out to be subject to repeated budget over-runs without sufficient (local) competence to make appropriate decisions, have made it plainly visible that immediate and strong action is needed.

Financial implications:
A significant allocation of research funding channelled into a dedicated program or into a well-defined segment of a national ICT research program, will be needed.

Responsible:
The Research Council of Norway and the Ministry of Justice and Public Security.

Local Actions

Description:
There are two actions that fall under the responsibility of the institutions. The committee does not detail these actions here, but just provides a short title for them relating to the respective recommendation of the committee.

Local Action 2.1: Comparison of ICT research results with leading peer organisations

Local Action 6.1: Mentoring and training of junior researchers

6 Priority of actions

The committee has assigned the following priority order to the recommended actions in Section 5:

1. Action 1.1: 15 new PhDs in ICT in 2013
2. Action 1.2: New national ICT research program
3. Action 10.1: Research agenda in cyber security
4. Action 3.2: SFI for public sector

5. Action 5.1: Two new (inter)national ICT PhD schools
6. Action 9.1: Collaboration with North America and BRICS

7. Action 7.1: 25 tenure track positions for ICT
8. Action 3.1: Nærings-PhD for public sector
9. Action 3.3: More 20% positions
10. Action 9.2: Better competitiveness within EU
11. Action 8.1: Reward structure for collaboration
12. Action 9.3: Improved co-operation with industries on EU funded projects
13. Action 1.3: Two-stage evaluations
14. Action 4.1: Follow up MNT-SAK

7 Concluding remarks

Norway invests less in research and education targeting ICT, compared with EU and North America (not to mention the BRIC countries). At the same time, Norway has an ambitious plan to make use of ICT across society. Such a policy will not be sustainable in a long perspective. This is already visible when ICT projects exceeds their budget substantially or fail to deliver the expected functionality or service.

The international evaluation panel concluded that only 5 research groups in ICT deserved an excellent grade. Furthermore, national competence in critical domains like cyber security has fallen below a critical minimum. There are, however, many research groups with good international visibility and a high potential in the categories very good and very good/excellent. Furthermore, some groups with an applied focus and high industrial impact have merits that have not been fully accounted for in the committees grading scheme. The ICT evaluation committee makes the general remark that "A central finding is that the country possesses international strengths in a number of areas beyond what could be expected from its relatively small investments." This is a fragile situation, and the level may fall unless considerable investments are made in the generic ICT area.

This committee has pointed out that the output of Ph.D level candidates in Norway will fall sharply over the next 3-4 years. This is due to lack of research funding within ICT. At best, the situation will improve in 5 years, however, such a cyclic situation is harmful to the recruitment of young talent and to the ability to develop and maintain strong research groups over time.

The proposed actions will help to reverse this situation. Stronger actions are needed if Norway shall develop its ICT technology and competence to the same level as we observe in other countries.

Appendices

A Mandate

IKT-evalueringen - Mandat for oppfølgingsutvalget

Med utgangspunkt i evalueringsrapporten, og i samsvar med planen for oppfølgingsarbeidet, inviterte Forskningsrådet de evaluerte miljøene i brev av 13. august 2012 til å beskrive

1. Egne planer for oppfølgning av evalueringen.
2. Forslag til tiltak som bør utføres på nasjonalt nivå.
3. Hvordan de, alene eller i samarbeid med andre, kan bidra til den nasjonale oppfølgningen.

Forskningsrådet har mottatt innspill fra alle miljøene. I henhold til planen for oppfølgingsarbeidet, som er vedtatt av Divisjonsstyret for vitenskap, skal disse innspillene vurderes av et eget utvalg bestående av representanter fra de evaluerte miljøene og eventuelt evalueringskomiteen med det oppdrag å identifisere et grunnlag for oppfølging fra Forskningsrådets side.

Oppfølgingsutvalget oppnevnes av Norges forskningsråd ved Divisjon for vitenskap (DSV) og vil bestå av 6-7 medlemmer som samlet skal dekke de delene av IKT som ble evaluert. Arbeidet skal gjennomføres i nær dialog med Forskningsrådet, som vil delta som observatør i utvalget.

Utvalget skal lage et forslag til en oppfølgingsplan for IKT-evalueringen med utgangspunkt i evalueringsrapportens anbefalinger og de mottatte forslag til tiltak. Planen skal i størst mulig grad gi konkrete råd og anbefalinger til tiltak som kan utføres på nasjonalt nivå. Tiltakene kan være av faglig og/eller strukturell karakter og omfatte både kortsiktige tiltak og tiltak med en lengre tidshorisont (5 – 10 år). Foreslåtte tiltak skal fremmes i prioritert rekkefølge, med angivelse av hvem som bør ha hovedansvar for de ulike tiltakene. Tiltak som forslås skal være innenfor en realistisk budsjettramme. Planen kan også gi råd til Kunnskapsdepartementet og andre relevante departementer om spesifikke tiltak og finansielle behov.

Planen skal bl.a. gi råd om:

- Tiltak for videreutvikling og styrking av forskningen og forskerutdanningen innenfor IKT-fagene.
- Tiltak for å fremme nasjonalt samarbeid, koordinering og arbeidsdeling, samt internasjonalt forskningssamarbeid og mobilitet.
- Tiltak som kan forbedre kjønnsbalansen og fremme rekrutteringen til IKT-fagene; spesielt rekruttering av kvinner til faste vitenskapelige stillinger.
- Identifisering av spesifikke områder innenfor IKT-fagene som bør styrkes.
- Gi råd om bruk av virkemidler for å følge opp evalueringens anbefalinger.
- Gi råd om andre strategiske tiltak som vil bidra til å utvikle og styrke forskningen innen IKT-fagene i Norge og IKTs rolle innenfor nasjonale strategiske forskningsområder.

Utvalget bes om å ferdigstille planen innen 1. mai 2013. Planen skal skrives på engelsk.

Planen vil bli sendt til evalueringskomiteen til kommentar før den presenteres for de evaluerte miljøene i et felles møte.

B Description of the members of the committee

Professor Petter E. Bjørstad (Chair) received his Ph.D. from Stanford University in 1980. After work in the private sector (Det Norske Veritas), he became professor of Computer Science at the University of Bergen in 1985. He has been actively engaged in establishing eInfrastructure for computational science in Norway throughout this time. He made early and fundamental contributions to the field of domain decomposition algorithms. He is currently Head of the Computer Science Department at the University of Bergen.

Professor Kristin Braa received her Ph.D in Computer Sciense from the University of Oslo in 1995. She become Professor in 2000 and from 2001 to 2008 she was research director in Telenor where she established Telenor Research & Innovation Centre taking care of research and innovation in Telenor's Asian operations. She is heading the Health Information Systems Program (HISP). HISP is a global action research network which is responsible for the development of the open source based District Health Information Software (DHIS) implemented in 30 developing countries. She is currently Vice Head of the Department of Informatics, University of Oslo.

Professor Monica Divitini holds a Master of Science in Information Science from Milano University,Italy and a PhD in Computer Science from Aalborg University, Denmark. Her research interests lie primarily in the area of CSCW, Technology, Enhanced Learning, and mobile/ubiquitous computing. She is actively involved in national and European projects. She has in previous years acted as leader of the department research committee and she is currently the representative of permanent staff in the Faculty board.

Professor Bjarne E. Helvik received his Siv.ing. degree in 1975 and was awarded the degree Dr. Techn. from Norwegian Institute of Technology (NTH) in 1982. He has held various positions at ELAB and SINTEF Telecom and Informatics and was in 1988-1997 Adjunct Professor at NTH.
Since 1997 he has been Professor at NTNU and in 2003-2012 principal academic at the Norwegian Centre of Excellence (CoE) for Quantifiable Quality of service in Communication systems (Q2S). He is currently Vice Dean for Research at the Faculty of Information Technology, Mathematics and Electrical Engineering at NTNU.

Professor Andreas Prinz studied mathematics and computer science at the Humboldt-University in Berlin, Germany, and received his M.Sc. in mathematics (1988) and Ph.D. in computer science (1990) there. From 1990 to 2003 he had several positions at academic and industrial institutions in Germany and Australia. Since 2003, he is professor at University of Agder in Norway, where he became Head of the ICT department in 2007. His research interests and competence include systems engineering with particular focus on modelling, languages and formal methods. Prof. Prinz has worked in several projects dealing with the development of modern ICT systems using advanced technology.

Professor Barbara Wasson received her Ph.D in Computer Science (Artificial Intelligence) from the University of Saskatchewan, Canada in 1990. After working on contract for Telenor AS in Tromsø, she was hired as professor at the University of Bergen in 1995. She has been involved in research into ICT and learning since her Masters work in 1985, and has made significant contributions in the fields of Intelligent Tutoring Systems, distributed collaboration, mobile learning, and e-assessment. Currently she is co-leader of the Interaction Research Group at the Department of Information Science and Media Studies, and Scientific Leader of the InterMedia research group in Uni Research AS.