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User survey of the technical-industrial research institutes in Norway

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Summary

The user survey described in this report was tasked with investigating the views of users of the Norwegian technical-industrial (TI) institutes. For the purposes of the survey, users include both clients buying commercial services from the institutes and partners collaborating with the institutes in publically co-funded R&D projects. The survey is part of the background material for an evaluation of the TI institutes that is conducted by an international panel of experts appointed by the Research Council of Norway (RCN). The user survey was carried out by Technopolis between January and May 2015.

Method and empirical data

The user survey was conducted through a web survey and 79 telephone interviews. The web survey generated 518 responses, corresponding to a response rate of 26 per cent (the response rate was almost 40 per cent for Norwegian respondents). Respondents were asked to classify themselves as "mainly partners" or "mainly clients", which resulted in a considerable dominance of partners; 422 partners compared to 96 clients. A majority of users that the institutes had listed as "key clients" defined themselves as being mainly partners, which indicates that many users are both clients and partners. There is a reasonable balance between Norwegian and foreign users (300 and 218 respectively). The users are dominated by companies (52%), followed by higher education institutions (HEIs; 23%), research institutes (other than the TI institutes; 16%) and the rest of the public sector (10%). The average number of respondents per institute entity is 29, but four of the 18 entities have 15 or fewer respondents; a number of institute entities have very few, or no, foreign respondents.

Interview candidates were sampled in three dimensions; whether the user is Norwegian- or foreign-based, whether it belongs to the private or the public sector, and whether it is client or partner. Around half of interviewees are clients; two-thirds belong to the private sector, and three in four are based in Norway.

The sampling approach has implications for how the results should be interpreted. The majority of client names were provided by the institutes, and the vast majority of clients are repeat clients; likewise, the majority of partners are recurring collaborators. Moreover, since it is likely that dissatisfied users have a lower tendency to respond to a survey or to agree to be interviewed, the users constitute a positive selection.

Results

A majority of users are highly satisfied with the scientific and technical competences of the institutes; more than half judge the institute entity in question as "excellent" and more than a third as "good". Foreign users are slightly more positive than Norwegian, probably because foreign ones often choose to work with a TI institute specifically because its expertise in something, while many Norwegian users appear to employ a TI institute mainly because it is located in the same country. There is nonetheless no doubt that there are many groups and divisions of high international standards within the TI institutes. The institutes receive very high ratings for their collaborative skills, their flexibility and their adaptability. The users are also satisfied with the institutes' communicative skills and with their abilities to identify and share ideas for new projects.

The institutes receive the lowest ratings for their capabilities in market intelligence. A clear majority of companies are satisfied, but very few of them give the institutes the highest score. Moreover, several companies express dissatisfaction, and most of them are Norwegian; almost a fifth of Norwegian company respondents select "very poor" or "poor". Several interviewees remark that the institutes would benefit from having more personnel with industry experience, or with specific engineering competences. The most frequent comment on the market topic is the need for more dialogue and

networking with other stakeholders for the institutes to stay abreast of market developments and to develop a sense of "what's next".

Users are on average reasonably satisfied with the institutes' project management skills and administrative processes. However, it is evident that the relatively high ratings sometimes hide dissatisfaction with individual project leaders. Users consider well-functioning project management as very important, and quite a few interviewees identify this as a topic for improvement. Four institute entities receive notably lower rating for project management than the others. There is no user dissatisfaction with regard to treatment of intellectual property rights.

Users are in general satisfied with the institutes' hardware- and software-related infrastructure. Interview statements indicate that several institutes have facilities that make them more or less crucial as suppliers to some users.

Users rate the institutes as rather competitive against Norwegian universities, particularly when it comes to project management and value for money. However, the interviews, as well as other studies of Norway and elsewhere, indicate that users typically use institutes and universities with different tasks; the competition between them should therefore not be exaggerated. The survey also shows that the institutes are equally competitive as their foreign competitors, except in terms of value for money where they receive a slightly lower rating.

Reflections

Overall, the survey paints a picture of well-performing institutes. The institutes are highly valued for their scientific and technical competences. Most interviewees do not want to recommend the institutes to develop new competences, often with the argument that they should focus on maintaining their current strengths. However, a research institute has a most challenging task in balancing responding to current client needs and developing or acquiring new competences and facilities to be able to fulfil future needs. If an institute were to listen only to its (present) clients and to build solely on competences it already has, it risks being locked in.

The institutes' collaborative skills, flexibility and readiness to adapt to user needs are obvious strengths, and interviewees convey the picture that this is often a competitive advantage relative to consultancies, HEIs and sometimes also foreign competitors. It is evident that Norwegian users benefit from this, in part due to relations often being deep and long-standing, and in part because the national character of networks protects Norwegian companies from losing the competitive edge to foreign competitors.

Project management and market intelligence stand out as two areas where the institutes may improve their offer. Interviewees reveal that it is rather common that some project leaders are notably less competent managers than others. In addition, the fact that many institutes are small make them dependent on single individuals, which in turn make them vulnerable to retirement, illness or mobility of key staff members. In terms of market intelligence, interviewees relate a shortage of staff members with industry background, and a lack of enthusiasm for engaging in forward-looking, strategic dialogues with (potential) clients, partners and other stakeholders. Conferences are important arenas for such dialogues, and several institutes are criticised for too seldom attending such, which simultaneously are ideal places for marketing. Several institutes are criticised for poorly marketing their expertise internationally, and thereby missing opportunities to attract new clients and partners and to engage in arenas where they could develop their expertise.

Interviewees indicate a risk that the institutes run too many similar projects in order to generate constant inflow of assignments to maintain their often expensive infrastructure. If an institute knows one method very well and it works, there are strong incentives to use it over and over, with the consequence that the institute over time misses out on opportunities to develop its competences. Also, the infrastructure

needs to pay for itself by being frequently used, and it may lock an institute into focusing on certain standard testing.

We note that the base funding of the TI institutes is quite low from an international perspective. An institute's base funding is its main source of funding to develop new knowledge and competences to satisfy tomorrow's client needs. An institute's base funding is also used to co-fund its participation in for example European FP (and Horizon 2020) projects, which are also means to develop knowledge and competence. It is thus evident that the low level of base funding makes it more difficult for the TI institutes, and in the long run also their clients, to stay ahead of the competition.

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1. Introduction

1.1 Panel evaluation of the Norwegian technical-industrial research institutes

According to its statutes, one of the main tasks for the Research Council of Norway (RCN) is to "work to achieve a constructive distribution of tasks and cooperation between research institutions, and take strategic responsibility for the research institute sector".[1] RCN's five-year plan for evaluation of research institutes states three overarching objectives for such evaluations:[2]

1. To provide knowledge for the institutes own strategic development efforts,

2. To strengthen the knowledge base for the efforts of the Research Council and the ministries to develop an effective, targeted research policy, and

3. To provide a basis for assessing the design of the Research Council funding instruments.

As part of its strategic responsibility for the institute sector, RCN evaluates the research institutes, and the time has now come to evaluate the Norwegian technical-industrial research institutes (hereinafter referred to as TI institutes).

For the purposes of the evaluation, the two largest institutes (IFE and SINTEF Foundation) have been subdivided into subunits to account for the fact that the 14 TI institutes are of very different sizes. The evaluation has thus assessed the 18 institute entities listed in Table 1.

The evaluation is a combination of i) an assessment of individual institutes and entities (and their particular framework conditions, strengths, weaknesses and opportunities); ii) an evaluation of technical-industrial research in Norway, including the institute sector's national and international interactions; and iii) an evaluation of the institute sector's changing framework conditions and needs. At the overall level, the evaluation embraces several important aspects of the Norwegian research system, and the future challenges and opportunities of the Norwegian TI institutes.

1.2 Supporting documentation for the evaluation

The evaluation of the TI institutes is conducted by an international panel of experts appointed by RCN, supported by a panel secretary contracted by RCN. The panel will conduct hearings with the institute entities, and does additionally have a vast amount of background material at its disposal, including:

1. Internal evaluations (self-assessments) by the institutes

2. A descriptive fact report on the institutes prepared by RCN

3. User survey

4. Impact analysis

5. Bibliometric analysis

6. Evaluation of basic and long-term research within technology conducted by RCN

RCN has procured a three-part assignment to produce items 3, 4 and 5 in this list. The assignment has been carried out by Technopolis Group in collaboration with Stiftelsen Nordisk institutt for studier av innovasjon, forskning og utdanning (NIFU) between January and May 2015. The assignment, led by Tomas Åström of Technopolis, has been carried out as three subprojects. The user survey subproject has been carried out by a team consisting of Tobias Fridholm, Anders Håkansson, Annika Zika-Viktorsson

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[1] Statutes of the Research Council of Norway.

[2] «Instituttevalueringer, Overordnet plan», Norges forskningsråd, 2013.

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and Tomas Åström. The team was supported by Oskar Lindström and Carolina Jonsson. The subproject was led by Tobias Fridholm and quality controlled by Erik Arnold. This report summarises the findings of the user survey; the impact analysis and bibliometric analysis subprojects are presented in separate reports.

Table 1 Research institute units in the evaluation.

Research institute	Abbreviation	Technical-industrial profile
Christian Michelsen Research AS	CMR	Renewable energy, Space, Oil & gas, and Marine & environment
Institute for Energy Technology, nuclear research activities	IFE Nuclear	Nuclear power & safety and Nuclear technology & health
Institute for Energy Technology, other research activities	IFE Other	Energy & environment, Man & technology, Materials technology and Oil & gas
International Research Institute of Stavanger AS	IRIS	Energy, Environment, and Ullrigg (an oil rig for full-scale testing)
Norwegian Marine Technology Research Institute AS	MARINTEK	Maritime, Oil & Gas and Ocean energy
Norwegian Geotechnical Institute	NGI	Offshore energy, Building, construction & transportation, Natural hazards, and Environmental engineering
NORSAR	NORSAR	Seismic modelling, Seismology, and Nuclear test monitoring
Northern Research Institute AS, Norut Tromsø	Norut Tromsø	Biotechnology, ICT and Earth observation
Northern Research Institute AS, Norut Narvik	Norut Narvik	Renewable energy, Structural engineering, Materials technology, Cold climate technology, and Environmental technology
Norwegian Computing Center	NR	Oil & gas, Bank & finance, Climate & environment, Industry & energy, Health, and Private & public services
SINTEF Energy Research AS	SINTEF Energy	Carbon capture & storage, Grid/Smartgrids, Energy efficiency, Oil & gas/Subsea and Renewable energy
SINTEF Petroleum Research AS	SINTEF Petroleum	Oil & Gas (Exploration, Improved recovery, Drilling & well, Carbon storage, Multiphase transport)
SINTEF Building and Infrastructure	SINTEF Build.&Infrast.	Building & Infrastructure (Energy, Environment, Architecture, Materials, Installations, Infrastructure)
SINTEF ICT	SINTEF ICT	ICT (Micro-systems and sensors, Software, Robotics, Computing, Instrumentation, Communication, Security)
SINTEF Materials and Chemistry	SINTEF Mat.&Chem.	Environment, Nanotechnology, Biotechnology, Oil & gas, Process industry and Energy
SINTEF Technology and Society	SINTEF Tech.&Soc.	Energy & climate, Employment & industry, Safe societies and Smart transport
Tel-Tek	Tel-Tek	Powder technology, Energy, Carbon capture & storage and Smart manufacturing
Uni Research AS	Uni Research	Biotechnology and Energy

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1.3 The user survey assignment

The user survey documents how the users of the TI institutes perceive their services, and specifically addresses:

- User satisfaction

- Quality, relevance and applicability of the services and deliveries provided

- Collaboration, including communication, availability and punctuality

- Competence of institutes' personnel, including their ability effectively to transfer their knowledge to users

In the context of this survey, users include both partners in publically co-funded R&D projects and clients buying commercial services. Both Norwegian and foreign users are included.

The user survey incorporates aspects of importance to both the institutes and their users, as well as aspects that are user-specific and ones relevant to one or more user groups. Results are reported both for the TI institutes as a group and at the level of institute entities.

1.4 Terminology

The user survey employs the following terminology:

- A **partner** is a private or public organisation cooperating with a TI institute in a publically co-funded R&D project, e.g. from RCN and the EU Framework Programme (FP)

- A **client** is a private or public organisation that buys services from a TI institute on commercial terms

- **User** is a generic term for a partner or a client

- A **Norwegian** or **foreign** user is defined based on the formal location of the legal entity that collaborated with the institute (i.e. if a US corporation collaborated with an institute through its Norwegian-based subsidiary, the user is considered Norwegian)

- A **large company** is a private company with 251 or more employees worldwide

- An **SME** (small and medium-sized enterprise) is a private company with 250 employees or less worldwide (a simplified SME definition)

- An **HEI** (higher education institution) is a university or a university college

- A **research institute** is a (Norwegian or foreign) research institute; in the case of Norwegian research institutes, only institutes from other arenas than the TI institutes are included in this terminology

- The **private sector** refers to private companies of any size

- The **public sector** includes government agencies, counties, municipalities, universities, university colleges, research institutes and public enterprises (including health trusts). In many figures, HEIs and research institutes are presented as user categories of their own. In these cases the term public sector refers to the remaining types of organisations of the definition[3]

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[3] We are aware of the existence of private HEIs and research institutes. Since these in practice function as their public counterparts, we have for analytical reasons included them in the public category.

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1.5 Method and empirical data

The user survey was conducted through interviews and a web survey, which were both directed to broad samples of institute users. Both interviewees and web survey respondents were selected from three main sources:

- Lists of key clients that the institutes shared with RCN as part of the self-assessment reports that they were required to provide for the panel evaluation[4]

- A subset of RCN's data warehouse, presenting projects finished in 2005 or later and where one or more of the institutes had been partners

- A subset of the E-Corda database of projects in the EU's Seventh Framework Programme for Research (FP7) finished in 2010 or later in which one or more of the institutes had been partners

In addition, we carried out desktop studies of RCN's fact report prepared for the panel, the 18 institutes' self-assessment reports, RCN's annual reports on the TI institutes, the institutes' websites etc.

For the interviews and the web survey, we used the lists of key clients in the self-assessment reports to identify clients and the other two data sources to identify partners. As expected, it soon became clear that many of the key clients were also significant partners. Since a partner relation is likely to be more in depth than a client relation (which was also the message these users generally conveyed in the interviews), we usually treated these users as partners, even though we investigated the client relation as well.

1.5.1 Web survey

The invitations to the web survey were e-mailed to 2,002 individuals in user organisations and the survey was open from 9 March to 30 March 2015. The e-mail list included:

- All listed key clients (not only Norwegian clients)

- Project leaders of all RCN projects finished in 2005 or later and where at least one of the TI institutes had been a partner (all Norwegian partners)[5]

- Partners of all FP7 projects finished in 2010 or later in which a TI institute had participated and where the partner had had at least 5 per cent of the total project budget. This threshold was implemented to eliminate partners with only marginal (or no) expected experience of a TI institute. However, CMR and Tel-Tek have had so few FP7 partners that we did not implement the threshold for their partners (mostly foreign partners)

No e-mail address was included more than once; multiple appearances were eliminated through randomisation, meaning that individuals who had been contact persons in several institute relations only were asked to respond regarding one of these relations. However, several individuals per organisation could receive invitations to the survey.

The first invitation to respond to the survey was sent on 9 March, with reminders 16 March and 24 March. The last reminder was accompanied by a separate e-mail from RCN that encouraged recipients to respond. The final response rate was 26 per cent, or 518 respondents. Another 53 respondents only provided background information (which type of organisation they represented etc.) but did not respond to a single

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[4] The institutes were asked to list their "most important" clients, meaning that they provided a selection of the client base.

[5] We only included project leaders because RCN's data warehouse does not include e-mail addresses to other partners. Projects led by the TI institutes were excluded altogether.

question that directly concerned the impact analysis or the user survey. Table 2 summarises response rates per respondent category.

Table 2 Web survey response rates per sample category.

Sample category	Selection	Responses	Response rate
Key clients	361	141	39%
Partners in RCN projects	433	169	39%
Partners in FP7 projects	1,208	208	17%
All	**2,002**	**518**	**26%**

As already mentioned, the key client category was intended to capture clients, while the RCN and FP7 categories were expected to generate partner responses. The respondents were, based on the definitions in Section 1.4, asked to classify their organisation as client or partner. Somewhat to our surprise, 81 (57%) of the key clients defined themselves as "mainly partners". Similarly, 33 (20%) respondents in the RCN partner category and 3 (1%) in the FP7 category defined themselves as "mainly clients". As already mentioned, respondents that considered their organisation "client and partner in roughly equal proportions", were classified as partners.

Table 3 shows the distribution of respondents in the client and partner categories. The outcome was 422 partner responses and 96 client responses; in other words a significant dominance by the former. A large majority of the responding clients are Norwegian, while the responding partners are rather equally distributed between Norwegian and foreign partners. Clients and partners received slightly different sets of questions, although most of the questions were identical for both categories. The part of the web survey that concerns impact is reported in the impact analysis.

Table 3 Distribution of web survey respondents into categories and nationality.

Category	Norwegian	Foreign	All
Partners	219	203	**422**
Clients	81	15	**96**
All	**300**	**218**	**518**

Respondents were also asked to classify their organisation into type; Table 4 summarises the distribution into user categories. Large companies constitute the largest category, followed by HEIs and SMEs. Most of the respondents from research institutes are foreign, and the Norwegian ones are all from institutes in other arenas (than the TI arena). The public sector provided the smallest number of respondents. The large companies, SMEs and users in the public sector are predominantly Norwegian, while the university respondents are equally split between Norwegian and foreign.

Table 4 Distribution of web survey respondents on user categories.

User category	Norwegian	Foreign	All
Large companies	108	44	**152**
SMEs	72	42	**114**
HEIs	61	57	**118**
Research institutes	23	59	**82**
Public sector	36	16	**52**
All	**300**	**218**	**518**

Table 5 shows how the respondents are distributed on institute units. Norut Tromsø and Norut Narvik have the least respondents with ten and nine respectively, while the SINTEF Group generally has more respondents. IFE has 57 respondents, which unfortunately cannot be separated into the two units (nuclear and other activities), since the data sources do not include this information (the two units are one and the

same legal entity). For the same reason, we are unable to separate the different units of the SINTEF Foundation for the FP7 partners, which means that these four units have almost only Norwegian respondents (for which the subdivision is available) and a large number of foreign respondents in common for the SINTEF Foundation. Several institutes, mainly the smaller ones, have very few, or no, foreign respondents. In contrast, since the SINTEF Group is very active in FP7, it has 71 per cent of all foreign respondents, but "only" 49 per cent of the Norwegian respondents.

Table 5 Distribution of web survey respondents on TI institute units.

Research institute	Norwegian	Foreign	All
CMR	21	3	24
IFE nuclear + IFE other	38	19	57
IRIS	18	2	20
MARINTEK	16	15	31
NGI	15	8	23
NORSAR	3	15	18
Norut Tromsø	6	4	10
Norut Narvik	9	0	9
NR	19	7	26
SINTEF Energy	14	19	33
SINTEF Petroleum	10	9	19
SINTEF Building and Infrastructure	15	0	15
SINTEF ICT	20	1	21
SINTEF Materials and Chemistry	44	0	44
SINTEF Technology and Society	16	0	16
SINTEF Foundation	12	111	123
Tel-Tek	11	1	12
Uni Research	13	4	17
All	300	218	518

The relatively high share of non-respondents is problematic and may indicate that the results are biased. In order to verify the results, we attempted to perform a non-response follow-up. An e-mail was sent to 100 individuals randomly selected among the approximately 1,500 non-responders, asking them to briefly state why they did not respond to the survey and to answer two of the most central questions in the user survey with a simple number between one and five. However, the feedback on these e-mail invitations, a mere twelve responses, neither provided a useful result, nor any hope that reminders would render an acceptable number of responses.

We have very limited background information on our respondents and non-respondents, which prevents us from conducting a proper non-response analysis. However, the response rates provided in Table 2 gives some indications on what may have been the cause of the relatively low overall response rate. First of all, we consider response rates of 39 per cent for key clients and partners in RCN projects to be relatively high, and quite on par with other similar surveys. The low response rate for FP7 partners probably has several reasons. One reason may be that since most of them are foreign, they have limited interest in participating in a Norwegian survey. Another reason may be the well-known fact that the project contact persons in E-Corda are quite often not researchers, but managers or administrators who lack insight into the

relations with the institutes. The relatively low response rate from FP7 partners is therefore not surprising.

However, survey results clearly indicate that the vast majority of client respondents are repeat clients (of the same TI institute). Private companies are the most common repeat clients, and SMEs to a greater degree than large companies. This means that the clients are a positive selection, i.e. most of them must have had sufficiently positive experiences with the institute in the past, or they would not have come back for more. Moreover, the majority of clients were provided in the institutes' self-assessment reports, and we assume that they have not listed clients that they know have been dissatisfied.[6]

Survey responses also show that a majority of partner respondents are repeat collaborators, even though the degree of recurring collaboration is less pronounced than for clients. It is also likely that dissatisfied partners are less interested in contributing to a user survey than satisfied ones (which in part may explain the low response rate for FP7 partners), meaning that it is reasonable to assume that the partner respondents are also positively inclined.

This means that there is a positive bias among survey respondents, and there is consequently reason to interpret survey results bearing this in mind. On the other hand, the recurring collaborators that dominate the respondents ought to be quite knowledgeable on the institutes' strong and weak points, meaning that their responses ought to be well founded. In summary, we cannot say that the respondents are representative of all TI institutes' users.

1.5.2 Interviews

In sampling the interviewees, we categorised users into three categories:

1. Whether the user was Norwegian or foreign-based

2. Whether the user's relation with the institute was mainly that of a client or that of a partner

3. Whether the user belonged to the private or the public sector

Given that around 80 per cent of the institutes' revenue is domestic, Norwegian users had to be well represented in the interviews. The views of foreign users are nevertheless important, since they are likely to hold the key to how the institutes can increase their international competitiveness. The client category is particularly relevant since buyers of commercial services are generally more demanding and ready to turn to another supplier if they feel that they do not get value for money. Finally, organisations in the Norwegian public administration are important in light of the institutes' mission to provide applied R&D services also to public entities and to society at large. We also tried to maintain a fair balance between clients and partners from different industry sectors and technical domains (for several institutes we otherwise risked ending up with too many interviewees from the oil and gas sector). Although this to some extent implicates the risk of introducing bias by giving more weight to less important sectors, we found that a diversity of views was more important. For each institute entity we made sure not to miss its key user sectors or technical domains.

Just as for the web survey, we created a threshold for FP7 partners to increase the likelihood that the potential interviewees would have sufficient knowledge about the institute in question. For the interviews, the threshold used was that both the institute and the partner should have had at least 10 per cent each of the total project budget.

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[6] It is possible that the addresses from RCN's data warehouse and E-Corda include the some dissatisfied clients; 34 percent of client responses are from addresses from RCN's data warehouse and 4 percent from E-Corda.

We note that this threshold resulted in almost all interviewees having participated in projects where either the institute or the interviewee's organisation had been project coordinator.

We conducted 79 unique interviews, distributed on user categories as shown in Table 6. The distribution into categories is not entirely as planned; most notably the foreign respondents are fewer than intended. The main reason is that there were fewer foreign organisations than expected among the key clients. In addition, these were concentrated to a minority of the institutes and to certain industry sectors (mainly oil and gas). Although many interviewees had experience of collaborating with more than one TI institute, each interview concerned one institute only.

Table 6 Distribution of interviewees on user categories.

User category	Norwegian	Foreign	Total
Private clients	18	9	**27**
Public clients	13	3	**16**
Private partners	19	5	**24**
Public partners	9	3	**12**
All	**59**	**20**	**79**

The interviews typically lasted for half an hour and covered an overall description of the collaboration, user satisfaction with the institute in a number of dimensions, as well as the user's suggestions on how the institute and the TI institutes as a group could develop their services in the future. The interviews also concerned users' rationale for collaborating with the institute and what results and impact the collaborations had already had, or were expected to have, on users. The latter questions were intended for the parallel impact analysis and the responses to these questions are not discussed in this report. The interview guide was adapted to tailor questions to different user categories.

1.6 Report structure

Following this introductory chapter, **Chapter 2** discusses skills and competence of the TI institutes' personnel and **Chapter 3** reports on matters concerning project management. **Chapter 4** describes users' view on the institutes' infrastructure and location, while **Chapter 5** reports on their competitiveness against Norwegian universities and foreign competitors. The concluding **Chapter 6** reflects on the results of the user survey and the institutes' performance. **Chapters 2–5** end with a bulleted summary of the main findings of the respective chapter.

Appendix A contains the interview guide and **Appendix B** provides the survey questionnaires. **Appendix C** gives an introduction for the subsequent **Appendices D–U** that present full individual survey results for each institute unit.

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2. Competence

This chapter presents the users' satisfaction with the TI institutes' scientific and technical skills, their market intelligence, and their collaborative skills. With some exceptions, the results are presented for the TI institutes as a group; full individual results are provided in Appendices D–U. Results are for the most part reported on a Likert-type scale, where respondents have been asked to rate to what extent they agree with statements. The scale used is:[7]

1. Very poor

2. Poor

3. Satisfactory

4. Good

5. Excellent

As Figure 1 shows, a majority of users (both clients and partners) are highly satisfied with the scientific and technical competence of the institutes. In fact, more than half of all clients judged the institute in question as "excellent" and another third as "good". Only a tiny minority expressed dissatisfaction by selecting "poor" or "very poor".

Figure 1 Users' assessments of institutes' competences. Source: Web survey.

Figure 2 displays the same data separated into user categories.[8] Obviously, the application-oriented user categories, i.e. companies and the public sector, as well as the research institutes, are more positive than HEIs. The interviews indicate that the slightly lower grades from HEIs reflect an emphasis on scientific standards (and higher awareness of these), while companies and the public sector are less scientifically demanding and value applied technical skills higher.

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[7]   Statements have been abbreviated to enhance readability; full statements are provided in Appendix B.

[8]   Large companies (private companies with 250+ employees worldwide); SMEs (private companies with 0–250 employees worldwide); HEIs (universities and university colleges); research institutes (TI institutes excluded); Public sector (government agencies, municipalities, health trusts, public enterprises, EU or other international organisations, non-governmental organisations).

The survey data reveals that foreign users are more positive about the institutes' scientific and technical competences than their Norwegian counterparts (57 and 49 per cent "excellent", respectively). This result is surprisingly positive, given that foreign respondents in general ought to have better insights into the institutes' foreign competitors and often well-developed relations to these. However, one also needs to bear in mind that foreign respondents often choose to work with Norwegian institutes specifically because they are experts in something, while quite a few Norwegian users appear to employ the institutes just because they are located in the same country. That makes the respondent populations different from each other. There is nonetheless no doubt that there are plenty of groups and divisions within the TI institutes that measure up to high international standards.

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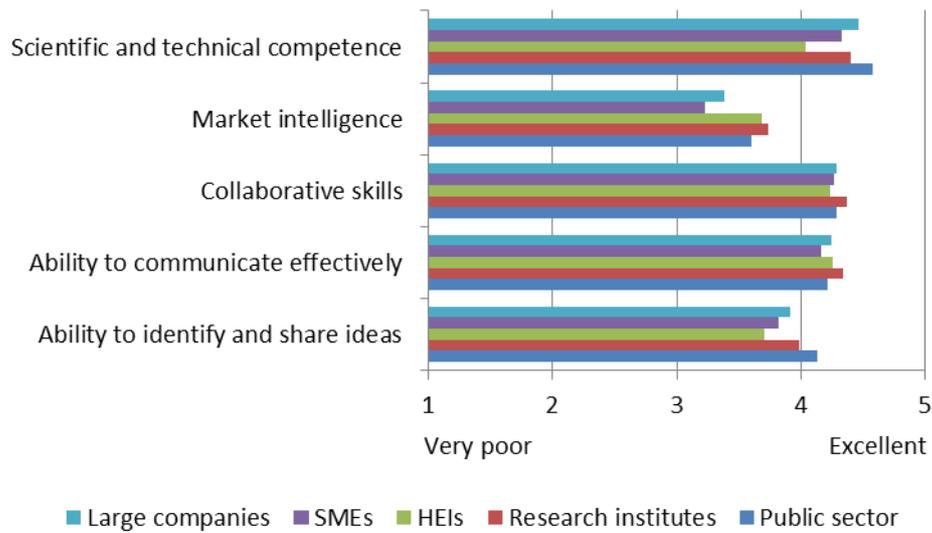
Figure 2 Users' assessment of institutes' competences. Source: Web survey.
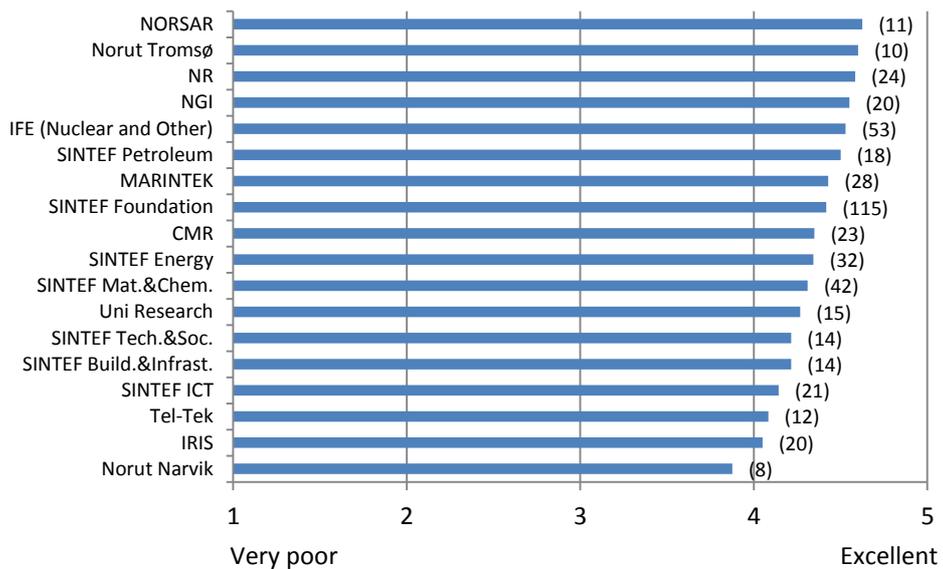
Figure 3 Users' assessments of individual institutes' scientific and technical competences. Numbers in parentheses represent the number of responses. Source: Web survey.

If we compare institute units, see Figure 3, all except for one receive average scores above 4, meaning "good". The small number of respondents makes this comparison a bit uncertain for several of the institutes. For instance, the lowest scoring institute, Norut Narvik, and the second highest scoring one, Norut Tromsø, only had eight and ten respondents, respectively. Conclusions should therefore be drawn with care. No institute unit stands out for having an unusual number of "very poor" or "poor" ratings.

The interviews provide the same positive picture of scientific and technical competences. A majority of the institute units are commended by every one of their

respective interviewees for having high scientific and technical competence. Several institutes are depicted as being internationally leading:

> *NGI is world leading in some fields. (Norwegian private partner)*

> *Norut Tromsø is internationally leading in analysing satellite images. (Norwegian public client)*

> *MARINTEK has very high competence, which in combination with excellent infrastructure is almost unbeatable. (Norwegian private client)*

Along the same lines, two foreign-based interviewees, who work with safety in nuclear power plants, portray IFE's competence on developing test facilities for control rooms as "outstanding" and "unique and highly innovative", respectively. It is evident that other interviewees have similar opinions about (parts of) other institutes as well. The very rare negative interview remarks on scientific and technical competences typically concern too much variation in competence between individual staff members when they act as project managers. Two interviewees make such a remark about SINTEF Building and Infrastructure. A few interviewees relate such problems to the inability of the institute to replace staff members who have retired.

A few comments concern the balance between scientific and technical staff. One interviewee observes that IFE's division for materials technology suffered from a shortage of engineers after – as the interviewee saw it – having focused on recruiting researchers with PhDs. Another interviewee argues that the balance between scientific and technical staff at NORSAR is highly beneficial:

> *I have encountered some really skilled technicians there, and the thing we appreciate is that NORSAR can offer a good mix of technical staff and researchers. That puts them in front of comparable suppliers. (Foreign private client)*

A cornerstone for a successful institute is its ability to understand the markets in which its partners and clients operate. Figure 1 shows that the institutes are scored the lowest in market intelligence. Most respondents give the institutes the grades "good" (30%) or "satisfactory" (25%). In addition, a significant share, 29 per cent, of respondents says that they either do not know or do not find market intelligence relevant in their institute relations. The interviews paint the same picture. Figure 2 presents the responses on market intelligence separated into user categories; an important distinction to make since companies would be expected to have considerably more interest in market intelligence than other categories. A clear majority of the companies are satisfied with the institutes' competence in market intelligence, although very few give the highest grade. However, several companies express dissatisfaction. A closer look at the data reveals that almost all dissatisfied companies are Norwegian; 18 per cent of the company respondents in Norway gave one of the grades "very poor" or "poor", which indicates opportunities for improvement. At the same time, a third of the Norwegian companies rated the institutes as "good" or "excellent", which shows that far from all Norwegian company respondents are dissatisfied.

Several interviewees remark that the institutes would benefit from having more personnel with industry experience, or with specific engineering competencies that would enable them to better respond to industry needs. The most frequent comments on the market topic in the interviews concern the institutes' need for dialogue and networking with other actors to stay abreast of market developments to develop a sense of "what's next". Some institutes are singled out for too rarely being present at conferences and other networking events, and a number of interviewees find that some institutes too rarely initiate informal dialogue with (potential) clients and partners to discuss for instance future technology developments. One of the most evident cases:

> *MARINTEK is too introvert on the market side. Even though we are one of its most important clients, its management has not visited us for quite a number of years. (Norwegian private client and partner)*

Respondents commenting on market intelligence quite often bring up SINTEF as an example of good practice; some parts of SINTEF (there appears to be some exceptions) are regarded as proactive, market-oriented and interested in an on-going dialogue with companies in their respective fields; "SINTEF seems more professional" is a recurring expression in many interviews. One interviewee is also very pleased with Norut Narvik in this respect:

> *They are very responsive and flexible. They also call me from time to time, calls of a probing character; they want to know about our needs and discuss what they potentially could do for us. (Foreign private client)*

Long-standing, productive relations between institutes and their clients and partners require effective collaboration. Figure 1 shows the respondents' assessment of the institute personnel's collaborative skills. The results are positive: 47 per cent of respondents rated the institute as "excellent" and another 36 per cent as "good", while a mere 3 per cent opted for one of the two lowest grades. Figure 2, as well as a closer look at the data, reveals remarkably similar response patterns between user categories. Three comments from the more or less consistently positive interviewees:

> *IFE's staff in the nuclear safety area is very responsive and easy to work with. (Foreign private partner)*

> *We have worked with Uni Research for a couple of years now. They are open and easy to work with, and they do things in a simple and straightforward way. (Norwegian Private client)*

> *We have always been pleased with Norut Tromsø, but perhaps they should try to improve their reporting on how their deliverables could be utilised by the client. (Public client)*

Notably, all five interviewees on SINTEF Materials and Chemistry particularly point to the fact that the entity is unusually good at collaboration and project management.

A closely related issue concerns the institutes' ability to be flexible and adapt to changing client needs, which may refer to anything from demands to adjust a technology to new system requirements, to new ways of managing projects. Figure 4 reveals a high level of client satisfaction also in this respect (note that this figure includes client responses only, not partner responses). Three-quarters of clients chose one of the two top grades, while only seven respondents (8%) opted for the two lowest. Flexibility is frequently commented upon in the interviews. Four examples of varying character:

> *IRIS' staff in the environmental division is always ready to do a little more than they need to, the kind of things that private consultants often wouldn't do. (Norwegian public client)*

> *IFE is really very flexible and ready to support us. Sometimes, they think more about quality than costs. (Norwegian private client and partner)*

> *Once we had a problem with SINTEF ICT. Their service level was too dependent on single individuals, but then they swiftly changed working practices and everything was fine again. (Norwegian private client)*

> *Tel-Tek's small size makes the institute flexible and easy to work with, but the disadvantage is that it lacks the muscle to compete in the long run. We have therefore started to look for other suppliers, which is a pity because Tel-Tek is good in our field. (Norwegian private client)*
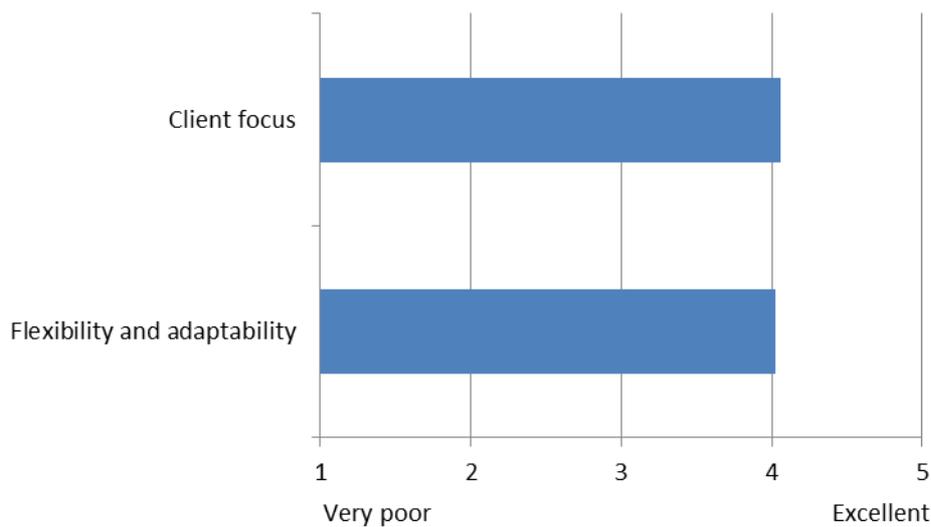
Figure 4 Clients' assessments of institutes' client focus and their flexibility and adaptability. Source: Web survey.

The institutes have to find a proper balance between, on the one hand a steady inflow of projects to meet present demands from clients and partners, and on the other hand building capacity for the future through active participation in national and international R&D projects. For individual researchers, who may have relatively strong academic identities, this balance can be particularly difficult. This is also one of the most common negative remarks by company representatives, who speak of too much research focus and too little interest in client needs. Three institutes have been particularly criticised on this respect: IFE, MARINTEK and NGI. However, as shown in Figure 4, survey data indicates a high degree of client satisfaction with institute personnel's client focus; very few respondents have opted for "very poor" or "poor", while three out of four selected one of the two top grades.[9] One interviewee remarks:

> *SINTEF Building and infrastructure is good at balancing client focus with scientific interests. Other institutes have sometimes not been as good, they have drifted off as researchers, and we have occasionally had to put our foot down. (Norwegian private client).*

The respondents were also asked how able the institutes are at identifying and sharing ideas for new projects. Figure 1 shows that clients and partners are generally pleased with the institutes also in this respect; two thirds of respondents selected one of the two highest grades. Only 9 per cent of all respondents rated the institute in question as "very poor" or "poor". These are most commonly found among HEIs, which probably should be interpreted as dissatisfaction with the institutes' scientific capabilities; if so, this is another indication of the institutes' challenge in balancing science with applied needs. One interviewee points to a specific concern in this respect:

> *The relation with us is very important to SINTEF, but its relation to RCN is even more important. Unfortunately, the priorities at RCN are not the same as ours, which to some extent is a barrier in our relation with SINTEF. (Norwegian public client).*

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9   The question on client focus was only posed to respondents who identified themselves as "mainly clients", but since many interviewees are both clients and partners, they responded to the partner questions in the survey.

Effective communication is important to facilitate efficient transfer of research findings into users' operations, and into their products and processes. Figure 2 shows that all user categories are on average satisfied with the institute personnel's communication on scientific and technical matters. The satisfaction is higher among foreign than Norwegian users (51 and 37 per cent "excellent", respectively), a difference larger than the one between the partner and (the Norwegian-dominated) client categories. This issue is rarely highlighted in the interviews, but two statements are worth noting, since they both concern SINTEF units, but provide quite different pictures:

> *SINTEF Energy is very good at translating research into a language that is easy to understand. You can see a difference compared to universities in this respect. (Private partner).*

> *When it comes to communication, there are significant differences between individuals at SINTEF Petroleum. They should either teach all staff how to give presentations and how to communicate, or let the most communicative individuals do it. (Private client).*

Main findings of chapter

- A majority of users are highly satisfied with the scientific and technical competence of the institutes

- The institutes receive very high grades for their collaborative skills and for their flexibility and adaptability

- The users are satisfied with the institutes' communicative skills and with their abilities to identify and share ideas for new projects

- Market intelligence is where the institutes score the lowest, although a clear majority of companies are still satisfied

3. Management

One of the issues most frequently commented upon in the interviews concerns project management. Good project management is apparently a key to a successful relation between an institute and a user. Figure 5 illustrates that respondents on average consider the institutes' abilities to manage projects as good; around two thirds of the respondents rate the respective institute unit as "good" or "excellent". Partners are slightly more satisfied with the institutes' project management skills than clients. This difference is to some extent supported by the interviews, primarily because clients in general appear to pay more attention to project management skills than partners do. The results also show that Norwegian users are slightly less content with the project management than foreign users, as illustrated both in a lower share of "excellent" ratings (20 per cent and 36 per cent, respectively) and a slightly higher share of "very poor" or "poor" among Norwegian respondents. Figure 6 reveals no major differences between user categories, but there is a slightly higher percentage of "very poor" and "poor" and smaller shares of "excellent" ratings from companies.
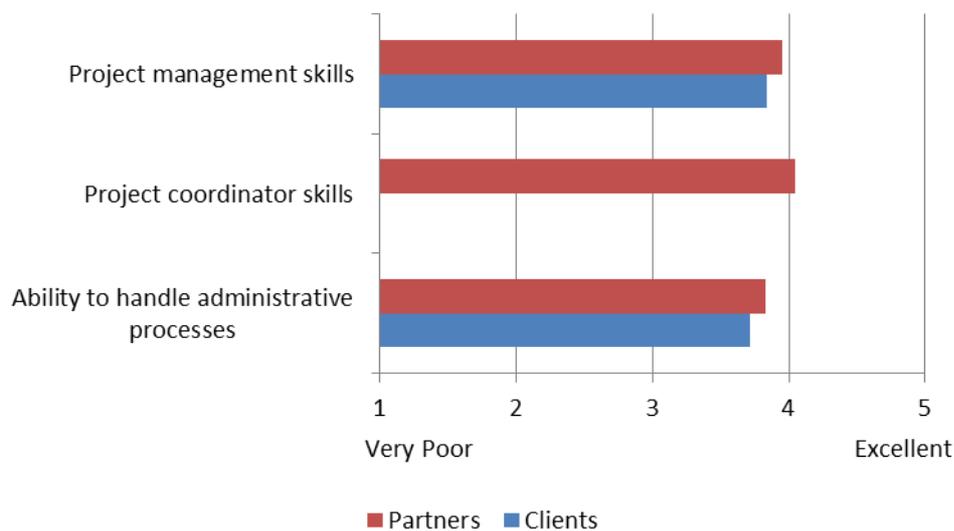
Figure 5 Partners' and clients' assessments of institutes' management skills. Source: Web survey.

Looking at the assessments of single institutes, we find that results vary more between institutes than they did in the assessments of scientific and technical competences. Figure 7 shows that only four institute units receive average scores above 4 ("good"). It is notable that one of these is SINTEF Foundation, where almost all respondents are foreign partners of four SINTEF units that all receive lower grades from their Norwegian clients and partners. Four institute units lag behind: IRIS, Tel-Tek, SINTEF Building and Infrastructure and Norut Narvik. It should once again be emphasised that the small number of respondents for some institute units makes interpretation of the results difficult, but all four at the bottom have in common that they have attracted comparably few responses and two or more "very poor" or "poor" ratings. The two units with the most responses, IFE and SINTEF Foundation, are at the top, which indicates a consistent user satisfaction. If we combine respondents for SINTEF Foundation with respondents for its four separately presented parts, the average score is 3.95, which would be the sixth highest.
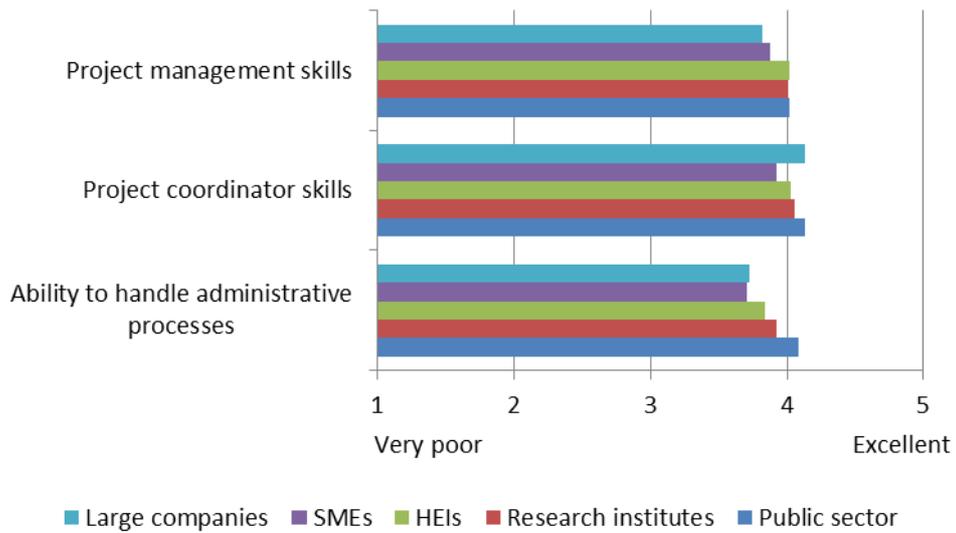
Figure 6 Users' assessments of institutes' management skills. Source: Web survey.
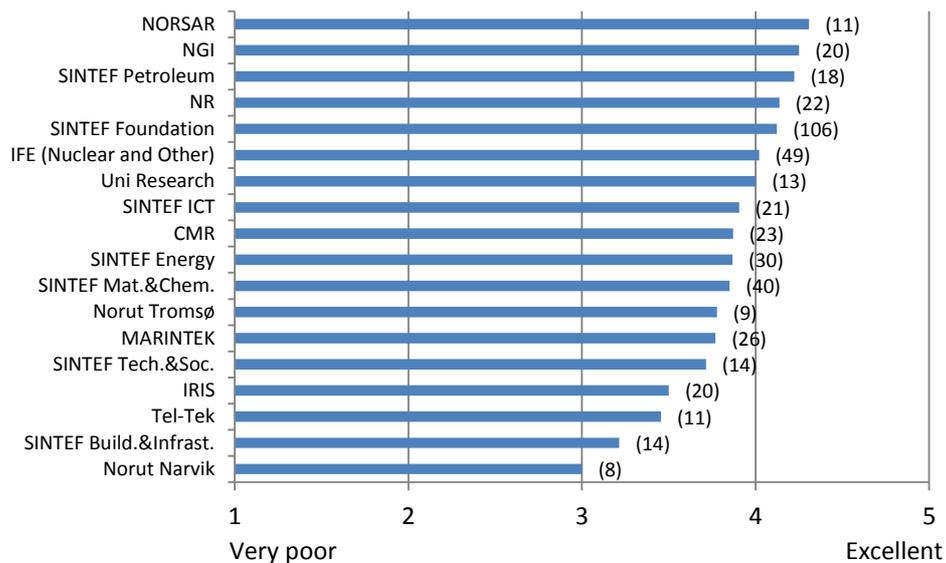
Figure 7 Users' assessments of project management skills per institute. Numbers in parentheses represent the number of responses on which the scores are based. Source: Web survey.

The interviews resulted in more negative comments on project management skills than the survey data would have suggested. We find two primary reasons for this: project management is viewed as being very important (and very disruptive when it does not work well), and that the quality of project management often varies significantly between individuals. Thus, even if a user gives a good grade, that grade may hide the fact that e.g. one in five projects was poorly managed. This is reflected in an interview on SINTEF:

> *SINTEF is usually very good at project management. We have worked with several units, but within SINTEF Building and Infrastructure the*

level of project management differs too much between individuals.
(Norwegian private partner)

Almost one quarter of the clients interviewed and a notable number of the partners express dissatisfaction or complaints about how the institute personnel has managed projects; these opinions apply to almost all institute units. MARINTEK receives a notable number of remarks on project management too often being unsatisfactory in one way or another; almost all interviewees with MARINTEK users mention this, which is somewhat unexpected given MARINTEK's decent outcome in Figure 7. The indisputably most severe criticism comes from a partner in a European project:

MARINTEK has not functioned as a research partner. You don't know when they will deliver; it often takes three months before they start doing something. When all other partners had spent their budgets MARINTEK had only used half its budget. I also tried to reach its management regarding a business idea, but until this day I haven't had any response to my e-mails and phone calls. (Foreign public partner)

Most of the statements concern typical issues such as planning, monitoring and progress reporting to users. Apart from too much variation between individuals, other comments in interviews concern:

- Great dependency on single individuals; project management responsibilities are not distributed (perhaps due to lack of competence)

- Projects involve too many partners (as a consequence of demands from e.g. RCN), which makes efficient project management more demanding

- Shortage of, or too unclear, plans on who is to do what in the project

- Lack of up-to-date project management tools, such as common project web sites, which may make project management, administration and communication between project partners more efficient

- Too ambitious objectives, tendencies to overload single individuals with work, and tendencies to overdo research tasks appear to be the most frequent reasons for discontent and failure to meet project objectives

However, some interviewees point out that efficient project management also requires that users are able to formulate their needs and specifications, and understand the scope of what they are asking for, which is not always the case.

It deserves to be pointed out that all institute units also receive positive comments on their project management, albeit to varying degrees. One particularly positive remark:

CMR is very good at project management, very professional indeed.
(Foreign private partner)

One specific form of project management concerns coordination of publically co-funded collaborative R&D projects. Figure 5 shows a high average score from partners, meaning that most respondents selected "good" or "excellent", and Figure 6 that there are only small differences between user categories (note that project coordination responses on only include partners).

Relations between clients and institutes often involve sensitive information and intellectual property rights (IPR). Sloppy treatment of such issues may not only undermine a client's competitive advantage, but also endanger the relation between the institute and the client. Survey results show that private clients are on average very satisfied with the institutes' ability to deal with sensitive information and IPR. Every single respondent selected "satisfactory" or better, and a considerable share judged the ability as "excellent"; the average grade was 4.2. The interviews paint the same positive picture; there is not a single case of criticism in this respect. A typical statement is that sensitive information and IPR are handled professionally, and interviewees talk of well-functioning contracts, formal as well as informal agreements, and respect for

clients. Interviewees are also pleased with the way in which the institutes handle discussions on publications based on potentially sensitive results. This is not only mentioned by clients, but also by many partners who are to some degree also clients.

Figure 5 and Figure 6 also illustrate that a majority of survey respondents are pleased with the institutes' administrative processes. More than 40 per cent of respondents chose "good" or "excellent", and only a few respondents chose "poor", with only small differences between user categories. Administrative processes are rarely brought up in interviews, which may be interpreted as them rarely causing any problems. However, two interviewees point out that Tel-Tek's administrative processes as considered unsatisfactory; one of them explains:

> *Tel-Tek is not very good at administration. By having poor routines they give us extra work. (Norwegian private client)*

Main findings of chapter

- Survey respondents are on average quite satisfied with the institutes' project management and administrative processes

- Interviewees indicate that dissatisfaction with individual project leaders is fairly common

- There is not a single case of user dissatisfaction with regards to treatment IPR

4. Infrastructure and location

Access to research infrastructure such as software, databases, measurement and testing facilities etc., is often an important collaboration rationale. The institutes' sometimes unique research and testing facilities thus constitute significant contributions to their service offer, especially since users are rarely able to maintain such facilities themselves.

In general, survey respondents are quite satisfied with the institutes' software-related infrastructure, see Figure 8, and public sector respondents rate the institutes highest in this respect. Interviewees explain that the combination of state-of-the art modelling tools or unique databases and skilled personnel, which can utilise the data and perform advanced tailor-made analyses are key reasons for collaborating with institutes, including – but not limited to – IFE, NORSAR, NR and Norut Tromsø.
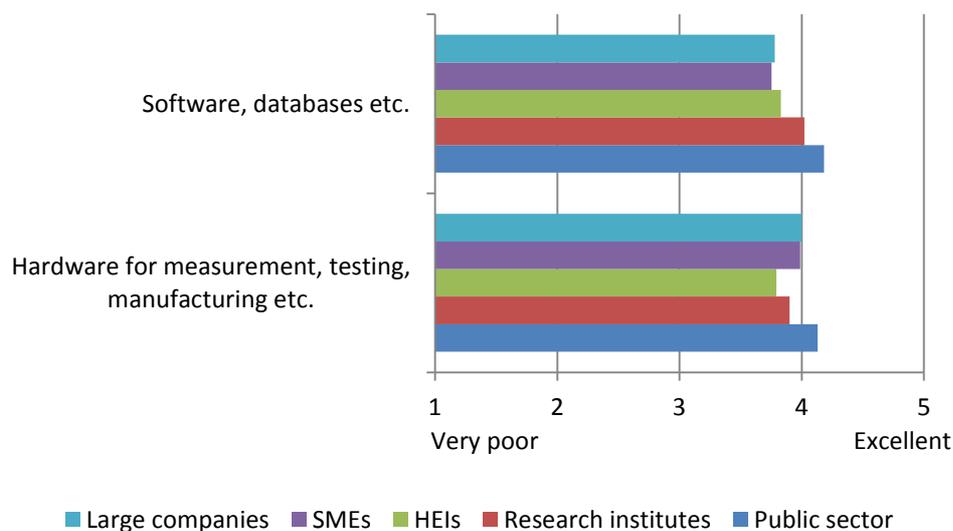
Figure 8 Users' assessments of the institutes' infrastructure. Source: Web survey.

Respondents are even more content with the institutes' hardware-related infrastructure, although more respondents answer "do not know/not applicable". Almost 60 per cent of large company respondents and just over 50 per cent of SME respondents rate the institutes as "good" or "excellent" in this respect. Clients are on average more satisfied than partners.

We understand from the interviews that some SINTEF units, including MARINTEK, offer testing facilities that are highly sought after. Other prominent examples are IRIS' offshore drilling rig for full-scale testing, and equipment in several parts of IFE, not least in Halden. Several company representatives state that access to these facilities is vital for their product development processes.

The institutes' geographical locations are not without significance for users that prefer easy access to their premises and sometimes state that an institute's co-location with an HEI or another research organisation can be decisive when choosing supplier. Figure 9 shows client satisfaction with regards to institutes' physical location. Private clients are almost unanimously satisfied or very satisfied, while public clients are a bit more moderate in their assessment; both categories nevertheless appear quite satisfied. Unfortunately, the empirical data is not sufficiently comprehensive to present it at the level of individual institute entities.
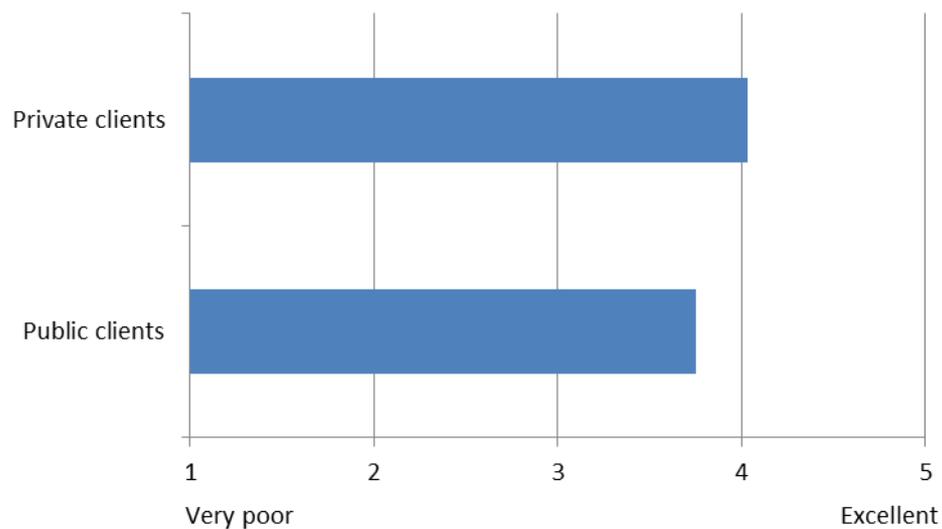
Figure 9 Clients' assessments of the physical location of the institutes. Source: Web survey.

Interviewees openly state that geographical location matters. Often the alternative to enlisting a Norwegian institute would be to look for a foreign supplier, since the TI institutes' competence and infrastructure are often unique in the country. Many interviewees argue that when timely, swift and accurate results are required, it is simply not worth the effort or the risk to try out the competition, as long as a Norwegian institute's delivery is good enough. These are of course the same barriers that Norwegian institutes face when trying to enter foreign markets.

Main findings of chapter

- Respondents are quite satisfied with the institutes' hardware- and software-related infrastructure

- Some interviewees indicate that institutes have facilities that make them more or less crucial as partners

- Respondents are in general satisfied with the institutes' physical location

5. Competitiveness

The TI institutes often face fierce competition from other Norwegian and foreign suppliers in both commissioned work and in R&D. As regards commissioned work, the institutes mainly compete with private companies, often consultancies, and other research institutes. In terms of R&D, they also face competition from HEIs, mainly for competitive research grants and to a lesser extent for contract assignments. The institutes have a somewhat ambivalent relationship to their competition on the R&D market; some of their main competitors are often simultaneously their most frequently recurring R&D partners. This is most obvious in the close relation between SINTEF and the Norwegian University of Science and Technology (NTNU), but we also note that several institutes collaborate with large consultancies in their own fields. As described in Chapter 2, the survey respondents and interviewees alike in general have a very positive view on the scientific and technical competences of the institutes, and several of them are pointed out for being world leading.

Figure 10 shows how survey respondents rate Norwegian universities' competitiveness compared to the TI institutes. Please note that the scale is inverted compared to previous figures; in this figure, a short bar is a "positive" result (for the institutes), meaning that they appear to be more competitive than the universities. Most respondents believe that Norwegian universities and TI institutes are equally competitive in terms of scientific and technical competence. Furthermore, among company respondents almost equally many respondents select either the TI institute or the Norwegian universities as the "more competitive" or "much more competitive" hypothetical supplier in this regard. To a rather high degree, public sector respondents rate the universities as being less competitive. Client respondents are in general more prone than partners to rate Norwegian universities as less or much less competitive. It is important to note large shares of respondents chose "do not know/not applicable" for this question: from 30–40 per cent on scientific and technical competence and project management to 50–60 per cent on infrastructure and value for money. A possible explanation for this is that many users may lack experience of collaborating with Norwegian universities. Another explanation may be that they do not see them as alternative (competing) suppliers. Moreover, we would like to remind the reader to keep the aforementioned positive bias in mind; most respondents are repeat collaborators for a reason.
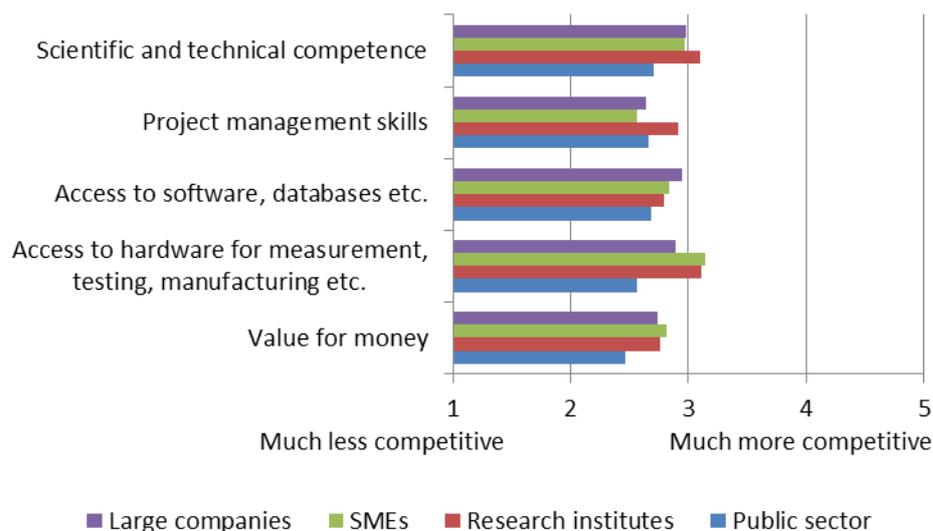
Figure 10 Norwegian universities' competitiveness against the institutes. Source: Web survey.

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We have previously discussed users' overall high degree of satisfaction with the institutes' project management skills. According to users, the institutes perform better than Norwegian universities in this respect. More than a quarter of all respondents rate universities as "less competitive" or "much less competitive", while 13 per cent believe that the universities are "more competitive" or "much more competitive". We note that other research institutes have the highest tendency to respond in favour of the institutes.[10] Not surprisingly, partner respondents (many of which are from universities) are in general more positive towards universities as project managers than client respondents.

These tendencies concur with statements made in interviews. One of the most frequent comments is that university researchers are better researchers than project leaders. Many interviewees maintain that institute researchers are both more used to collaborating with industry and more experienced in leading multi-partner R&D projects. Several interviewees comment that university researchers also in bilateral projects have a tendency to "dig too deep".

A majority of the respondents that have rated the universities on software-related infrastructure believe that universities are not quite as competitive as the institute in question. The result is similar for hardware-related infrastructure, although SMEs and research institutes feel that the universities have a comparative advantage in this respect.

In terms of value for money, a rather high share of respondents view the universities as "less competitive" or "much less competitive" than the institute in question. Public sector respondents are most inclined to agree that the institutes give better value for money than universities. When separating the data on client and partner respondents we see – as expected – that clients to a greater degree than partners believe that the institutes give better value for money.
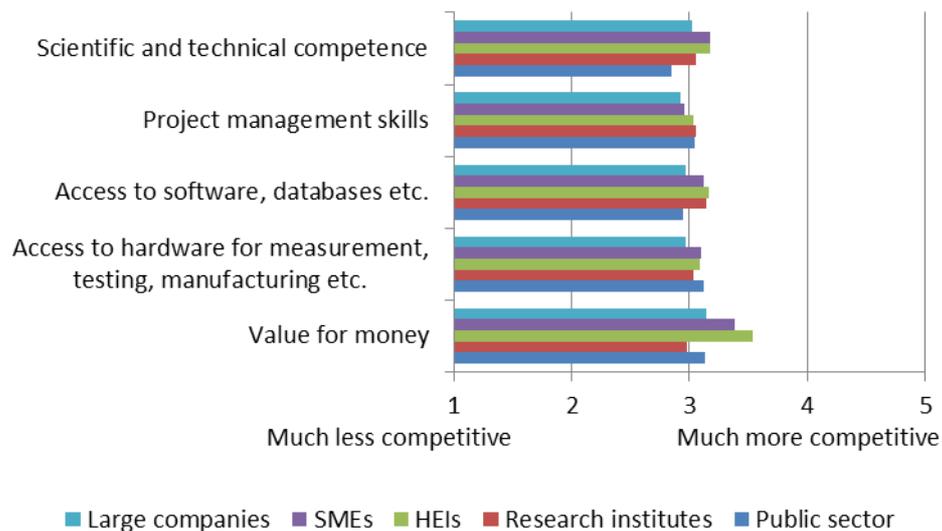
Figure 11 Foreign competitors' competitiveness against the institutes. Source: Web survey.

We also asked survey respondents and interviewees to rate how foreign competitors compare with the institutes, see Figure 11. Also in this figure, a short bar indicates a "positive" outcome for the institutes. Many respondents, 30–50 per cent depending on

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[10]   No TI institutes are included (even though they frequently collaborate with each other).

statement, chose "do not know/not applicable", indicating that they perhaps have little experience of foreign alternatives. In terms of scientific and technical competence, Norwegian users are more disposed than foreign ones to consider foreign competitors as more competitive. This result is expected, since quite a few of the foreign users have sought out Norwegian institutes specifically because they are unusually good at something. On the other hand, the institutes' capabilities are probably more aligned with the needs of Norwegian users, and their networks in Norway are often very well established. It is also likely that more Norwegian than foreign users are satisfied with "good enough" quality, on the assumption that a higher share of Norwegian users focus on local or national markets where competition is less fierce; Norwegian users active on highly competitive international markets are of course as interested as any foreign user in getting world-leading services.

Most respondents believe that the institutes are on par with their foreign competitors in terms of project management skills, though slightly more respondents are in favour of the institutes. Differences are small, but company respondents are somewhat more prone to rate foreign competitors as less competitive. There are no significant differences between client and partner responses.

Concerning software- and hardware-related infrastructure, the bulk of respondents rate the institutes and their foreign competitors as equally competitive. Client respondents – dominated by Norwegian companies – are slightly more inclined to rate foreign competitors as less competitive. Interview statements follow the same pattern; users are often reluctant to respond or consider themselves incapable of comparing different providers with each other. Some interviewees point out that the companies' requests are often so specific that only one or two suppliers come into question. As a consequence, it is difficult to rate the institutes as either more or less competitive than other suppliers.

Although a large share of respondents rate the institutes and their competitors as equally competitive in terms of value for money, a fair share of company and HEI respondents believe that the foreign competitors give better value for money. The obvious interpretation is that the TI institutes are seen as expensive, especially since the institutes receive high scores on scientific and technical competences. Separating the responses on partners and clients, we find that clients to a higher degree view the institutes' competitors as "more competitive" or "much more competitive" in terms of value for money. Clients are more sensitive to cost because they generally shoulder the full cost of commissioned work, whereas in a publically co-funded R&D project they "just" pay for part of it. It is also worth noting that Norwegian users are considerably more prone than foreign ones to rate foreign competitors as "more competitive" or "much more competitive". This may in part be due to foreign users often enlisting a TI institute specifically because its expertise is world-leading, and perhaps in part because Norwegian users may be poorly informed about the (often also high) prices of foreign alternatives.

In interviews, many clients and partners clearly state that the institutes are expensive, but they also explain that the institutes offer services for which the demand is relatively cost-insensitive. Furthermore, several interviewees state that the services of the TI institutes are similar in cost to those of leading institutes in other European countries. However, high costs can be a deterrent when entering into multi-partner consortia, which this written comment in the survey summarises:

> *Extremely high salaries make it difficult to include [the institute] as a partner into planned multi-partner submissions of EU FP7 and Horizon2020 projects (an unfairly high proportion of the budget would go the institute). One has to think twice before including [the institute] as partner into these types of projects. (Foreign partner)*

The survey results allow us to distinguish between repeat users and users who state that they have bought services or participated in R&D projects with a TI institute only once. Figure 12 and Figure 13 present the result of two key questions in the survey

(scientific and technical competence and project management skills). Repeat users tend to rate the institutes as "excellent" in terms of scientific and technical competence more often than one-off users. With regard to project management skills, repeat users and one-off users give almost identical, and high, scores. This analysis was done based on the presumption that first-time users ought to be less positively inclined (i.e. including some that had had a bad experience), but this is obviously not (significantly) the case.
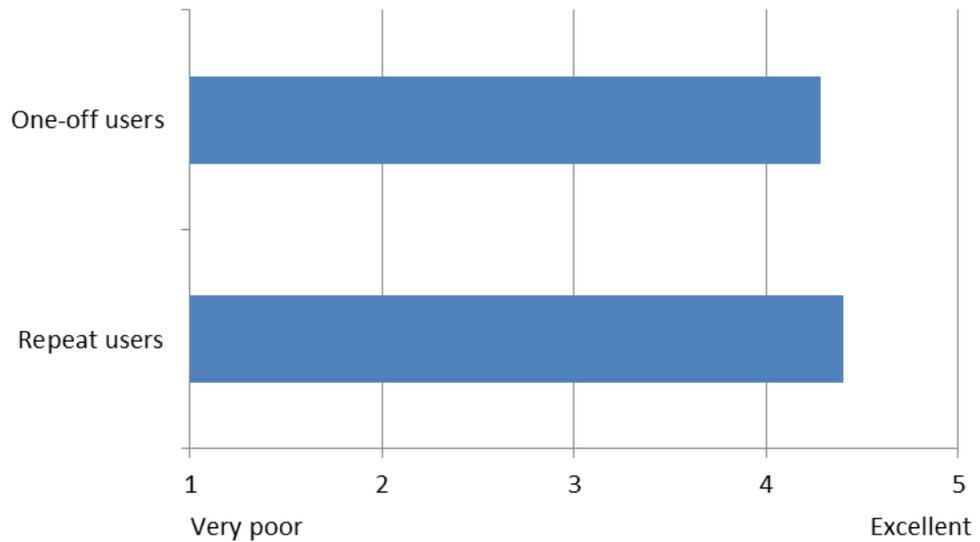
Figure 12 One-off and repeat users' assessments of the institutes' scientific and technical competence. Source: Web survey.
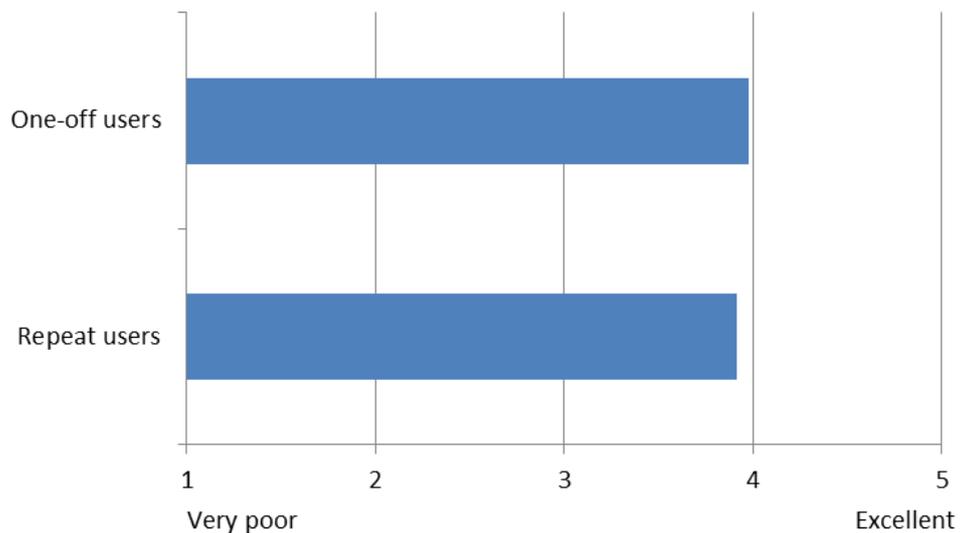
Figure 13 One-off and repeat users' assessments of the institutes' project management skills. Source: Web survey.

Main findings of chapter

- Users consider that the institutes are slightly more competitive than Norwegian universities, particularly when it comes to project management and value for money

- The institutes perform on par with their foreign competitors in all investigated dimensions, except value for money where they receive a somewhat lower rating

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6. Reflections

Overall, the TI institutes' users are clearly very satisfied. A large majority of survey respondents rate the institutes as "satisfactory", "good" or "excellent" on the investigated topics, and the interviewees contribute to a consistent picture. In the following, we reflect upon some key points arising from the empirical data.

Scientific and technical competence

It should be comforting to both RCN and the institutes themselves that so many users are highly positive about the institutes' scientific and technical competences. In our view, this is the most important message of the user survey. In this and other key dimensions the institutes should be rated as "good" or "excellent" not to risk losing their position among clients and partners or, worse, make less valuable contributions to the Norwegian industry and public sector.

Most interviewees do not want to recommend the institutes to develop new competences, often with the argument that the institutes should focus on maintaining their strength in the fields where they are already strong. These interviewees typically believe that the cost of developing new areas of expertise would prove to be unjustifiably high both in terms of infrastructure investments and in the recruitments that would be necessary. (A suspected bias should be noted; most respondents obviously collaborate with an institute because of its current competences.)

However, a research institute has a most challenging task in balancing responding to current client needs and developing or acquiring new competences and facilities to be able to fulfil future needs. If an institute were to listen only to its (present) clients and to build solely on competences it already has, it risks being locked in. This is one reason why some sectorally oriented research institutes have run into trouble in Sweden and elsewhere. Different competences could likely attract users that the TI institutes currently do not have, but for obvious reasons we have no empirical data from non-users, so that will have to remain an untested hypothesis.

Market intelligence and marketing

Market intelligence stands out as the area where the institutes receive the least positive ratings. Norwegian companies are the least satisfied with almost one in five responding "very poor" or "poor" in the web survey. The interviews paint a similar picture, where some of the interviewees point to a lack of knowledge in the institutes about the industries with which they collaborate. The interviews indicate that the two main explanations for this is that the institutes have too few staff members with industry background, and that institutes are not sufficiently engaged in a forward-looking, strategic dialogues with (potential) clients, partners and other stakeholders. Conferences constitute important arenas for such dialogues, and several institutes are criticised for too rarely being seen at such, which simultaneously are ideal places for marketing. One foreign client in the oil and gas industry states:

> I am a bit surprised that I do not see IRIS very much at conferences anymore, but I guess there is an explanation to it, perhaps they are fully booked and satisfied with the clients they already have. (Foreign private client)

Several other institutes receive similar complaints. There are also interviewees who ask for better information on the institutes' websites, including not only information on competence and services, but also on ideas, strategies and visions. It is evident that several institutes could be better at communicating on all these issues, in various ways and on various arenas. Moreover, several institutes are criticised for poorly marketing their highly competitive expertise internationally, and thereby missing opportunities to attract new clients and partners and to engage in arenas where they could develop their expertise. SINTEF stands out as the benchmark for several interviewees, who

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argue that SINTEF appears more professional and market-oriented than the other institutes.

Project management and dependency on single individuals

Although the institutes' project management skills receive relatively high scores overall, interviewees reveal that it is rather common that some project leaders are notably less competent managers than others. In addition, the fact that many institutes are small make them dependent on single individuals, which in turn make them vulnerable to retirement, illness or mobility of key staff members.

Interviews indicate a number of areas where problems may occur. Inability to deliver on time is a key issue, which quite often seems to emanate from overly optimistic tenders and proposals. Another common issue is insufficient reporting during projects, which means that users cannot monitor progress satisfactorily. A relatively frequent problem seems to be that an institute is considered to be "too academic" in its approach and thereby either fails to deliver sufficiently useful results to match the needs of a client, or does not deliver on time because it digs too deep into the issue at hand. Several interviewees point out the need to use of up-to-date web-based tools to improve project management. Finally, too often project management seems to depend on a single individual, who easily becomes overloaded.

Professional project management is an absolute necessity for efficient collaboration in multi-partner projects, but also to satisfy clients in commissioned work, and the institutes should therefore train its personnel and develop routines to minimise the reasons for complaints.

Collaboration

The institutes also receive high scores for their collaborative skills and for being flexible and ready to adapt to the needs of clients and partners. This is an obvious strength, and from the interviews, we get the picture that this is often a competitive advantage relative to consultancies, HEIs and sometimes also foreign competitors. It is evident that especially Norwegian users benefit from this, due to relations often being long-standing, established decades ago and occasionally supported by mobility of staff between the institutes and users. With established personal and organisational relations, the barriers to continued collaboration are low.

For Norwegian users that are particularly interested in services of the highest international quality, we also observe a slight (and certainly not surprising) "national bias" in that the TI institutes are in general preferred partners because their networks are predominantly national and the Norwegian users are their key clients or partners. To some extent, this protects these companies from losing their competitive edge towards foreign competitors. Analogously, Norwegian companies would probably face the equivalent situation (but to their disadvantage) if they were to collaborate with institutes in their competitors' home countries.

The balance between research and application

We mentioned above that some users complain that the institutes focus too much on research and academic merits. On the other hand, it seems that HEI partners are not always as impressed by the institutes' scientific and technical competences as companies are. This very well illustrates the difficult balance the institutes have to strike. However, also companies realise that the institutes must conduct a certain amount of research to develop their competences and stay in touch with the scientific frontier.

In this context, some interviewees suggest that there is a risk that the institutes run too many similar projects in order to have constant inflow of assignments and, not least, income (and cash flow) to maintain their often expensive infrastructure. If an institute

knows one method very well and it works, there are strong incentives to use it over and over, with the consequence that the institute over time misses out on opportunities to develop its competences. This is also related to the above-mentioned interview comments about institutes that are too rarely seen on at international events. One interviewee explains:

> *The institutes should not only, as is the tendency now, do things first and then look for a theory afterwards to confirm what they did. They must also develop new theories that can improve their methods and possibly give better value for the partner. (Foreign private partner)*

A couple of company interviewees are critical of some institutes on this issue and identify large investments in infrastructure as specific risks. The infrastructure needs to pay for itself by being frequently used, and it may lock an institute into focusing on certain tests etc. A related comment from another interviewee:

> *Their incentives are a bit strange. We observe that the institute works hard to bring in the money to pay for its staff and infrastructure, and once they have succeeded they relax and take it a bit easier. From our perspective, that's when they should start working! (Norwegian private client)*

On the issue of balancing between research and application, and as a sequel to the argument we made above on the importance of an institute being one step ahead of its clients to avoid being locked in, we observe that the base funding of the TI institutes is quite low from an international perspective. Figure 14 reveals that the TI institutes have considerably lower base funding than many of their foreign colleagues and competitors. Some of these differences may possibly be attributed to the other institute systems having different missions and commitments and being obliged to use parts of their base funding to carry out certain tasks. However, it is an unavoidable conclusion that the TI institutes are disadvantaged when it comes to the level of their base funding.
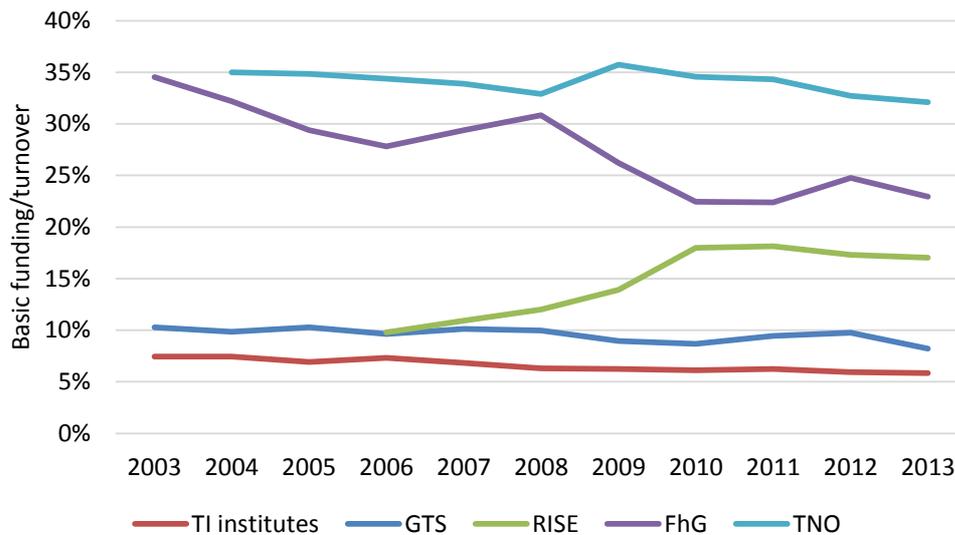
Figure 14 Base funding to SINTEF and four other European institute spheres as shares of total turnovers. Source: Technopolis analysis of institute annual reports.[11]

An institute's base funding is its main source of funding to develop new knowledge and competences to satisfy tomorrow's client needs. An institute's base funding is also used to co-fund its participation in for example FP (and Horizon 2020) projects, which are also means to develop knowledge and competence. It is thus evident that the low level of base funding makes it more difficult for the TI institutes, and in the long run also their clients, to stay ahead of the competition.

Competitiveness and value for money

The TI institutes are judged as being competitive compared to Norwegian universities and their foreign contenders. Compared to the universities, the institutes are considered particularly strong with regard to project management. However, companies tend to use universities and institutes for different tasks, so the comparison between the two may is not universally relevant. A study on the Swedish institute system showed that users turn to institutes to satisfy short- and medium-term needs that are time critical, and to universities for longer-term, more fundamental questions, often involving PhD students.[12] The interviews indicate a similar pattern in Norway, although the Norwegian institutes tend to be a bit more scientifically oriented than most of their Swedish colleagues. A number of interviewees observe that working with a university in almost all cases implicates a longer project that often involves a PhD student, or a shorter and in terms of quality more risky project that involves a masters' student. Hence, Norwegian universities and institutes probably complement each other rather than compete for the same projects. Moreover, the long-standing Swedish doctrine that the universities should be able to satisfy most of industry's R&D needs should serve as deterrent to anyone considering a policy shift in this direction. (This doctrine is unquestionably the major reason why Sweden's institute sector is so much smaller than that in Norway – and in most other comparable countries.)

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[11] GTS is a network of nine Danish RTOs (among them DTI), RISE gathers the leading Swedish RTOs (SP, Swerea, Innventia and Swedish ICT), FhG refers to Fraunhofer Gesellshaft and TNO to the Netherlands Organisation for Applied Scientific Research.

[12] E. Arnold, N. Brown, A. Eriksson, T. Jansson, A. Muscio, J. Nählinder and R. Zaman, "The Role of Industrial Research Institutes in the National Innovation System", VA 2007:12, VINNOVA, 2007.

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Despite receiving high scores on scientific and technical competences and other key dimensions, and being seen as equally competitive as their foreign competitors in almost all investigated dimensions, the TI institutes receive rather low scores for value for money. It is nevertheless worth noting that clients believe that the institutes give better value for money than Norwegian universities. Although some interviewees point out that the TI institutes are not necessarily more expensive than competitors in some other countries, they clearly have a cost disadvantage compared to competitors in most countries due to the high cost level of Norway. This cost disadvantage for example makes it an uphill battle to participate in the framework programmes (Horizon 2020), as evidenced by some of our interviewees and by previous studies.[13] The TI institutes of course cannot help the high cost-level in Norway, but they must find ways to deliver value for money by being better than their competitors in other countries.[14]

Parting words

Overall, this study obviously paints quite a positive picture of the TI institutes. In digesting this generally positive account, we must not forget that the survey respondents and interviewees are a positive selection, since we for methodological reasons have too few dissatisfied users among our respondents and interviewees.[15] We nevertheless have reason to believe that the overall picture would not change dramatically if we had been able to eliminate of compensate for the positive bias. The average ratings would of course be a bit lower with more dissatisfied users, but the trends would remain. The TI institutes are good at what they do, and this report provides some suggestions on how they could do it even better and thus increase their competitiveness.

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[13] T. Åström, T. Jansson, G. Melin, A. Håkansson, P. Boekholt and E. Arnold, "On motives for participation in the Framework Programme, Norwegian Ministry for Education and Research, 2012.

[14] T. Åström, A. Håkansson, G. Melin, P. Stern, P. Boekholt and E. Arnold, "Impact evaluation of the Research Council of Norway's support measures to increase participation in EU-funded research", RCN, 2013.

[15] We cannot force people to respond to a survey or set aside time for an interview if they really do not want to, and it is not possible to establish an adequate control group.

User survey of the technical-industrial research institutes in Norway

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Appendix A Interview guide

Nature of collaboration

1. Do you collaborate much with:
   - Research institutes?
   - Universities?
   - With (other) companies?
   - Why do you collaborate with others?

2. What is the nature of your organisation's relationship to the institute unit(s) in question? *Only partners*
   - What is the scope of your collaboration (number and approximate size of projects per year, year of first collaboration)?
   - Could you describe a 'typical' collaboration?
   - Are you also buying commissioned research from the institute in question?

Impact on the organisation resulting from collaborating with the institute

3. What is your organisation's driving force to engage in/buy collaboration with the institute?
   - Access to knowledge?
   - Access to infrastructure (software, instruments, laboratory equipment, manufacturing facilities, pilot facilities)?
   - Access to networks? (e.g. as door-opener to international research collaborations)
   - Use institute as a demonstration of the company's technical excellence and quality? *Only private users*
   - Other?

4. What have been the main outputs resulting from collaborating with the institute? *Only partners*
   - Participation in national or international publically co-funded R&D projects?
   - Journal or conference publications?
   - Granted patents or patent applications? Have they been used or licensed to others?
   - PhD candidates from your own organisation?
   - Increased international network?

5. How does collaborating with the institute impact your organisation, e.g. in terms of:
 - Skills:
   - Improvement of internal capabilities to conduct R&D?
   - Improvement of in-house staff skills?
   - Recruitment of researchers, specialists, others?
 - Relationships, development of networks (national and/or international)?

- Innovation activities:

    - Development of improved products, process, and/or services?

    - Implementation of innovations (e.g. through production or dissemination of new technology)?

- Commercial benefits: *Only private users*

    - Commercialisation of products or services?

    - New marketing opportunities?

6. What kind of long-term impact does your organisation expect in the future as a result of collaborating with the institute, e.g.:

    - Increased turnover? *Only private users*

    - Increased exports? *Only private users*

    - More effective processes or procedures (following implementation of innovations)?

    - Change in number of employees?

    - Spin-off companies?

    - Increased international competitiveness? *Only private users*

Satisfaction with competence and services, and relevance of service offer

7. What is your degree of satisfaction with:

    a) The institute's personnel (scientific and technical competence, collaborative and communication skills, project management skills)?

    b) The quality of the institute's services?

    c) The flexibility and adaptability of the institute's services to changing needs? *Only clients*

    d) The institute's ability to deal with sensitive information, trade secrets and IPR? *Only clients*

    e) The value for money of the institute's services?

8. In your view, does the institute lack any vital competence (scientific, technical or communicative) that you need?

    - Is there any other supplier (university or institute, inside or outside Norway) that you use instead to compensate for these shortcomings?

9. How does the institute compare to its international and national (if relevant) competitors in terms of competence, scientific level and quality of services?

    - Who do you consider to be the institute's main competitors?

    - If you have experience of collaborating with/buying R&D services from Norwegian universities: How does the institute perform compared to these universities?

Final questions

10. Do you have any suggestions for how the institute could improve its service offer to better serve user needs?

11. Is the technical-industrial institute sector in Norway able to fulfil your needs for R&D collaborations? If not, please elaborate. *Only Norwegian users*

Is there something you would like to add that has not been covered?

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Appendix B Survey questionnaires

Introduction to respondents

Dear Sir/Madam,

The Research Council of Norway (RCN) has commissioned an international panel to carry out an evaluation of the technical-industrial institute sector in Norway. The results of the evaluation are to be used in strategic development by the institutes themselves and in shaping future research policy in Norway.

To support the panel evaluation, RCN has commissioned Technopolis to conduct a user survey and an impact analysis for the technical-industrial institute sector. You have received this mail because, according to our data, your organisation has collaborated with [institute x] in recent years, either as commercial client or as partner in FP7 or RCN projects. We would very much appreciate if you would take the time to share your experiences of collaborating with the institute with us. The link below takes you to a web survey that we estimate will take you 15 minutes to complete.

The link is uniquely tied to this survey and your email address, but your answer will be treated fully anonymously. You may forward this mail to a colleague if he or she is in a better position to respond to the questions.

We would appreciate your response to the survey at the latest by March 27.

If you have any questions regarding the survey, please contact Anders Håkansson, anders.hakansson@technopolis-group.com, +46-8-55 11 81 14.

Thank you for your participation!

Client survey

Details on respondent

1. What relation does your organisation have with the institute?

- Mainly client (we mainly, or only, buy commercial R&D services)

- Mainly partner (we mainly, or only, collaborate in publically co-funded R&D projects)

- Client and partner in roughly equal proportions

2. Where is your organisation – i.e. the legal entity that you are working for – located?

- In Norway

- Outside Norway

3. Which of the following alternatives best describes your organisation?

- Private company with 250 or more employees worldwide

- Private company with 51–250 employees worldwide

- Private company with 11–50 employees worldwide

- Private company with less than 10 employees worldwide

- University or university college

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- Research institute
- Government agency
- County municipality or municipality (fylkeskommune or kommune)
- Health trust (helseforetak)
- Public enterprise other than health trust (statsforetak, kommunalt foretak etc.)
- EU or other international organisation (EU institution, OECD, IEA etc.)
- Non-governmental organisation
- Other [Open answer]

Frequency of and rationale for collaboration

4. How frequently does your organisation buy R&D services from the institute?

- Several times each year
- Approximately once a year
- Less than once a year
- Once only (not a repeat client)

5. Please assess to what extent the following statements reflect your organisation's rationale for buying R&D services from the institute:

Choose between: 1=Strongly disagree – 2=Disagree – 3= Neither agree nor disagree – 4=Agree – 5=Strongly agree + Do not know/Not applicable

- To access scientific or technical expertise
- To access expertise in social sciences or humanities
- To access databases
- To access software for analyses and simulations
- To access measurement and testing facilities
- To access manufacturing facilities
- To access training/courses
- To access market intelligence
- To access networks with R&D providers (universities and institutes)
- To access partners for future R&D proposals to for example the Research Council of Norway or the EU Framework programme
- Other: [Open answer]

Impact of collaboration

6. Please assess to what extent buying R&D services from the institute has contributed to the following for your organisation:

Choose between: 1=Strongly disagree – 2=Disagree – 3= Neither agree nor disagree – 4=Agree – 5=Strongly agree + Do not know/Not applicable

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- Improved scientific or technical skills of employees
- Improved collaborative working practices for R&D
- Implementation of new data
- Implementation of new software/methods for analyses and simulations
- Implementation of new measurement and testing techniques
- Implementation of new manufacturing/production techniques
- Granted patents
- Commercialisation of new or improved product or service
- New marketing opportunities
- Establishment of a long-term strategic relationship with the institute
- Establishment of networks with R&D providers
- Participation in R&D projects co-funded by for example the Research Council of Norway or the EU Framework programme

7. **Please assess to what extent buying R&D services from the institute has contributed to, or is expected to contribute to, the following financial benefits for your organisation:**

   Choose between: 1=Strongly disagree – 2=Disagree – 3= Neither agree nor disagree – 4=Agree – 5=Strongly agree + Do not know/Not applicable

- More efficient internal processes or procedures
- Increased number of employees
- Decreased number of employees
- Decreased costs
- Spin-off company/-ies
- *For private clients only*: Increased turnover
- *For private clients only*: Increased exports
- *For private clients only*: Increased international competitiveness

8. **How long time after buying R&D services from the institute does it usually take, or do you expect it to take, for financial benefits to materialise for your organisation?**

- Less than 1 year
- 1-2 years
- 2-5 years
- More than 5 years
- Do not know/Not applicable

Degree of satisfaction with the institute

9. **What is your degree of satisfaction with the institute in the following respects?**

Choose between 1=Very poor – 2=Poor – 3=Satisfactory – 4=Good – 5=Excellent + Do not know/Not applicable

- Scientific and technical competence
- Market intelligence
- Flexibility and adaptability to client needs
- Project management skills (availability, communication, on-time delivery etc.)
- Ability to deal with sensitive information, trade secrets and IPR
- Administrative processes
- Availability of software, databases etc.
- Availability of hardware for measurement, testing, manufacturing etc.
- Ability to identify and share ideas for new projects
- Physical location (where the institute is located)

10. **What is your degree of satisfaction with the institute's <u>personnel</u> in the following respects?**

    Choose between 1=Very poor – 2=Poor – 3=Satisfactory – 4=Good – 5=Excellent + Do not know/Not applicable

- Collaborative skills
- Client focus
- Ability to effectively communicate on scientific and technical matters

11. **How do Norwegian universities compare with the institute in the following respects (as potential alternative suppliers of R&D services)?**

    Choose between 1=Much less competitive – 2=Less competitive – 3=Equally competitive – 4=More competitive – 5=Much more competitive + Do not know/Not applicable

- Scientific and technical competence
- Project management skills (availability, communication, on-time delivery etc.)
- Access to software, databases etc.
- Access to hardware for measurement, testing, manufacturing etc.
- Value for money

12. **How do non-Norwegian competitors compare with the institute in the following respects?**

    Choose between 1=Much less competitive – 2=Less competitive – 3=Equally competitive – 4=More competitive – 5=Much more competitive + Do not know/Not applicable

- Scientific and technical competence
- Project management skills (availability, communication, on-time delivery etc.)
- Access to software, databases etc.
- Access to hardware for measurement, testing, manufacturing etc.

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- Value for money

Future collaboration

13. Please assess the likelihood that your organisation in the next three years will buy additional R&D services from the institute:

Choose between: 1=Very unlikely – 2=Unlikely – 3=Likely – 4=Very likely + Do not know/Not applicable

14. Do you have any suggestions on how the institute could improve its R&D services?

[Open answer]

Partner survey

Details on respondent

1. What relation does your organisation have with the institute?

- Mainly client (we mainly, or only, buy commercial R&D services)

- Mainly partner (we mainly, or only, collaborate in publically co-funded R&D projects)

- Client and partner in roughly equal proportions

2. Where is your organisation – i.e. the legal entity that you are working for – located?

- In Norway

- Outside Norway

3. Which of the following alternatives best describes your organisation?

- Private company with 250 or more employees worldwide

- Private company with 51–250 employees worldwide

- Private company with 11–50 employees worldwide

- Private company with less than 10 employees worldwide

- University or university college

- Research institute

- Government agency

- County municipality or municipality (fylkeskommune or kommune)

- Health trust (helseforetak)

- Public enterprise other than health trust (statsforetak, kommunalt foretak etc.)

- EU or other international organisation (EU institution, OECD, IEA etc.)

- Non-governmental organisation

- Other [Open answer]

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4. In how many publically co-funded R&D projects has your organisation collaborated with the institute (co-funded by for example the Research Council of Norway or the European Commission)?

- Four or more projects
- Three projects
- Two projects
- One project

5. Please assess to what extent the following statements reflect your organisation's rationale for collaborating with the institute in R&D projects:

Choose between: 1=Strongly disagree – 2=Disagree – 3= Neither agree nor disagree – 4=Agree – 5=Strongly agree + Do not know/Not applicable

- To access scientific or technical expertise
- To access expertise in social sciences or humanities
- To access databases
- To access software for analyses and simulations
- To access measurement and testing facilities
- To access manufacturing facilities
- To access public funding (from for example the Research Council of Norway or the EU Framework programme)
- To access networks with R&D providers (universities and institutes)
- To access networks with companies
- To co-author scientific publications
- Other: [Open answer]

Impact of collaboration

6. Please assess to what extent collaborating with the institute in R&D projects has contributed to the following for your organisation:

Choose between: 1=Strongly disagree – 2=Disagree – 3= Neither agree nor disagree – 4=Agree – 5=Strongly agree + Do not know/Not applicable

- Improved scientific or technical skills of employees
- Improved collaborative working practices for R&D
- Implementation of new data
- Implementation of new software/methods for analyses and simulations
- Implementation of new measurement and testing techniques
- Implementation of new manufacturing/production techniques
- Development or testing of prototypes/demonstrators

- Scientific publications

- Granted patents

- Commercialisation of new or improved product or service

- New marketing opportunities

- Establishment of a long-term strategic relationship with the institute

- Expanded networks with other Norwegian R&D providers (universities and institutes)

- Expanded networks with non-Norwegian R&D providers (universities and institutes)

- Expanded networks with companies

- Participation in additional R&D proposals to for example the Research Council of Norway or the EU Framework programme

- Participation in additional R&D projects co-funded by for example the Research Council of Norway or the EU Framework programme

- Improved opportunities for recruitment of trained researchers

7. **Please assess to what extent collaborating with the institute in R&D projects has contributed to, or is expected to contribute to, the following financial benefits for your organisation**

   Choose between: 1=Strongly disagree – 2=Disagree – 3= Neither agree nor disagree – 4=Agree – 5=Strongly agree + Do not know/Not applicable

- More effective processes or procedures

- Increase in number of employees

- Decrease in number of employees

- Decreased costs

- Spin-off company/-ies

- *For private clients only*: Increased turnover

- *For private clients only*: Increased exports

- *For private clients only*: Increased international competitiveness

8. *For private partners only:* **How long time after collaborating with the institute in R&D projects does it usually take, or do you expect it to take, for financial benefits to materialise for your organisation?**

- Less than 1 year

- 1-2 years

- 2-5 years

- More than 5 years

- Do not know/Not applicable

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Degree of satisfaction with the institute

9. **What is your degree of satisfaction with the institute as project coordinator, if applicable?**

   Choose between The institute has not been project coordinator – 1=Very poor – 2=Poor – 3=Satisfactory – 4=Good – 5=Excellent + Do not know

10. **What is your degree of satisfaction with the institute in the following respects?**

    Choose between 1=Very poor – 2=Poor – 3=Satisfactory – 4=Good – 5=Excellent + Do not know/Not applicable

- Scientific and technical competence
- Market intelligence
- Project management skills (availability, communication, on-time delivery etc.)
- Administrative processes
- Availability of software, databases etc.
- Availability of hardware for measurement, testing, manufacturing etc.
- Ability to identify and share ideas for new projects

11. **What is your degree of satisfaction with the institute's <u>personnel</u> in the following respects?**

    Choose between 1=Very poor – 2=Poor – 3=Satisfactory – 4=Good – 5=Excellent + Do not know/Not applicable

- Collaborative skills
- Ability to communicate effectively on scientific and technical matters

12. **How do Norwegian universities compare with the institute in the following respects (as potential partners in R&D projects)?**

    Choose between 1=Much less competitive – 2=Less competitive – 3=Equally competitive – 4=More competitive – 5=Much more competitive + Do not know/Not applicable

- Scientific and technical competence
- Project management skills (availability, communication, on-time delivery etc.)
- Access to software, databases etc.
- Access to hardware for measurement, testing, manufacturing etc.
- Value for money

13. **How do non-Norwegian competitors compare with the institute in the following respects?**

    Choose between 1=Much less competitive – 2=Less competitive – 3=Equally competitive – 4=More competitive – 5=Much more competitive + Do not know/Not applicable

- Scientific and technical competence

- Project management skills (availability, communication, on-time delivery etc.)
- Access to software, databases etc.
- Access to hardware for measurement, testing, manufacturing etc.
- Value for money

Future collaboration

14. Please assess the likelihood that your organisation in the next three years will collaborate with the institute on additional R&D proposals to for example the Research Council of Norway or the EU Framework programme:

Choose between: 1=Very unlikely – 2=Unlikely – 3=Likely – 4=Very likely + Do not know/Not applicable

15. Do you have any suggestions on how the institute could improve its collaborative skills and practices?

[Open answer]

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Appendix C Introduction to Appendices D–U

Appendices D–U present full individual survey results for each institute unit. Results from the two IFE units are presented collectively in Appendix E, since it is not possible to separate them. In addition, a separate presentation of results of the FP7 partners of the SINTEF Foundation is found in Appendix S. Consequently, the separate results for the units of the SINTEF Foundation (Appendices M–R) only contain data from the RCN and key clients sample categories.

Where there less than five respondents, results have been excluded.

It is only for IFE and SINTEF Foundation that are there is a sufficient number of respondents to present results for per user category.

Appendix D Christian Michelsen Research AS

Table 7 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	5	1	6
Public clients	3	0	3
Private partners	9	2	11
Public partners	4	0	4
All	21	3	24

Figure 15 Users' assessments of the institute's competences. Source: Web survey.
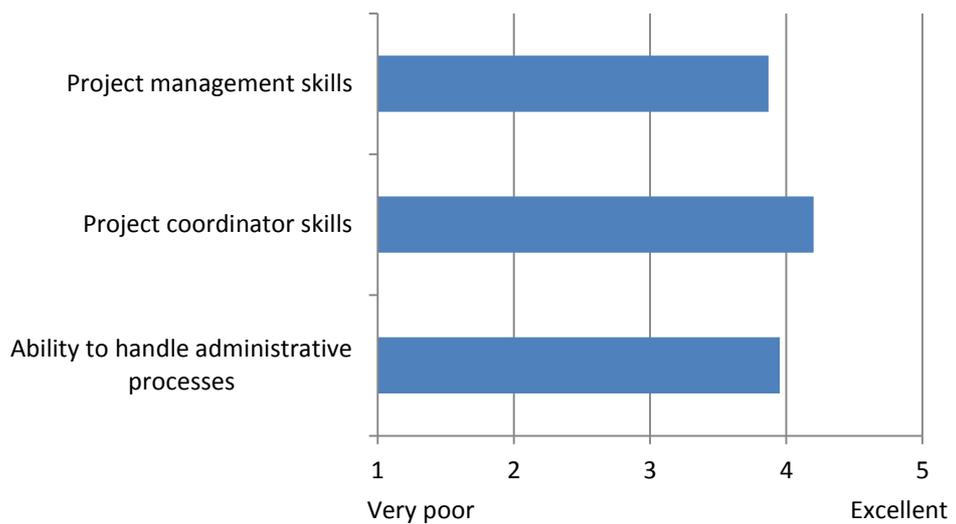
Figure 16 Users' assessments of the institute's management skills. Source: Web survey.
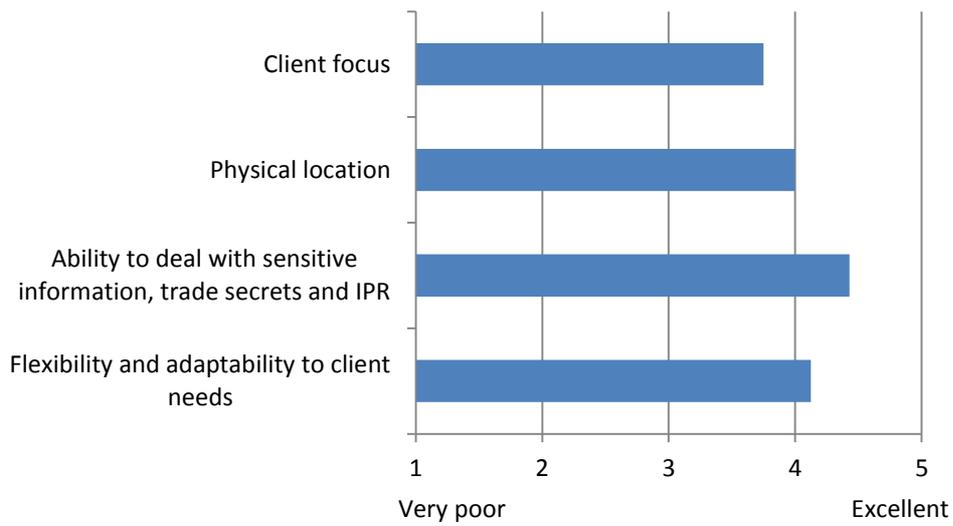
Figure 17 Clients' assessments of the institute. Source: Web survey.
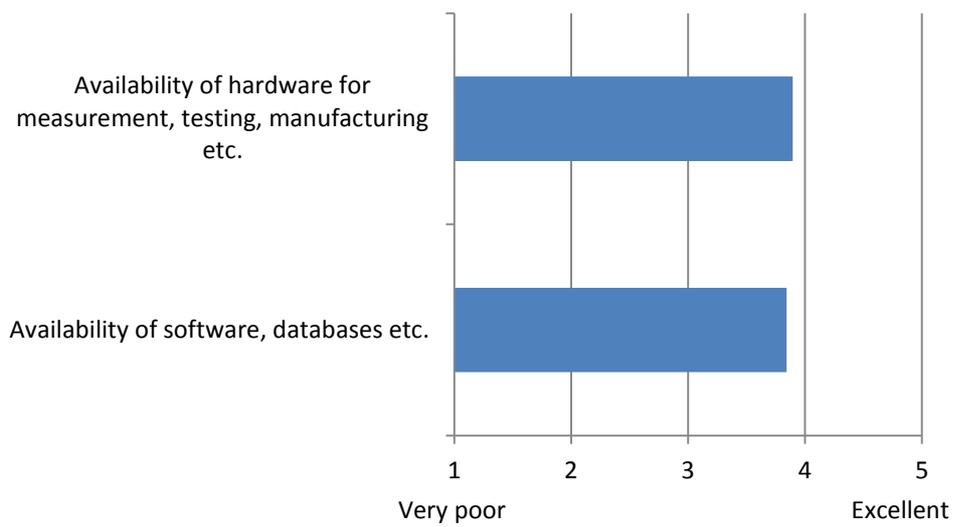
Figure 18 Users' assessments of the institute's infrastructure. Source: Web survey.
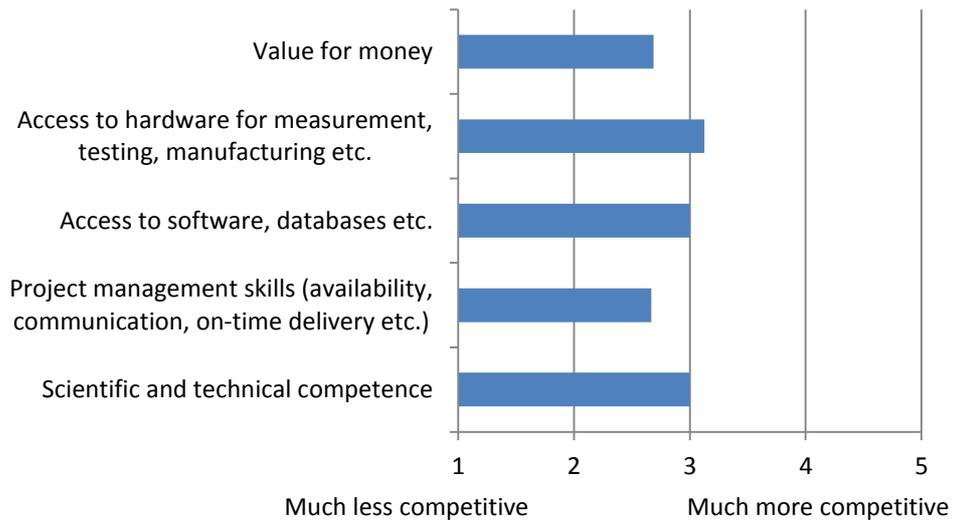
Figure 19 Norwegian universities' competitiveness against CMR. Source: Web survey.
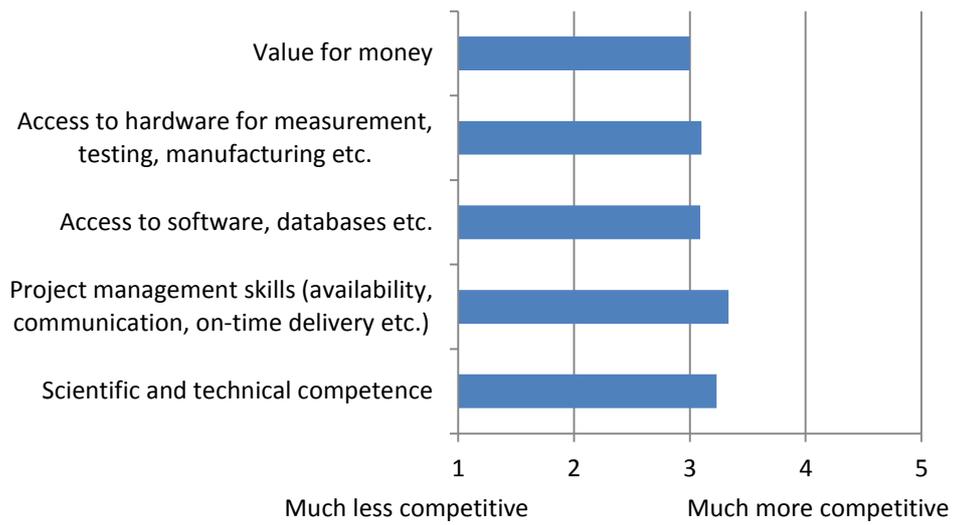
Figure 20 Foreign competitors' competitiveness against CMR. Source: Web survey.

User survey of the technical-industrial research institutes in Norway

Appendix E Institute for Energy Technology

This Appendix covers both the nuclear and other research activities of IFE, since it was not possible to separate the data between the two units.

Table 8 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	11	3	**14**
Public clients	4	2	**6**
Private partners	16	5	**21**
Public partners	7	9	**16**
All	**38**	**19**	**57**
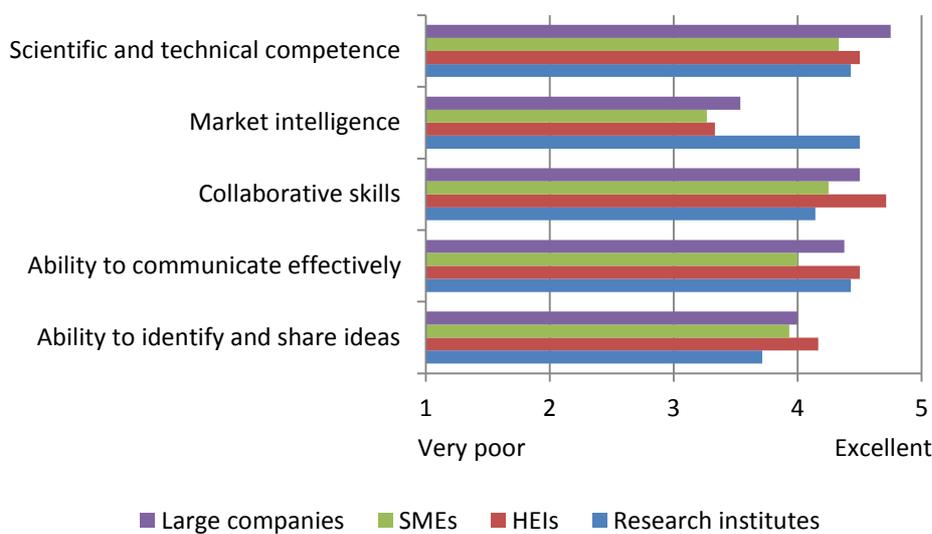
Figure 21 Users' assessments of the institutes' competences. Source: Web survey.
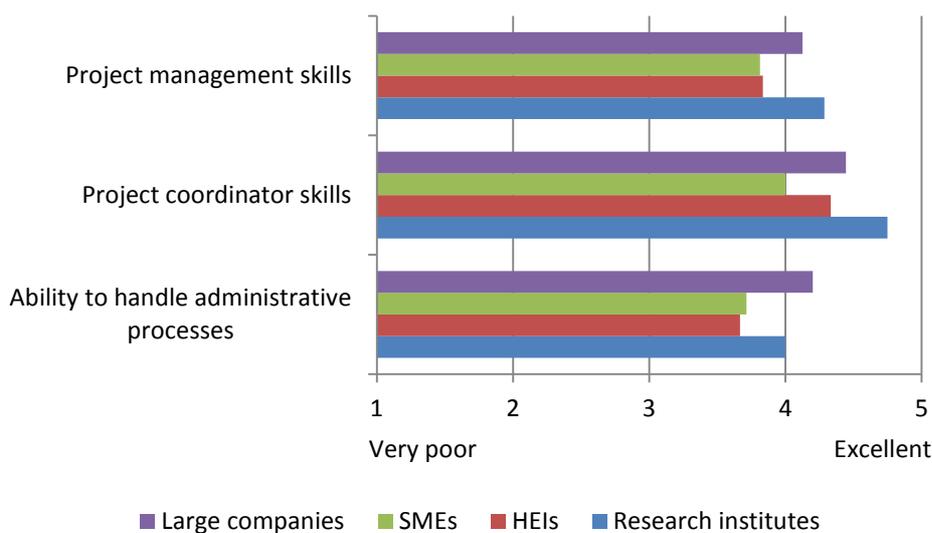
Figure 22 Users' assessments of the institutes' management skills. Source: Web survey.

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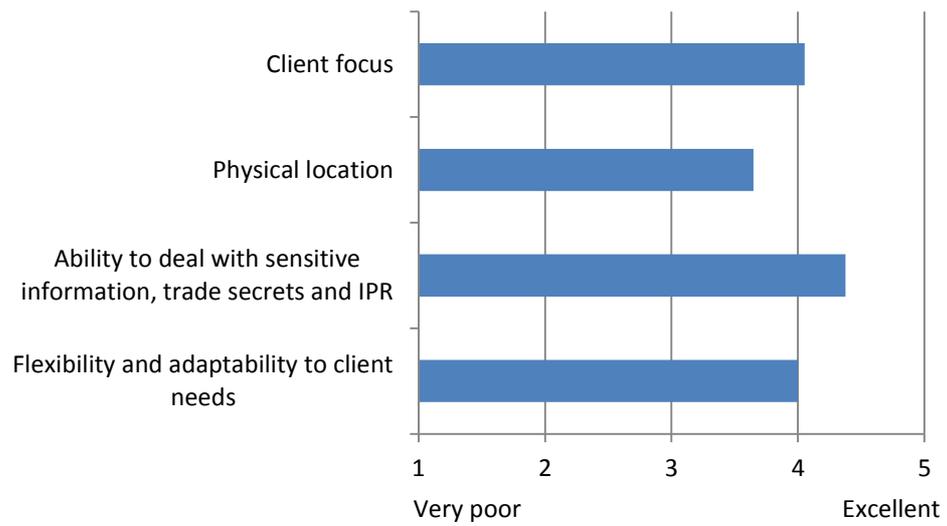
Figure 23 Clients' assessments of the institutes. Source: Web survey.
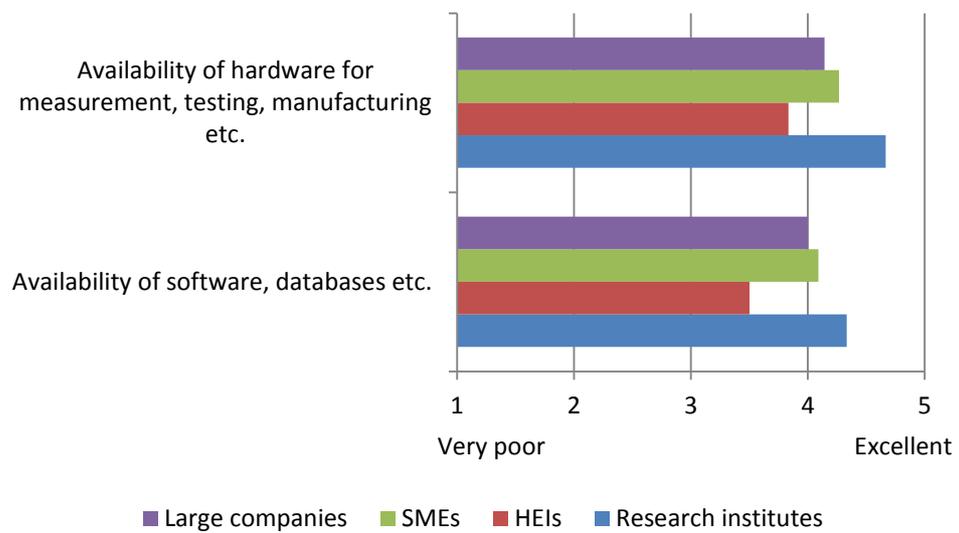
Figure 24 Users' assessments of the institutes' infrastructure. Source: Web survey.

User survey of the technical-industrial research institutes in Norway
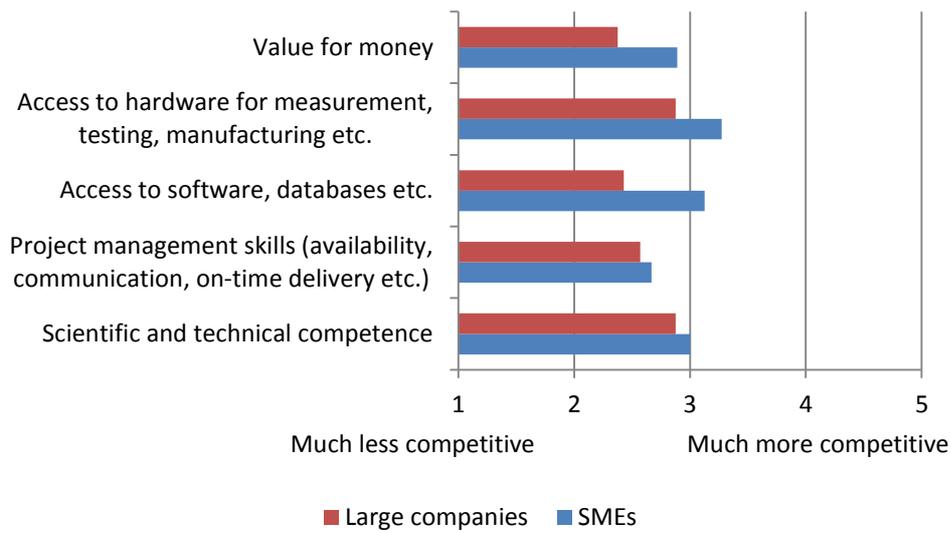
Figure 25 Foreign competitors' competitiveness against IFE. Source: Web survey.
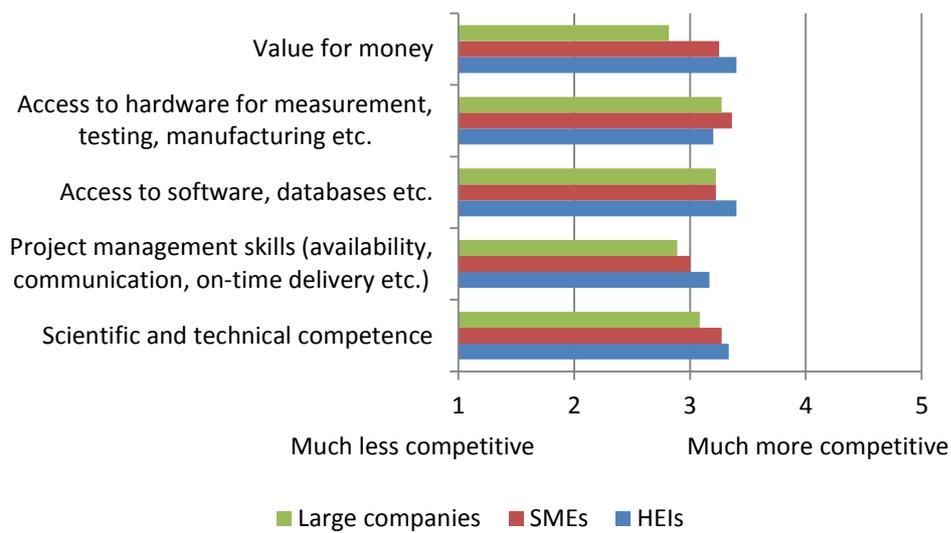
Figure 26 Norwegian universities' competitiveness against IFE. Source: Web survey.

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Appendix F International Research Institute of Stavanger AS

Table 9 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	3	0	3
Public clients	0	1	1
Private partners	5	1	6
Public partners	10	0	10
All	18	2	20

Figure 27 Users' assessments of the institute's competences. Source: Web survey.
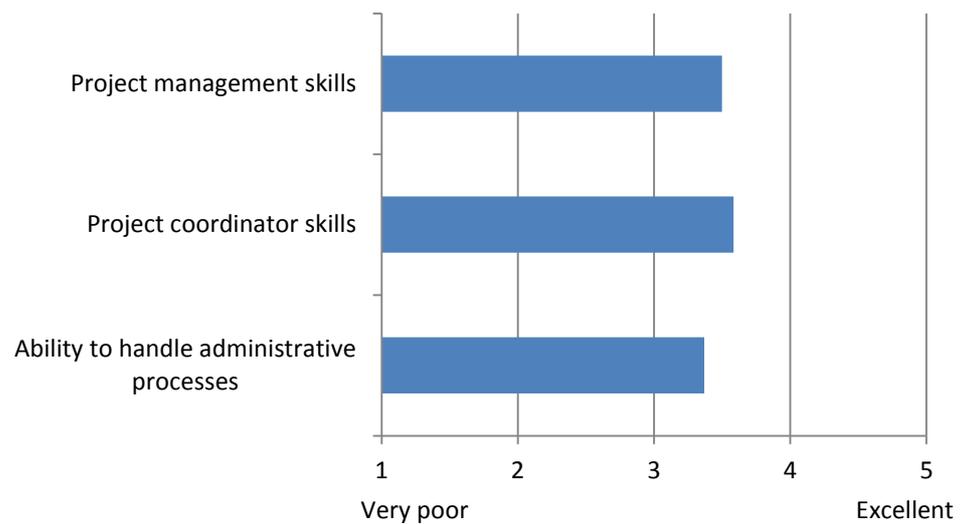
Figure 28 Users' assessments of the institute's management skills. Source: Web survey.
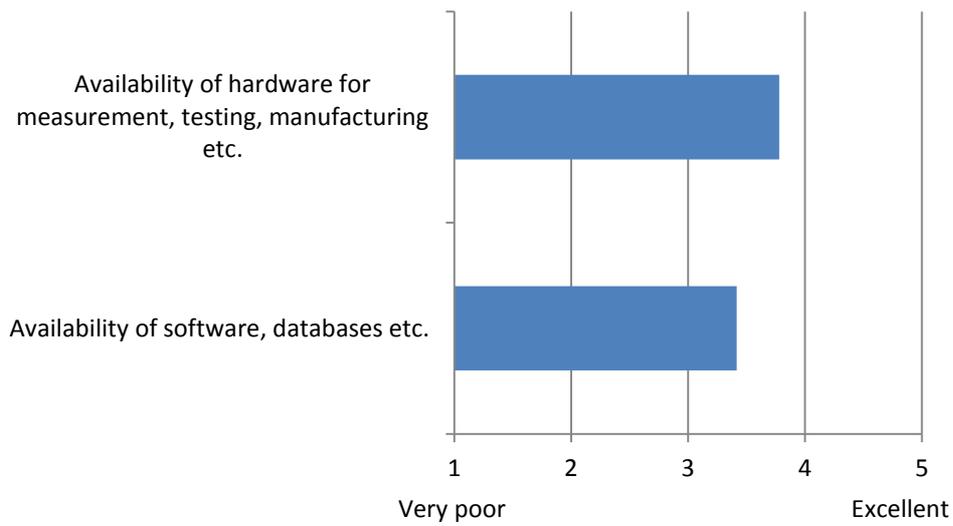
Figure 29 Users' assessments of the institute's infrastructure. Source: Web survey.
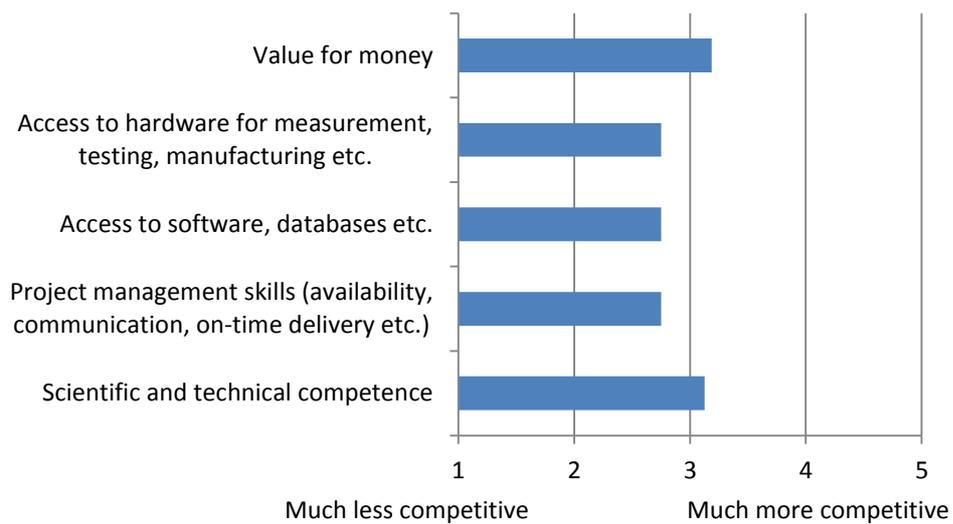
Figure 30 Norwegian universities' competitiveness against IRIS. Source: Web survey.
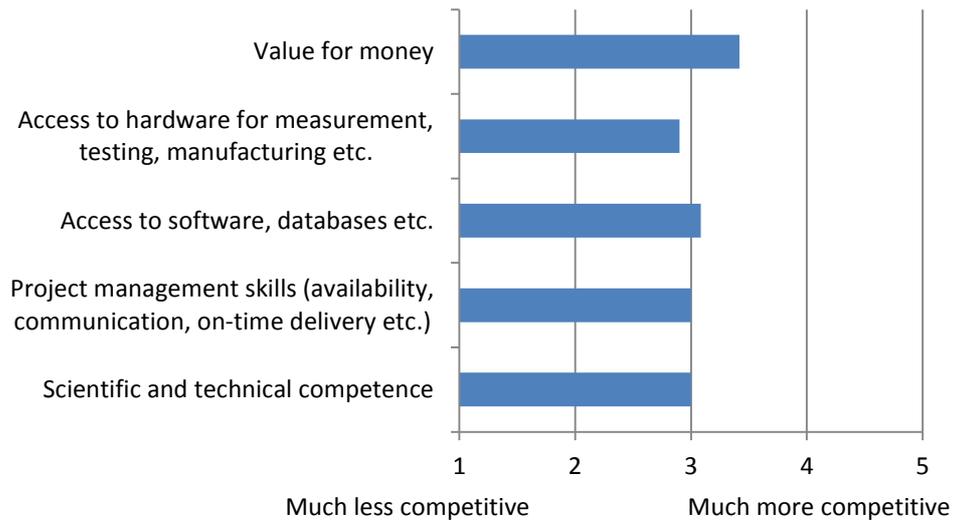
Figure 31 Foreign competitors' competitiveness against IRIS. Source: Web survey.

Appendix G Norwegian Marine Technology Research Institute AS

Table 10 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	4	2	6
Public clients	0	0	0
Private partners	6	5	11
Public partners	6	8	14
All	16	15	31

Figure 32 Users' assessments of the institute's competences. Source: Web survey.
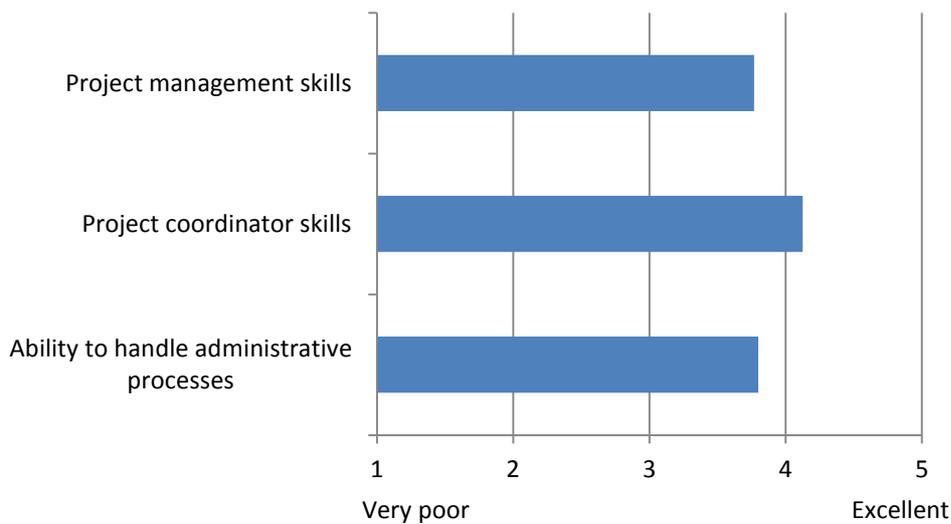
Figure 33 Users' assessments of the institute's management skills. Source: Web survey.
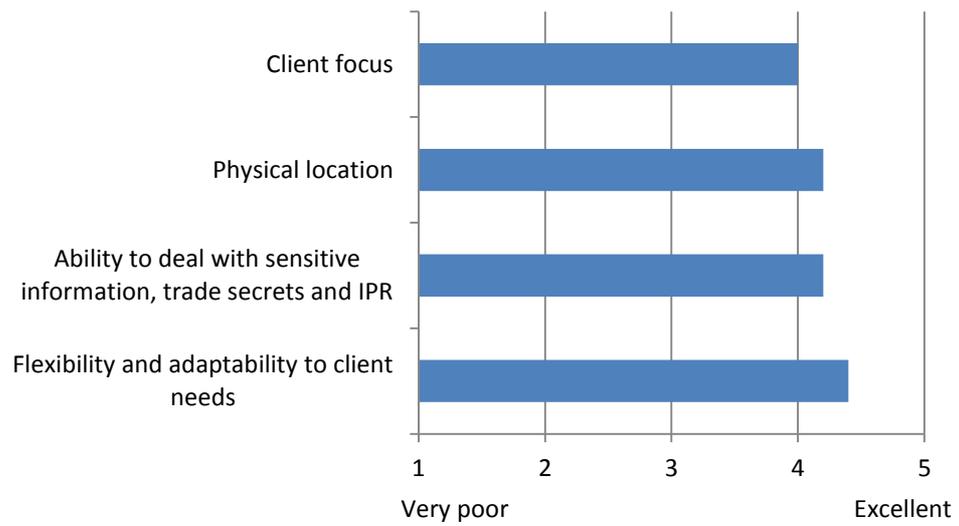
Figure 34 Clients' assessments of the institute. Source: Web survey.
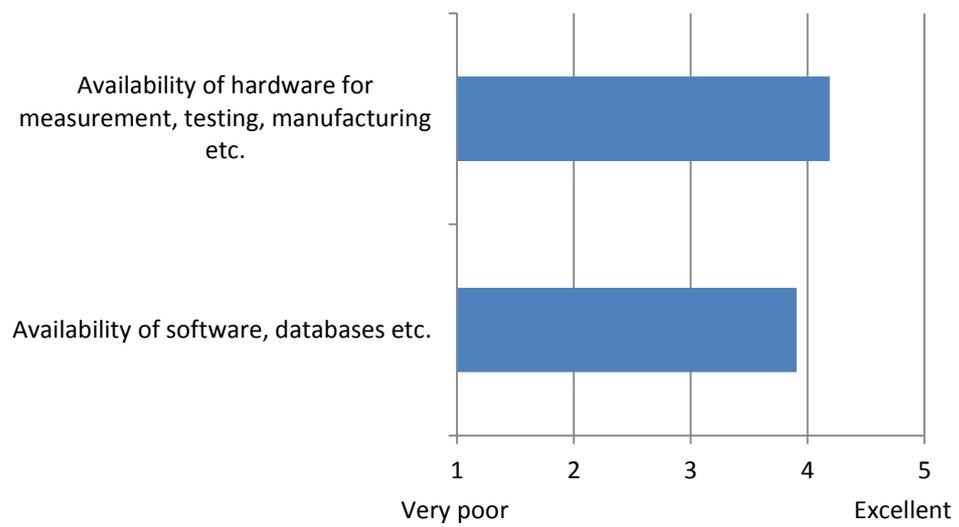
Figure 35 Users' assessments of the institute's infrastructure. Source: Web survey.

User survey of the technical-industrial research institutes in Norway
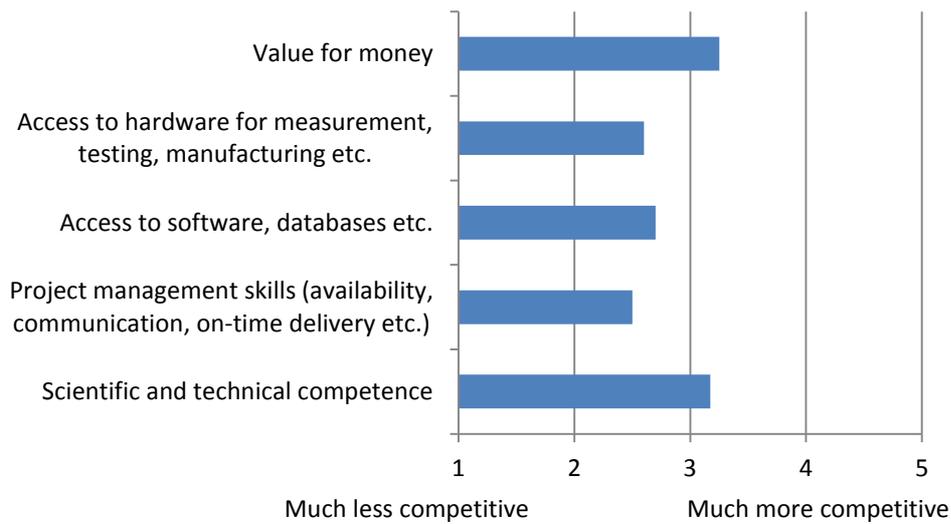
Figure 36 Norwegian universities' competitiveness against MARINTEK. Source: Web survey.
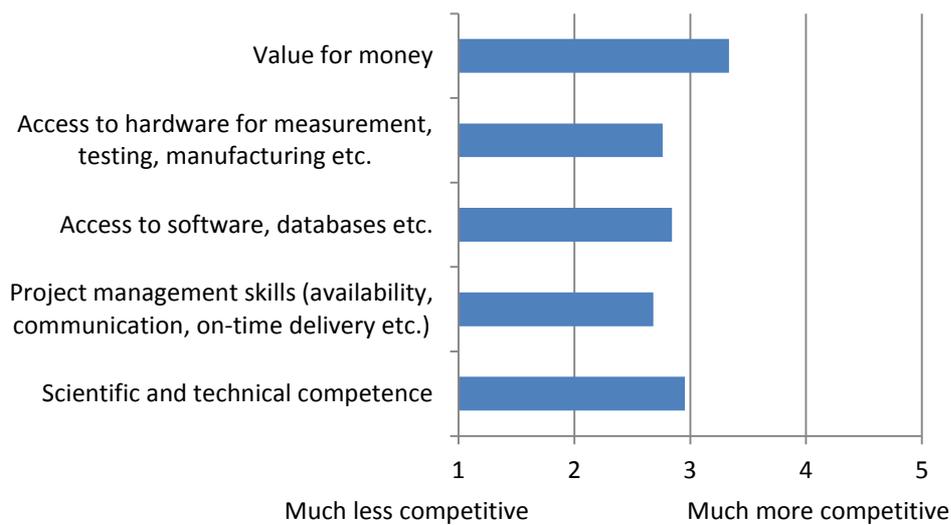
Figure 37 Foreign competitors' competitiveness against MARINTEK. Source: Web survey.

Appendix H Norwegian Geotechnical Institute

Table 11 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	2	1	3
Public clients	3	0	3
Private partners	3	1	4
Public partners	7	6	13
All	15	8	23

Figure 38 Users' assessments of the institute's competences. Source: Web survey.
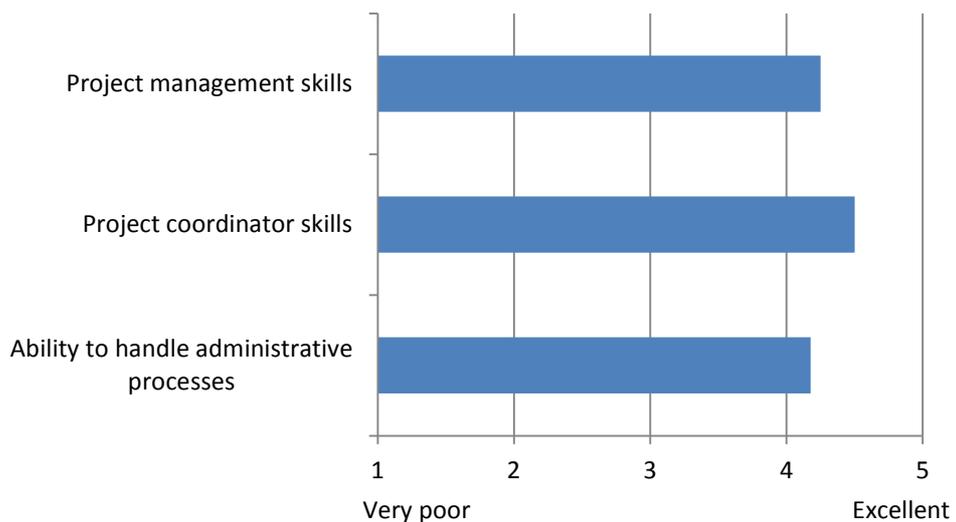
Figure 39 Users' assessments of the institute's management skills. Source: Web survey.

Figure 40 Clients' assessments of the institute. Source: Web survey.
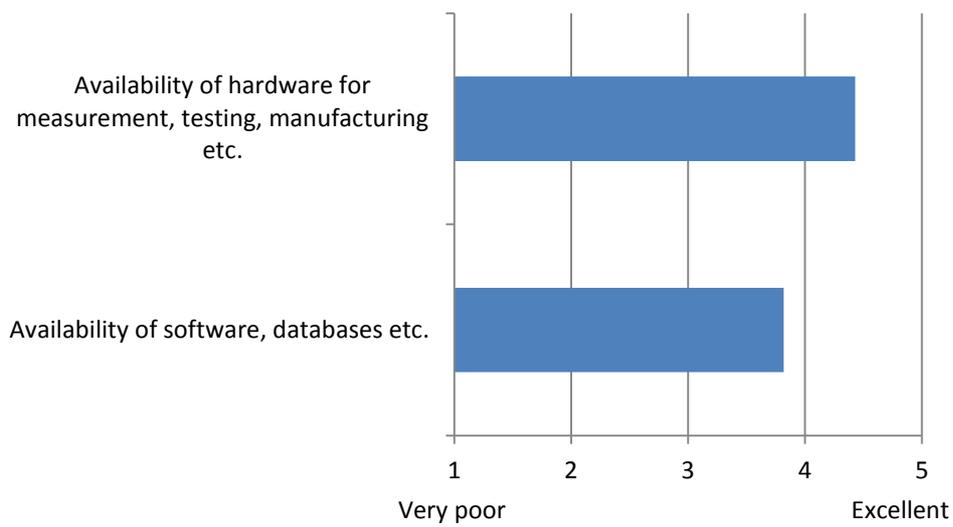
Figure 41 Users' assessments of the institute's infrastructure. Source: Web survey.
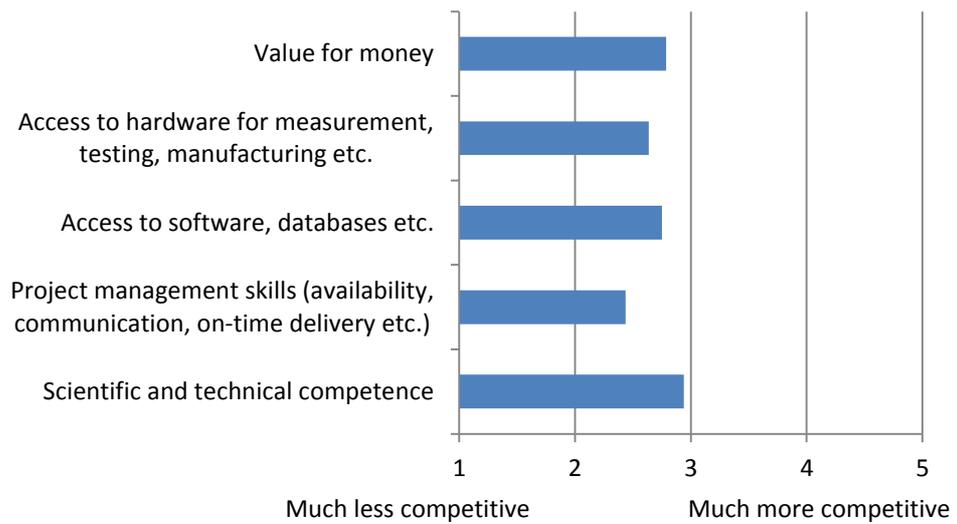
Figure 42 Norwegian universities' competitiveness against NGI. Source: Web survey.
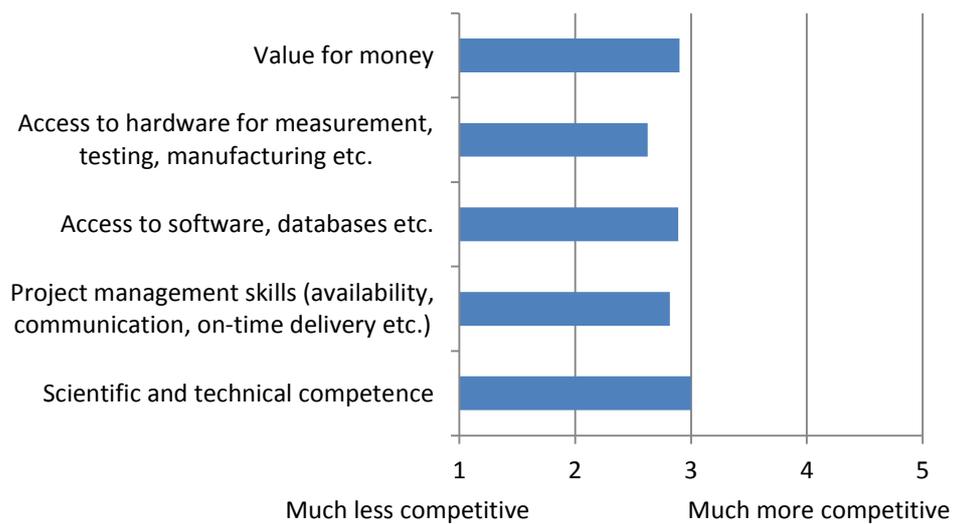
Figure 43 Foreign competitors' competitiveness against NGI. Source: Web survey.

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Appendix I NORSAR

Table 12 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	0	2	2
Public clients	0	2	2
Private partners	1	2	3
Public partners	2	9	11
All	3	15	18

Figure 44 Users' assessments of the institute's competences. Source: Web survey.
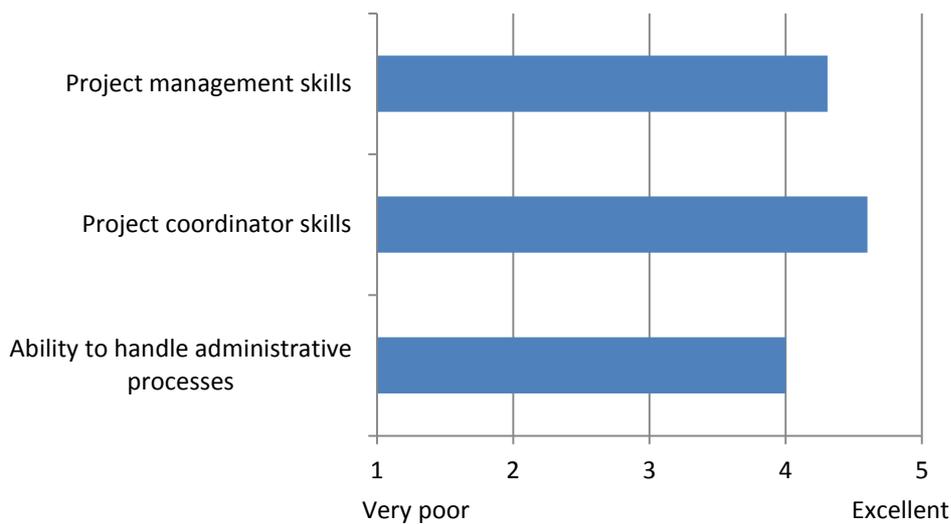
Figure 45 Users' assessments of the institute's management skills. Source: Web survey.
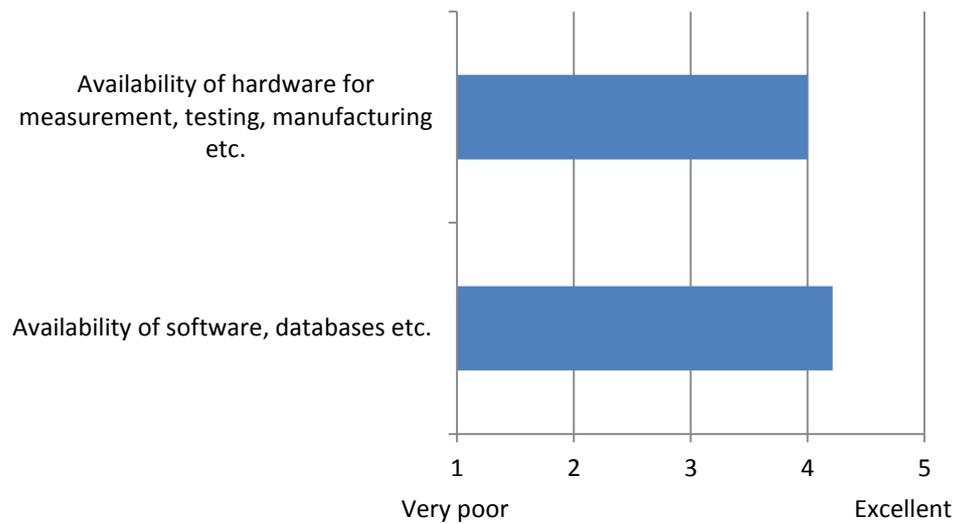
Figure 46 Users' assessments of the institute's infrastructure. Source: Web survey.
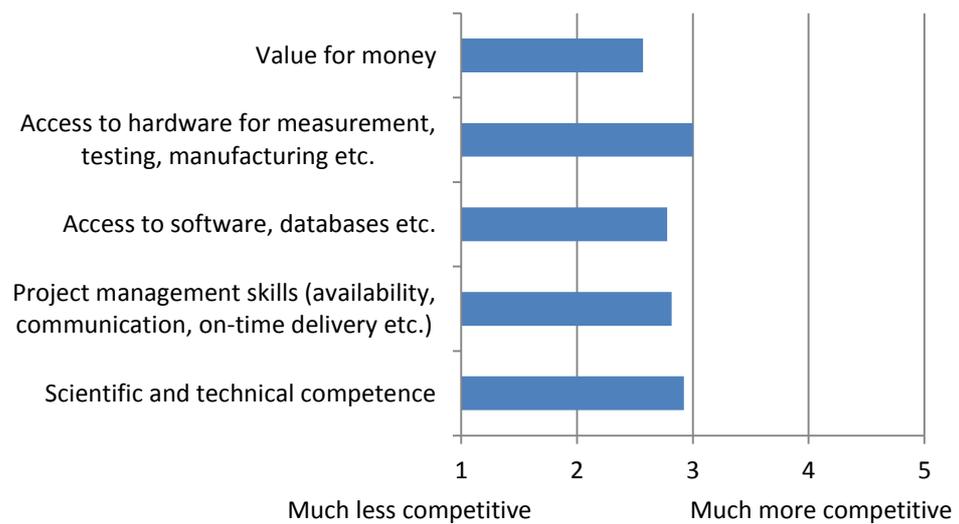
Figure 47 Norwegian universities' competitiveness against NORSAR. Source: Web survey.

User survey of the technical-industrial research institutes in Norway
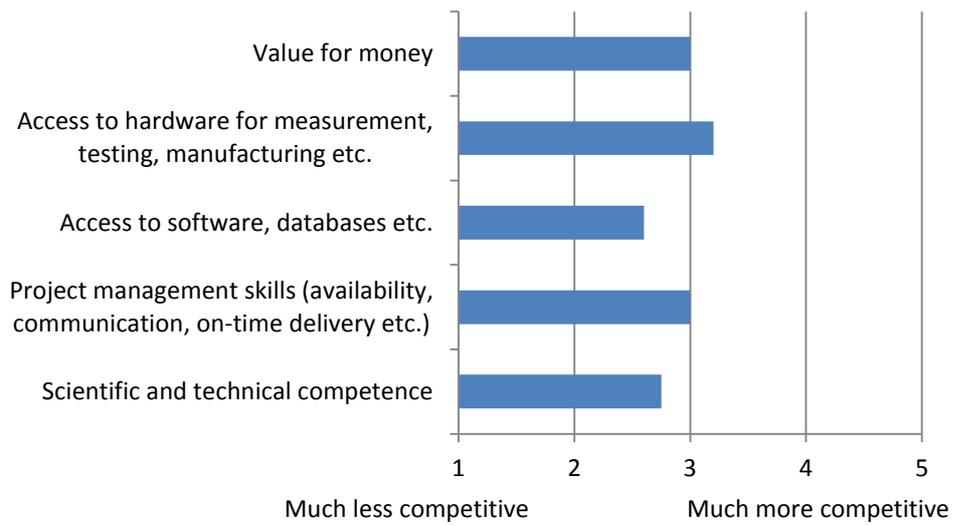
Figure 48 Foreign competitors' competitiveness against NORSAR. Source: Web survey.

Appendix J Northern Research Institute AS, Tromsø

Table 13 Distribution of survey respondents on user categories

User category	Norwegian	Foreign	Total
Private clients	0	0	0
Public clients	1	0	1
Private partners	4	3	7
Public partners	1	1	2
All	6	4	10

Figure 49 Users' assessments of the institute's competences. Source: Web survey.
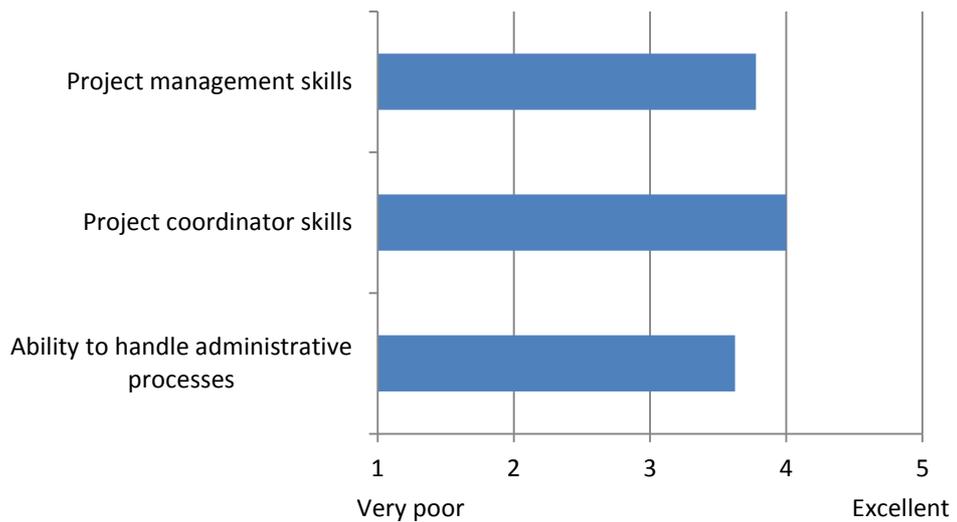
Figure 50 Users' assessments of the institute's management skills. Source: Web survey.
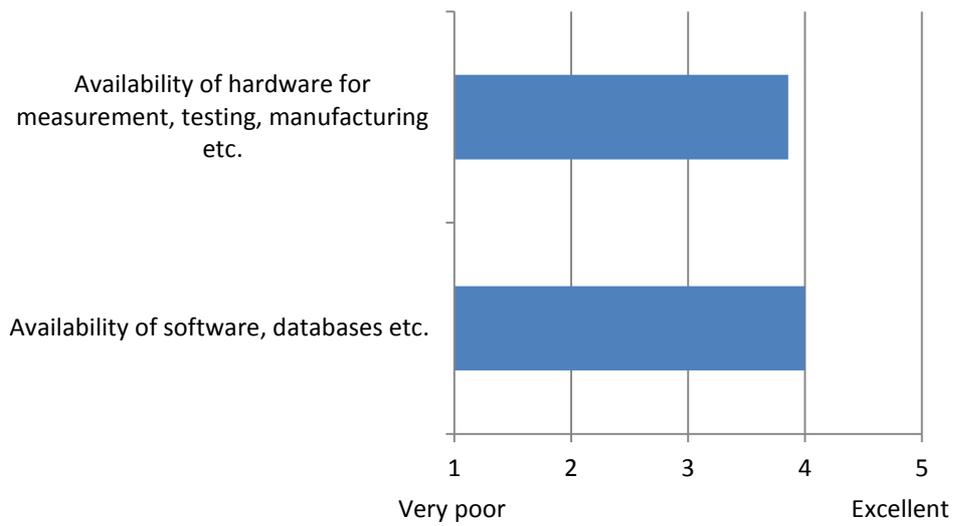
Figure 51 Users' assessments of the institute's infrastructure. Source: Web survey.
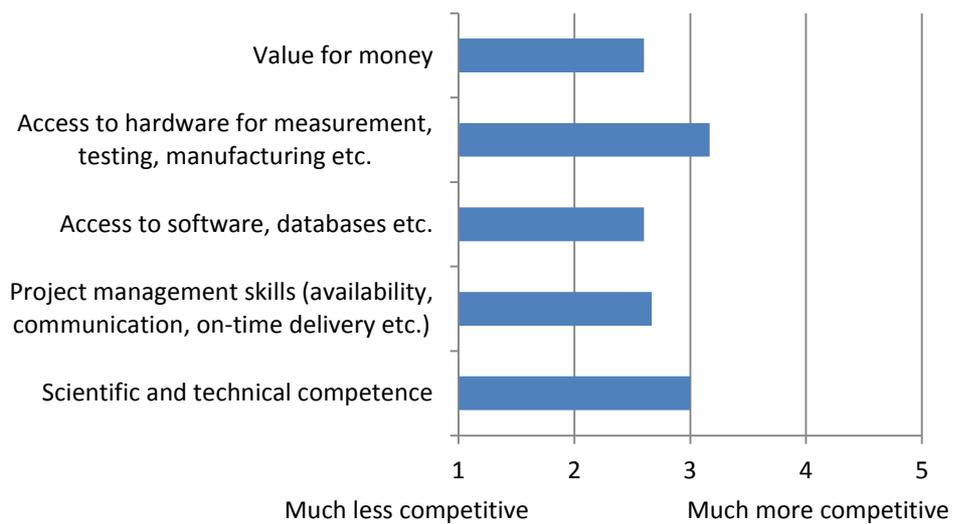
Figure 52 Norwegian universities' competitiveness against Norut Tromsø. Source: Web survey.
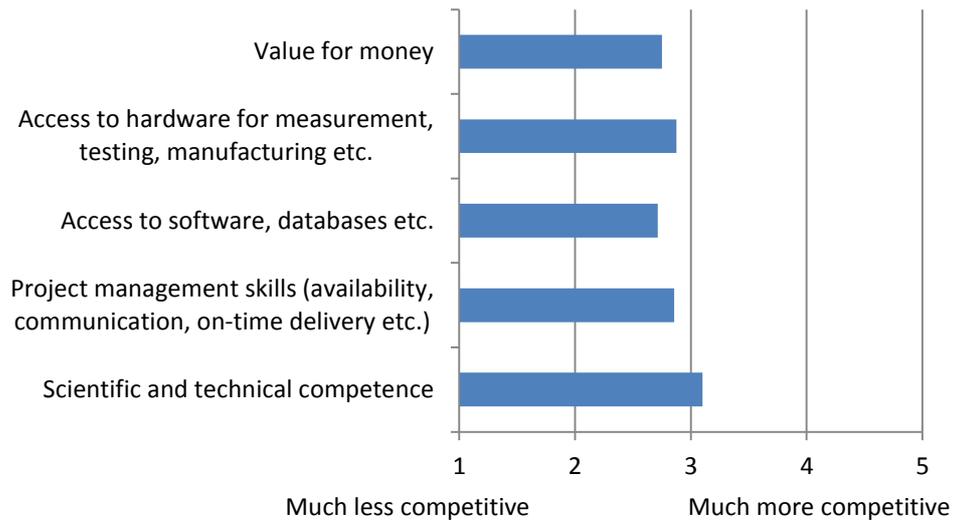
Figure 53 Foreign competitors' competitiveness against Norut Tromsø. Source: Web survey.

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Appendix K Northern Research Institute AS, Narvik

Table 14 Distribution of survey respondents on user categories

User category	Norwegian	Foreign	Total
Private clients	1	0	1
Public clients	1	0	1
Private partners	4	0	4
Public partners	3	0	3
All	**9**	**0**	**9**

Figure 54 Users' assessments of the institute's competences. Source: Web survey.
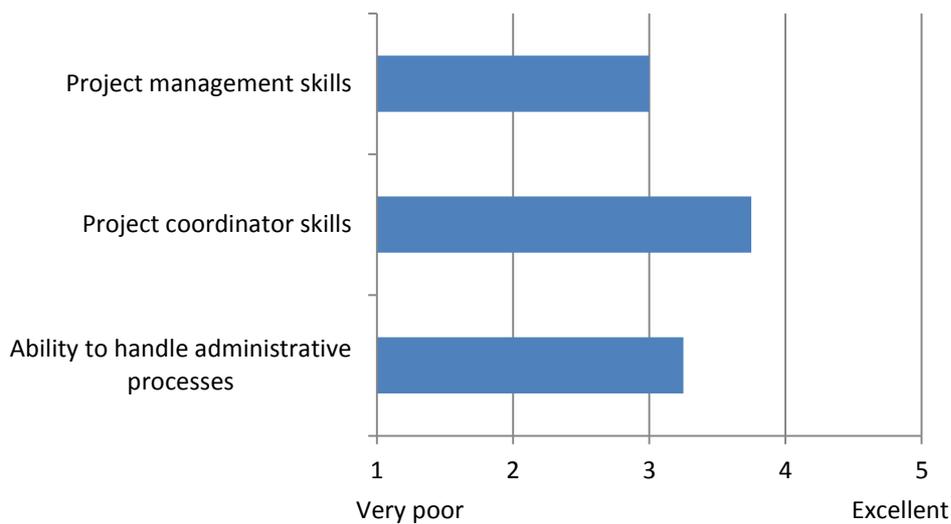
Figure 55 Users' assessments of the institute's management skills. Source: Web survey.
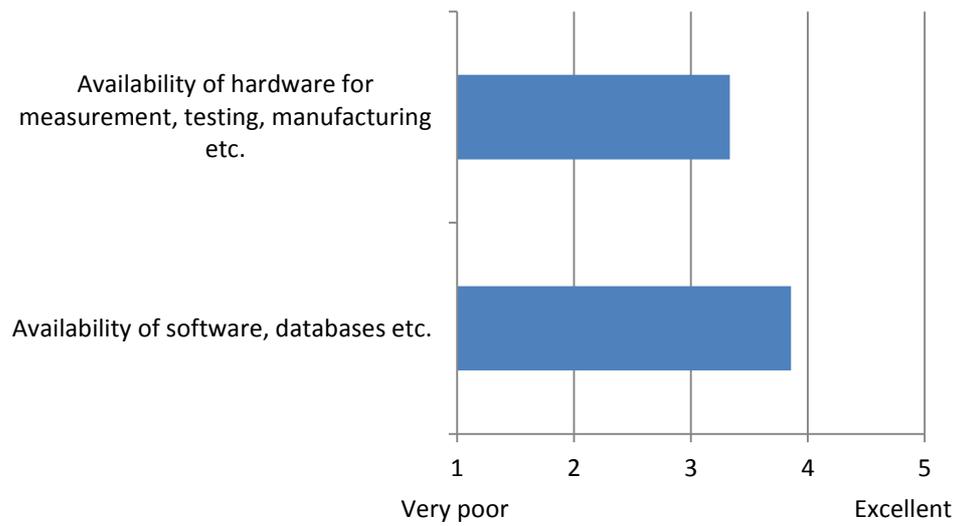
Figure 56 Users' assessments of the institute's infrastructure. Source: Web survey.
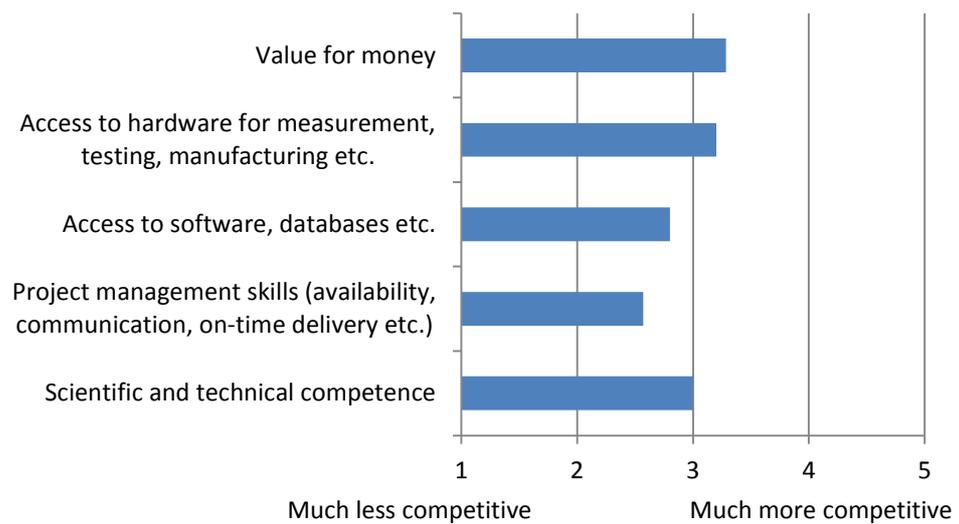
Figure 57 Norwegian universities' competitiveness against Norut Narvik. Source: Web survey.
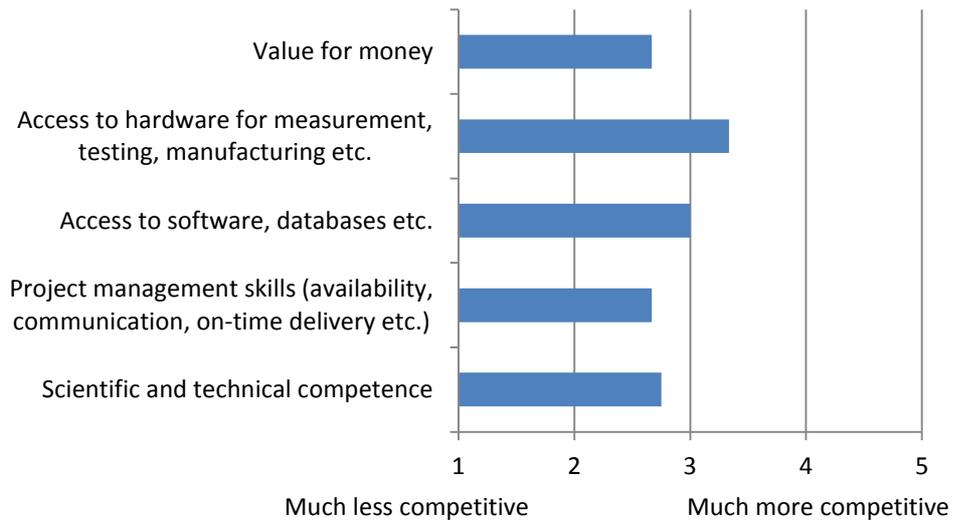
Figure 58 Foreign competitors' competitiveness against Norut Narvik. Source: Web survey.

Appendix L Norwegian Computing Center

Table 15 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	5	0	5
Public clients	3	0	3
Private partners	5	5	10
Public partners	6	2	8
All	19	7	26

Figure 59 Users' assessments of the institute's competences. Source: Web survey.
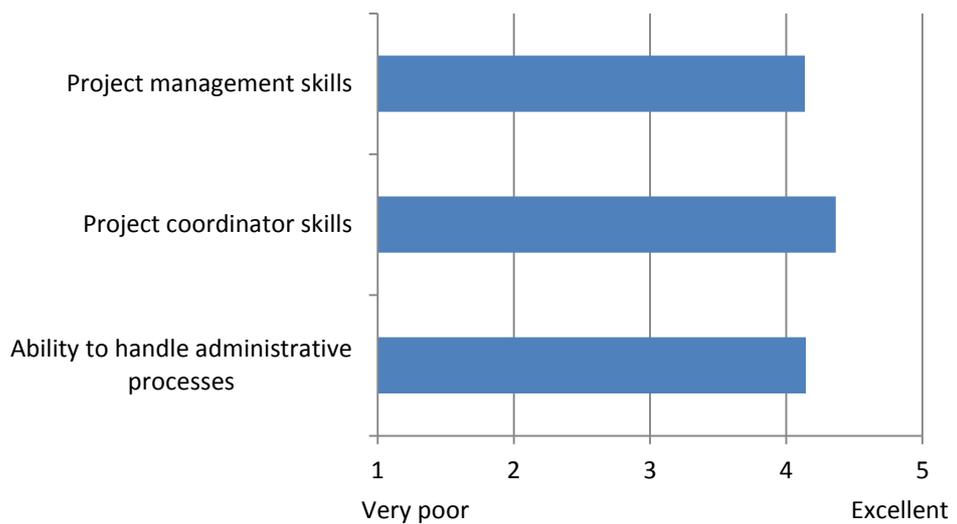
Figure 60 Users' assessments of the institute's management skills. Source: Web survey.

Figure 61 Clients' assessments of the institute. Source: Web survey.
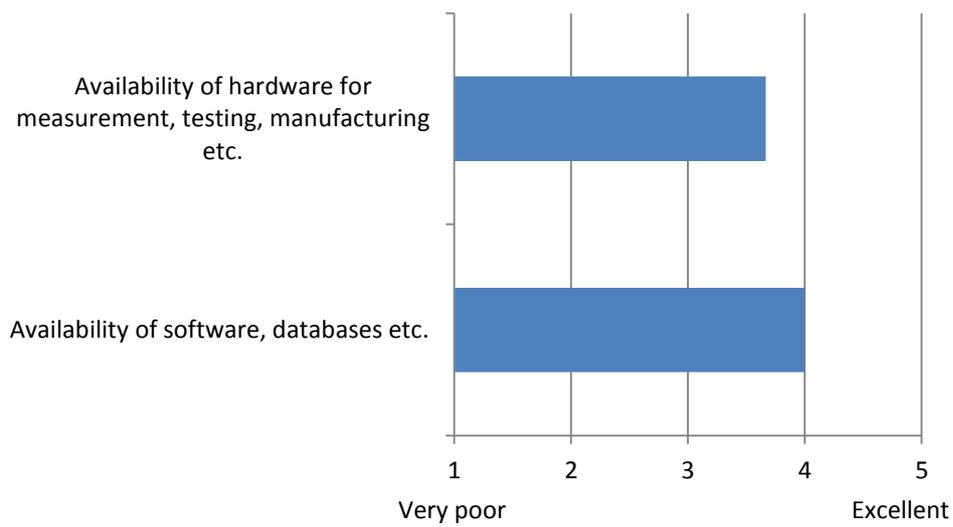
Figure 62 Users' assessments of the institute's infrastructure. Source: Web survey.
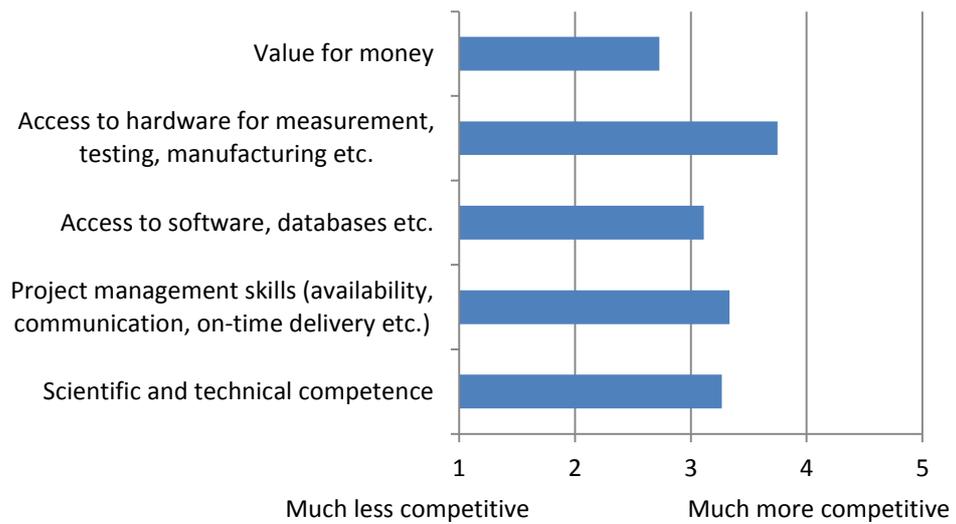
Figure 63 Norwegian universities' competitiveness against NR. Source: Web survey.
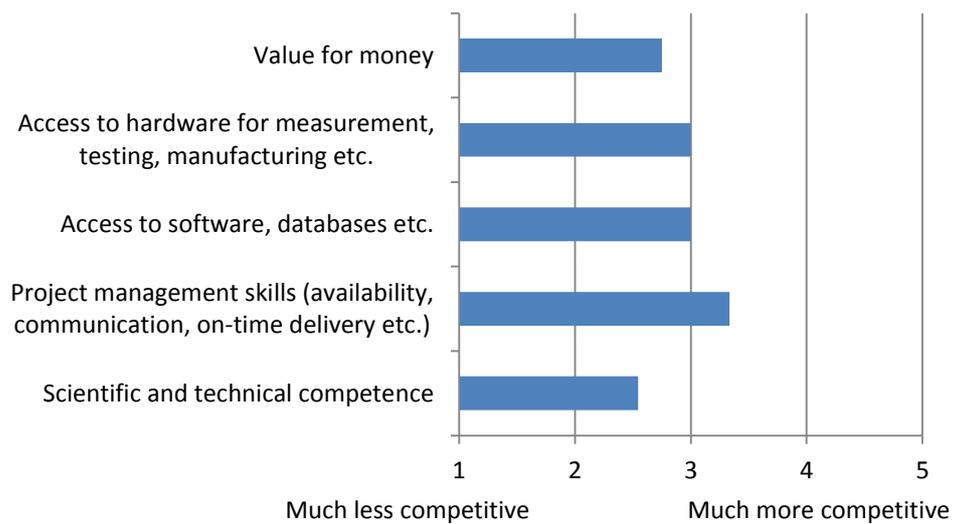
Figure 64 Foreign competitors' competitiveness against NR. Source: Web survey.

User survey of the technical-industrial research institutes in Norway

Appendix M SINTEF Energy Research AS

Table 16 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	5	0	5
Public clients	1	0	1
Private partners	5	9	14
Public partners	3	10	13
All	**14**	**19**	**33**

Figure 65 Users' assessments of the institute's competences. Source: Web survey.
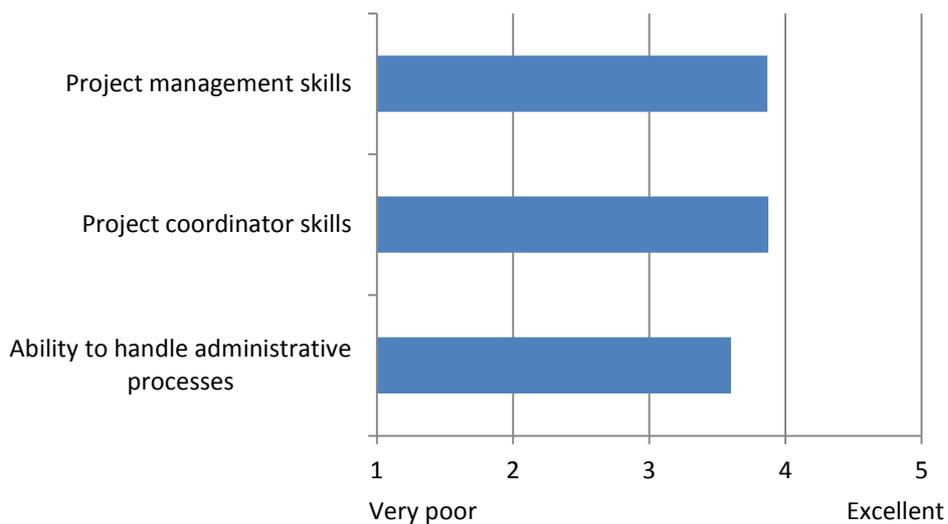
Figure 66 Users' assessments of the institute's management skills. Source: Web survey.
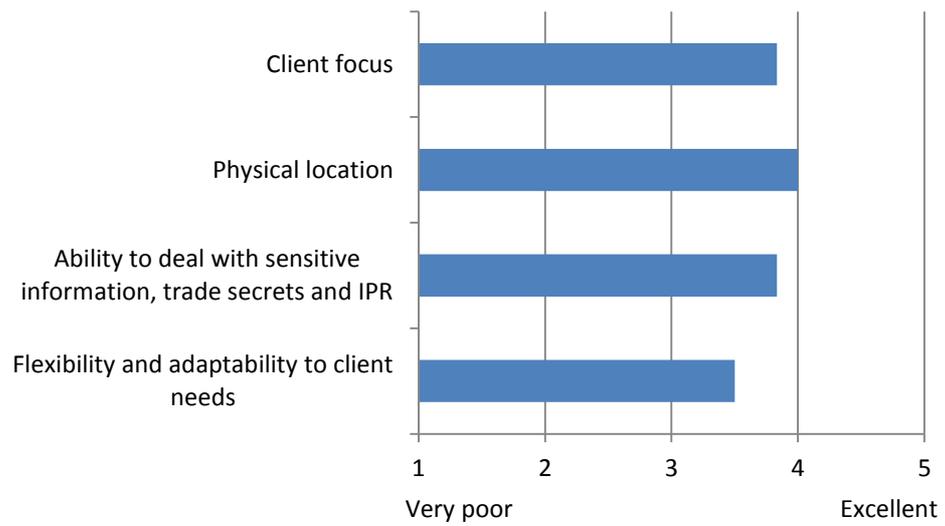
Figure 67 Clients' assessments of the institute. Source: Web survey.
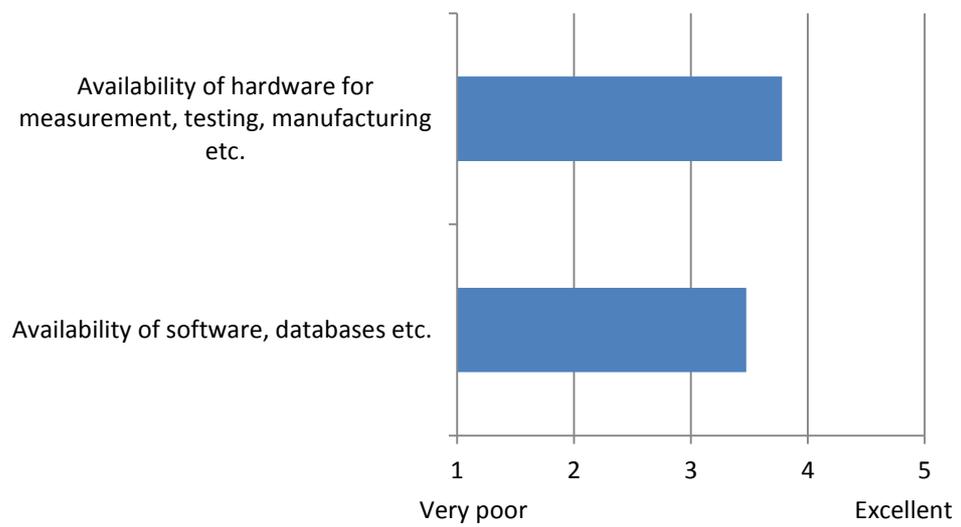
Figure 68 Users' assessments of the institute's infrastructure. Source: Web survey.
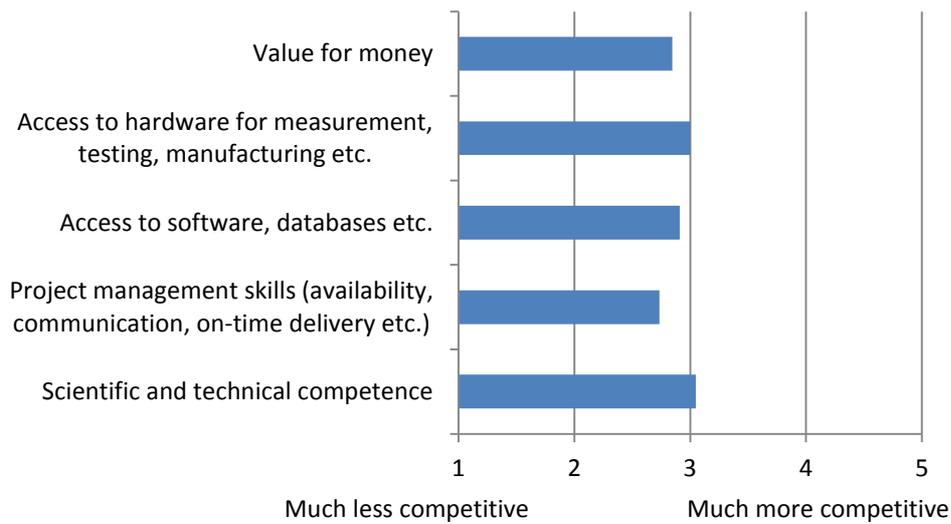
Figure 69 Norwegian universitie's competitiveness against SINTEF Energy. Source: Web survey.
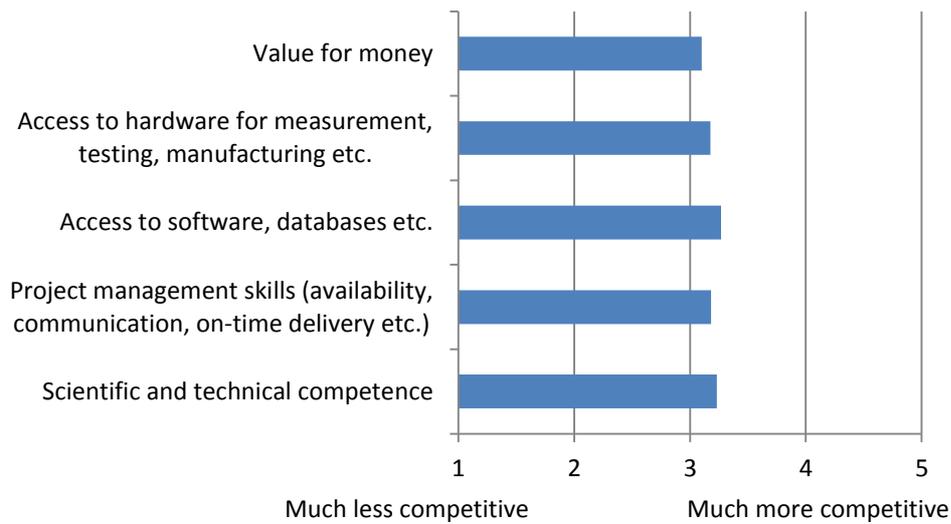
Figure 70 Foreign competitors' competitiveness against SINTEF Energy. Source: Web survey.

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Appendix N SINTEF Petroleum Research AS

Table 17 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	4	0	4
Public clients	1	0	1
Private partners	4	3	7
Public partners	1	6	7
All	10	9	19

Figure 71 Users' assessments of the institute's competences. Source: Web survey.
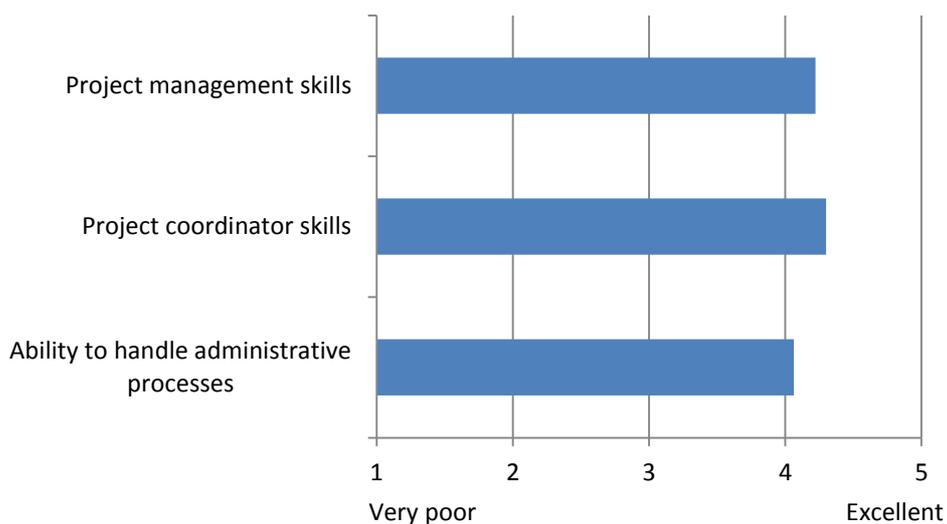
Figure 72 Users' assessments of the institute's management skills. Source: Web survey.

User survey of the technical-industrial research institutes in Norway

Figure 73 Clients' assessments of the institute. Source: Web survey.
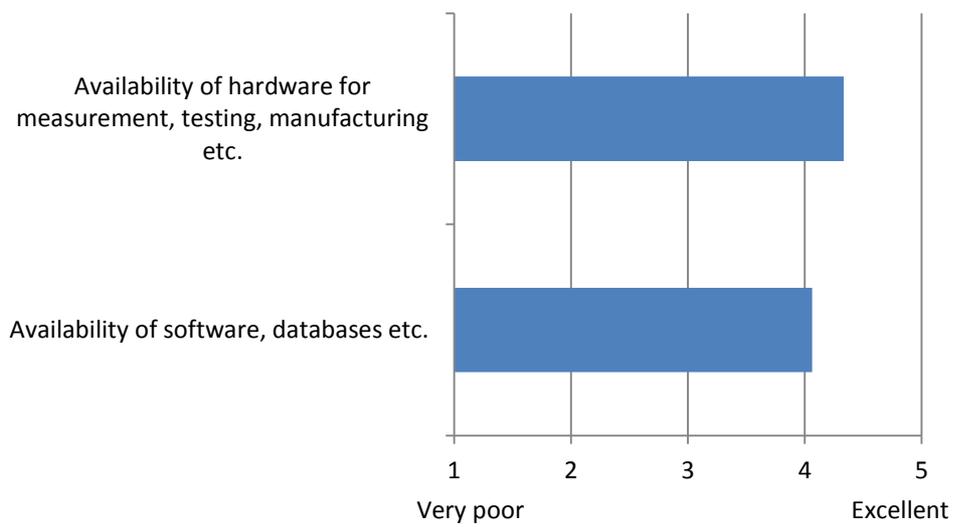
Figure 74 Users' assessments of the institute's infrastructure. Source: Web survey.
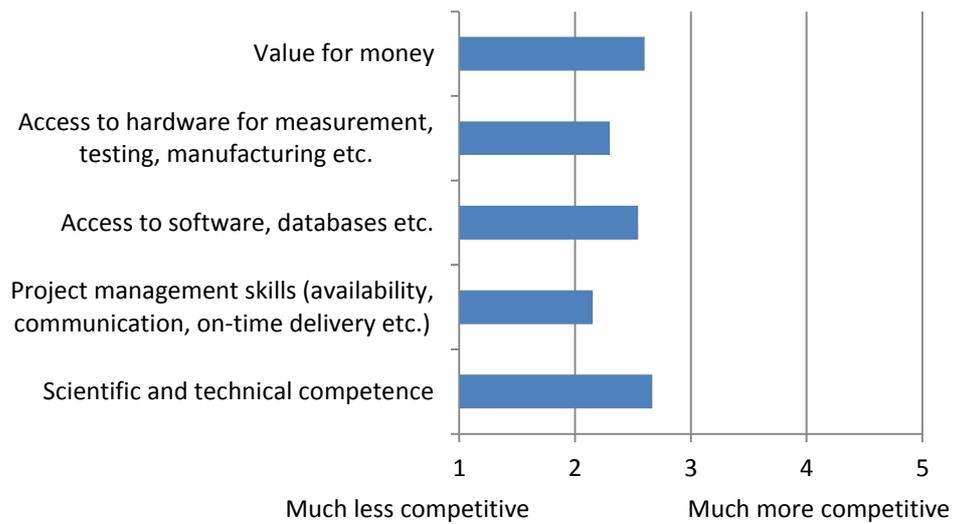
Figure 75 Norwegian universities' competitiveness against SINTEF Petroleum. Source: Web survey.
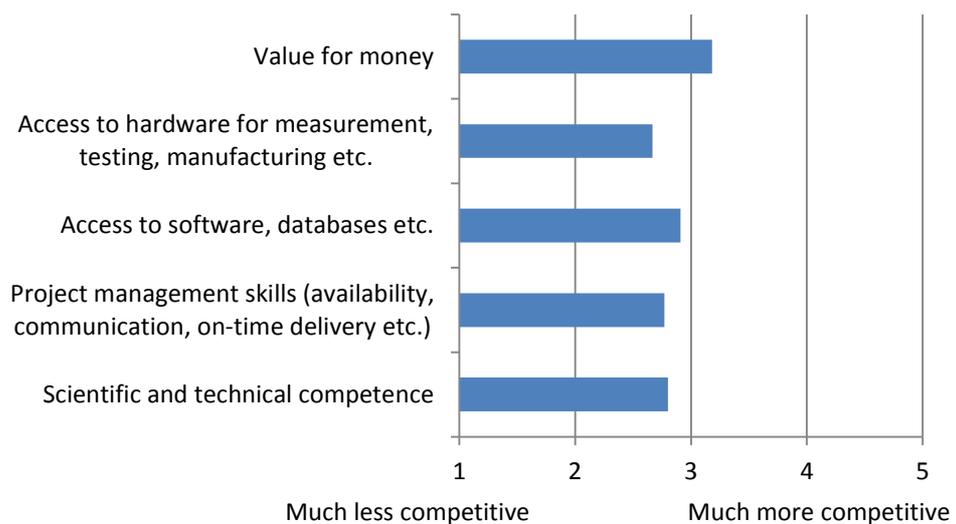
Figure 76 Foreign competitors' competitiveness against SINTEF Petroleum. Source: Web survey.

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Appendix O SINTEF Building and Infrastructure

Table 18 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	2	0	2
Public clients	0	0	0
Private partners	9	0	9
Public partners	4	0	4
All	15	0	15

Figure 77 Users' assessments of the institute's competences. Source: Web survey.
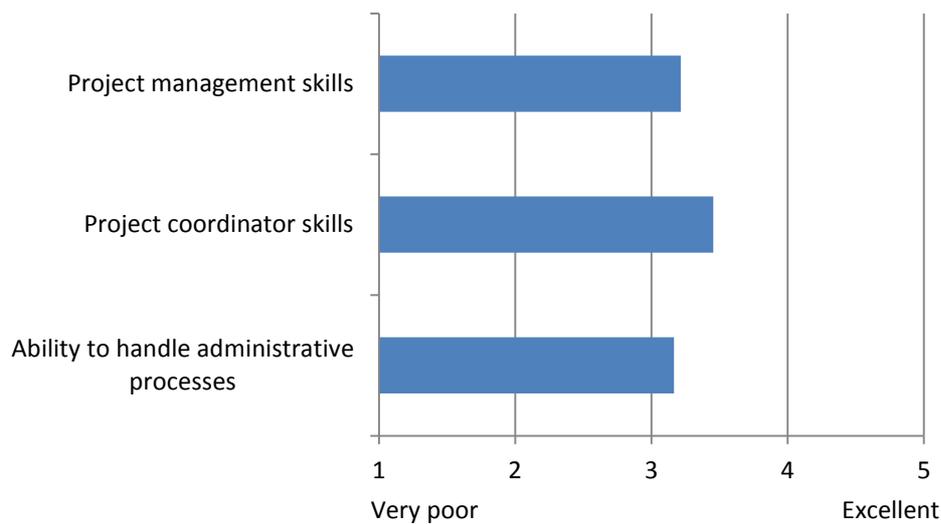
Figure 78 Users' assessments of the institute's management skills. Source: Web survey.
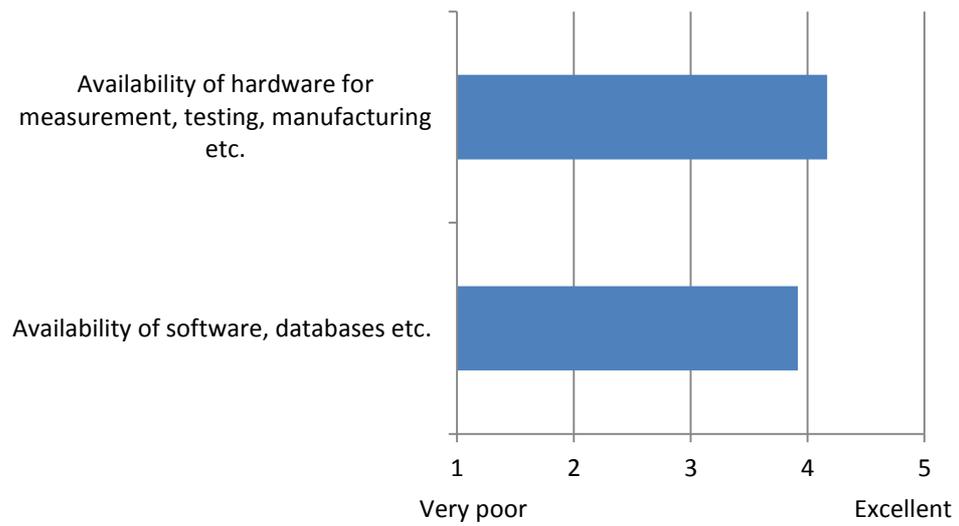
Figure 79 Users' assessments of the institute's infrastructure. Source: Web survey.
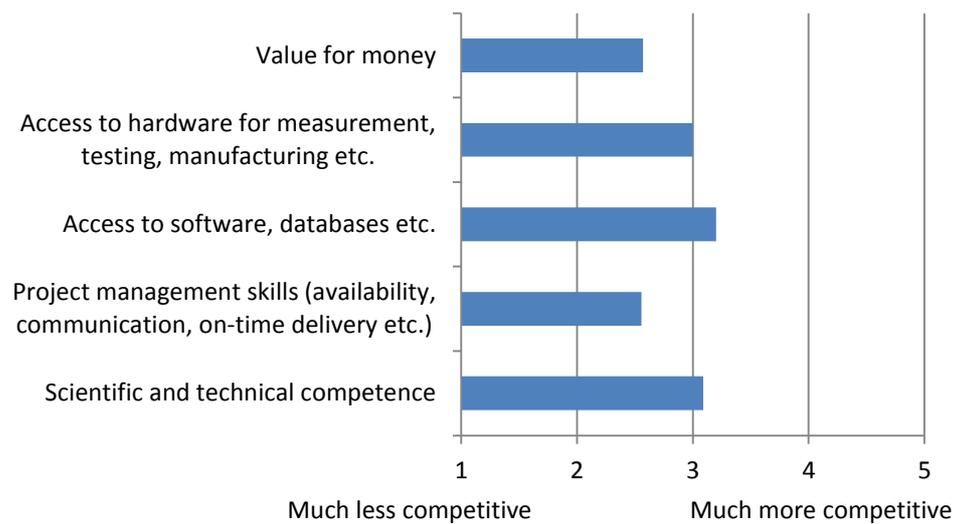
Figure 80 Norwegian universities' competitiveness against SINTEF Build.&Infrast. Source: Web survey.
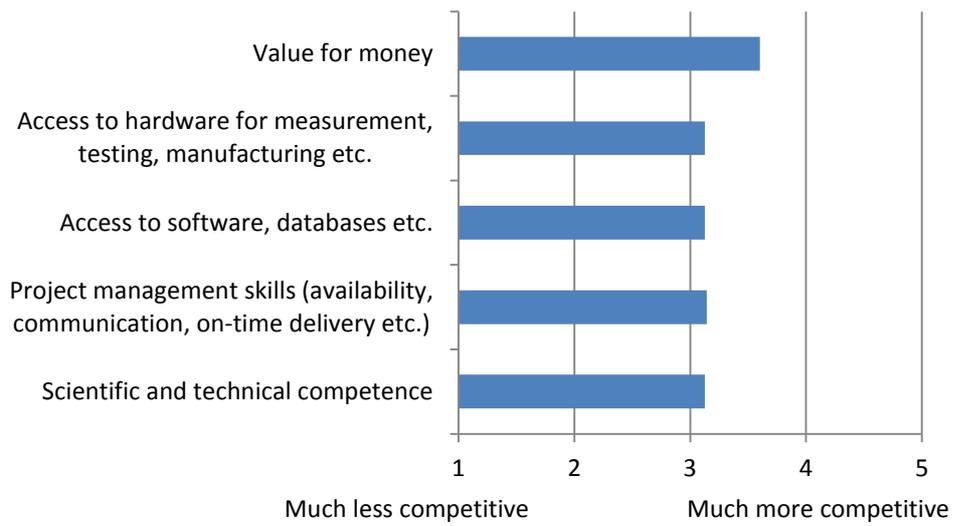
Figure 81 Foreign competitors' competitiveness against SINTEF Build.&Infrast. Source: Web survey.

Appendix P SINTEF ICT

Table 19 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	2	0	2
Public clients	1	1	2
Private partners	11	0	11
Public partners	6	0	6
All	20	1	21
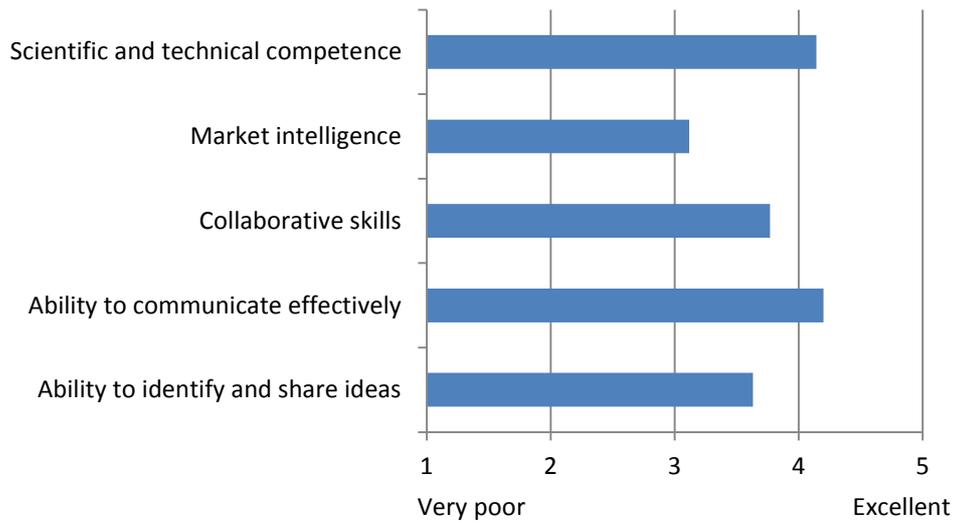
Figure 82 Users' assessments of the institute's competences. Source: Web survey.
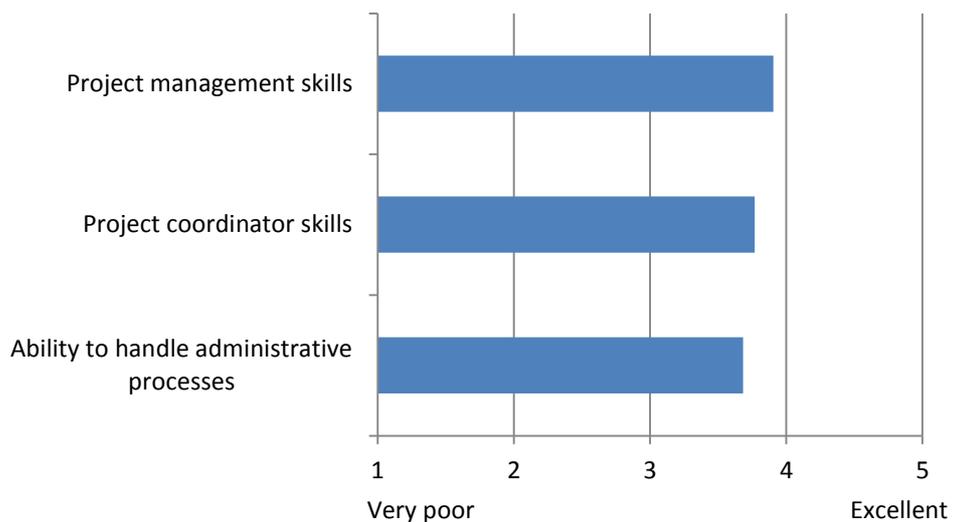
Figure 83 Users' assessments of the institute's management skills. Source: Web survey.
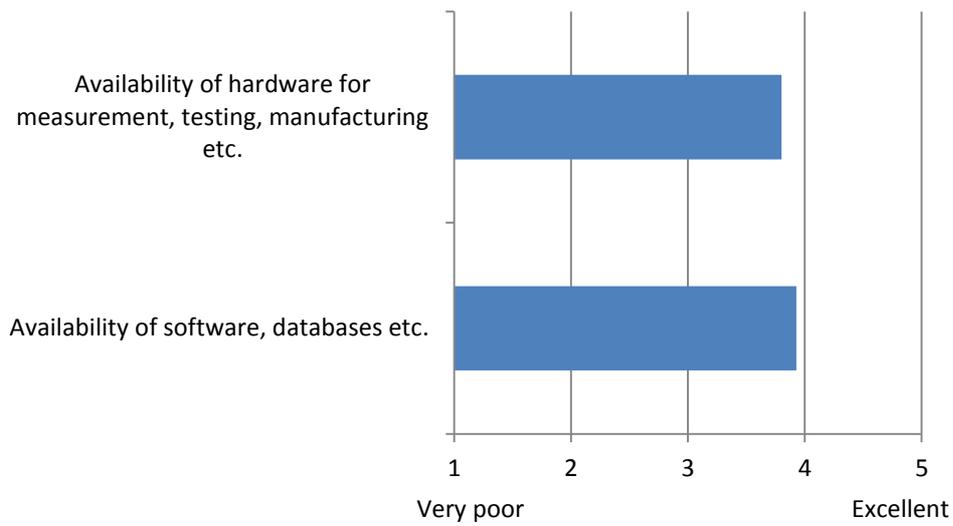
Figure 84 Users' assessments of the institute's infrastructure. Source: Web survey.
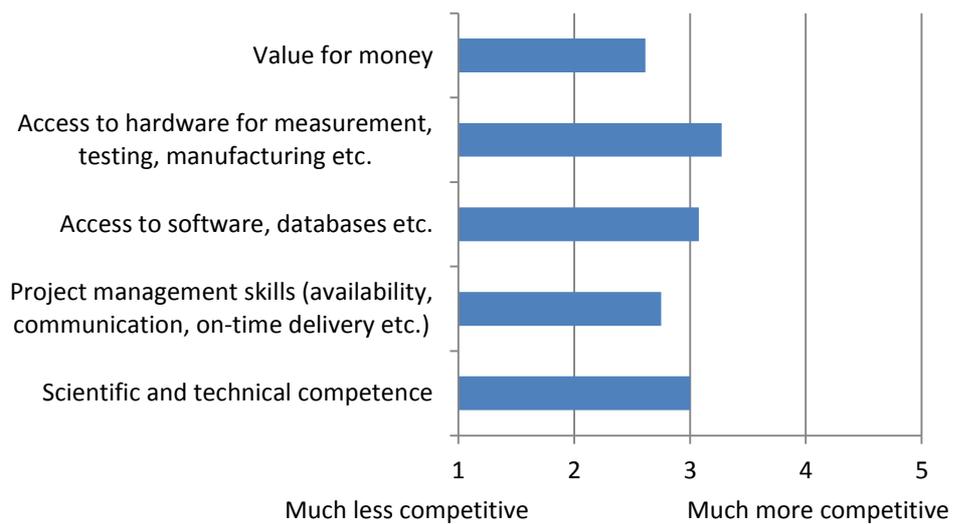
Figure 85 Norwegian universities' competitiveness against SINTEF ICT. Source: Web survey.
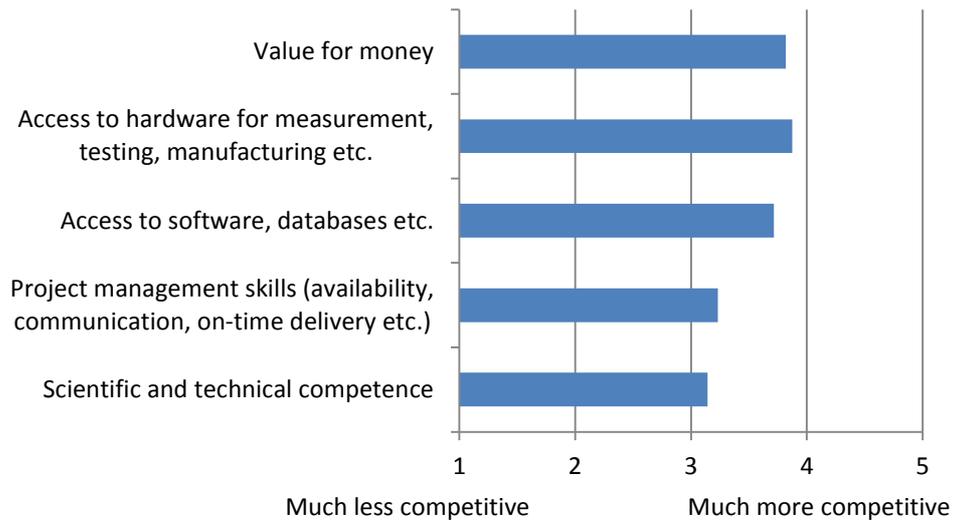
Figure 86 Foreign competitors' competitiveness against SINTEF ICT. Source: Web survey.

Appendix Q SINTEF Materials and Chemistry

Table 20 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	11	0	11
Public clients	0	0	0
Private partners	19	0	19
Public partners	14	0	14
All	44	0	44

Figure 87 Users' assessments of the institute's competences. Source: Web survey.
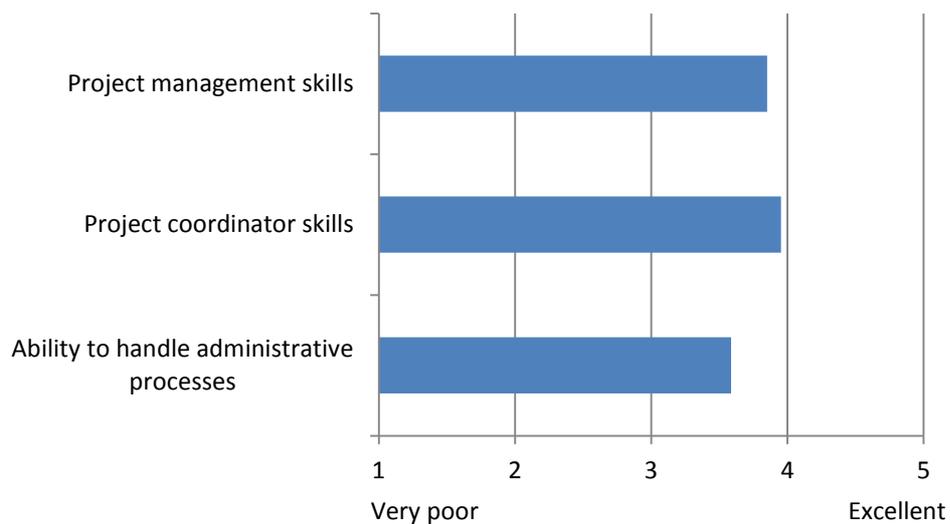
Figure 88 Users' assessments of the institute's management skills. Source: Web survey.
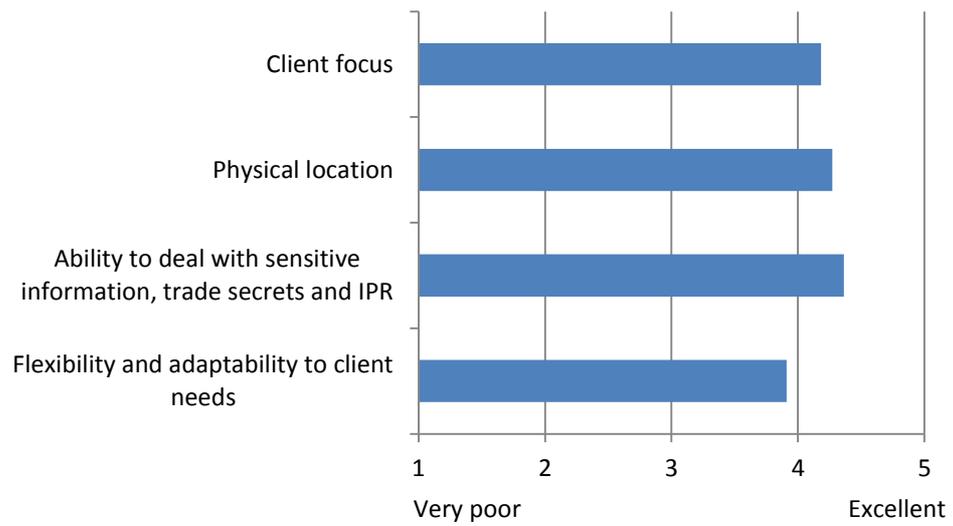
Figure 89 Clients' assessments of the institute. Source: Web survey.
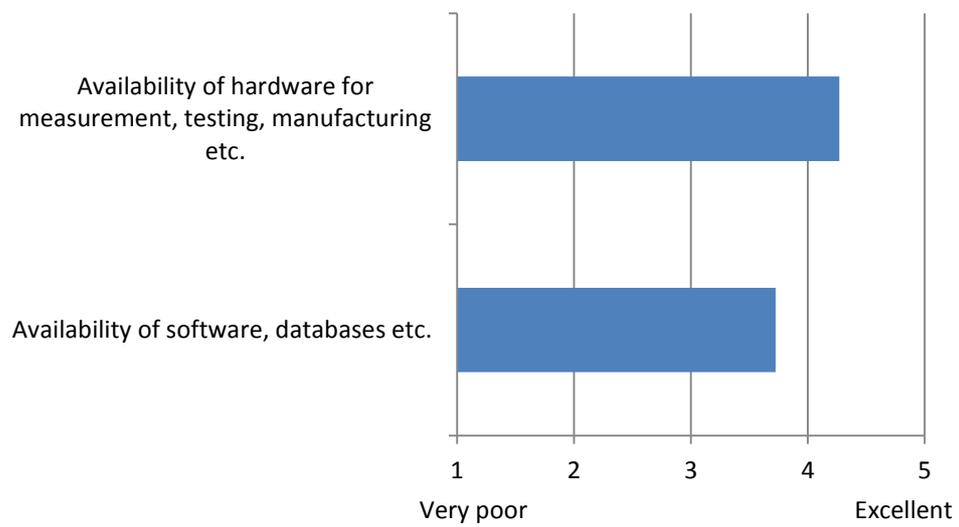
Figure 90 Users' assessments of the institute's infrastructure. Source: Web survey.
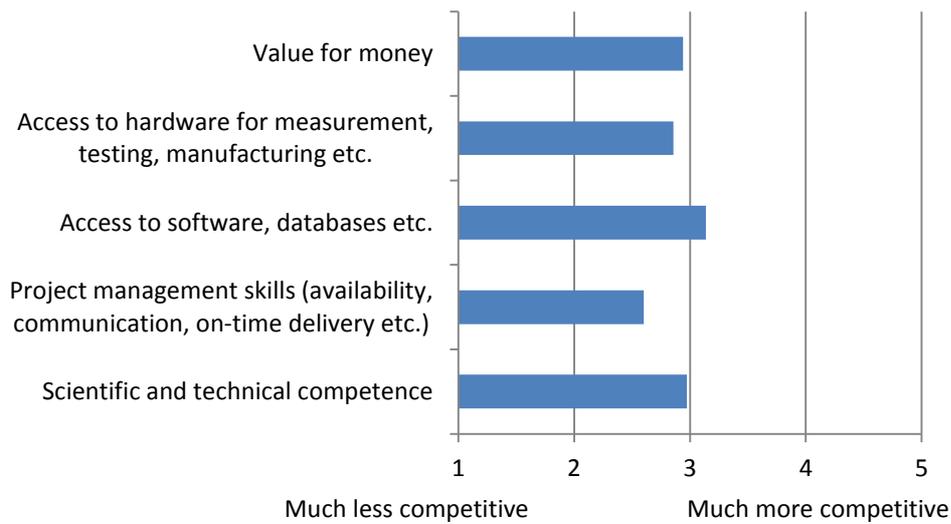
Figure 91 Norwegian universities' competitiveness against SINTEF Mat.&Chem. Source: Web survey.
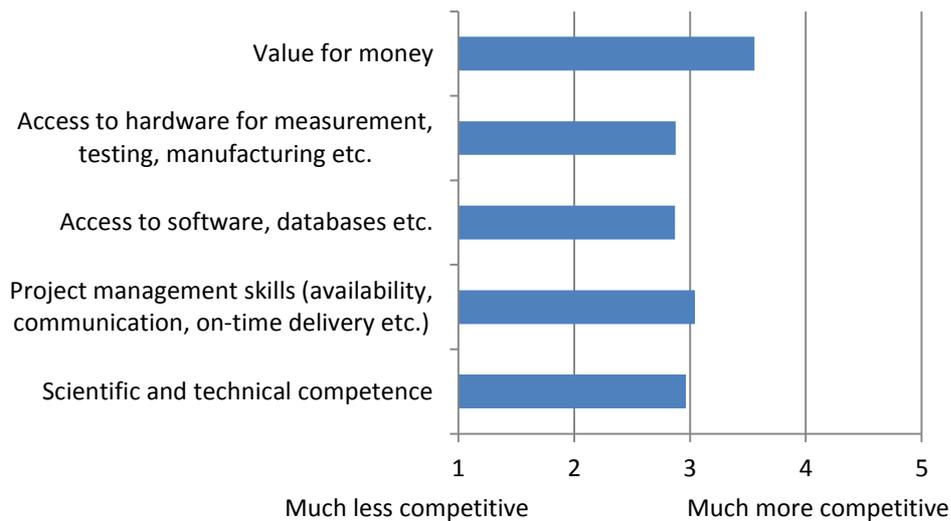
Figure 92 Foreign competitors' competitiveness against SINTEF Mat.&Chem. Source: Web survey.

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Appendix R SINTEF Technology and Society

Table 21 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	2	0	2
Public clients	1	0	1
Private partners	6	0	6
Public partners	7	0	7
All	16	0	16
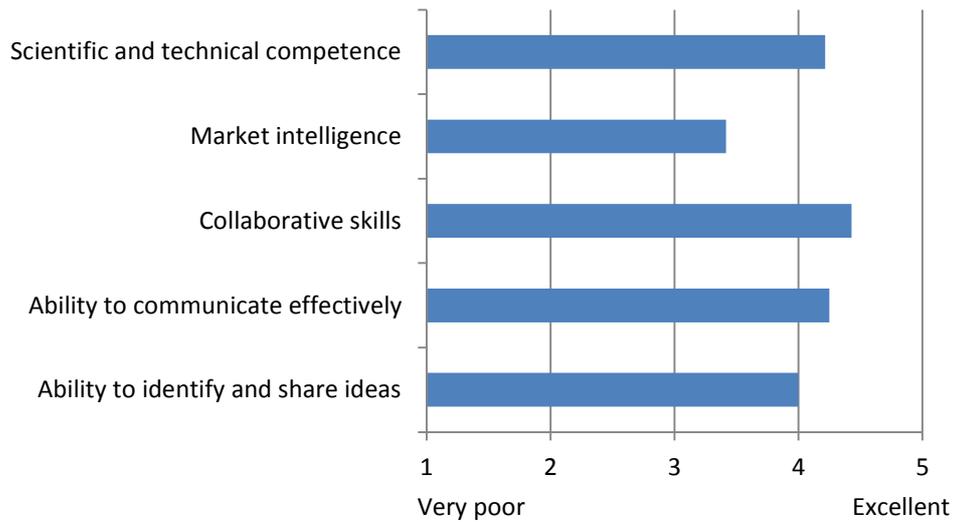
Figure 93 Users' assessments of the institute's competences. Source: Web survey.
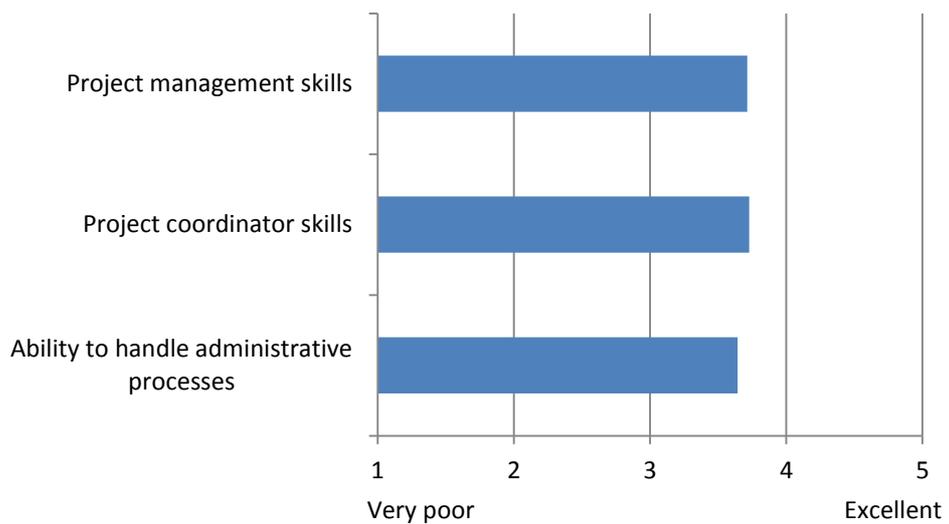
Figure 94 Users' assessments of the institute's management skills. Source: Web survey.
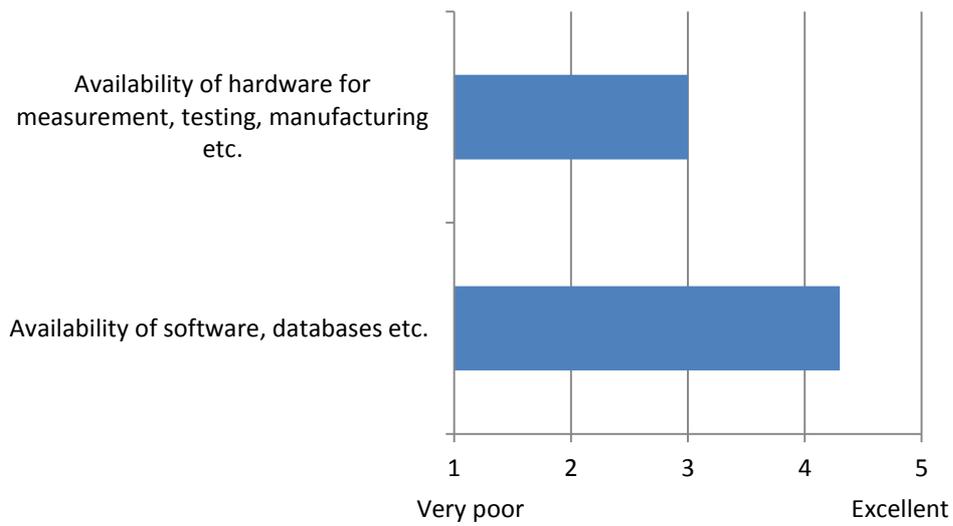
Figure 95 Users' assessments of the institute's infrastructure. Source: Web survey.
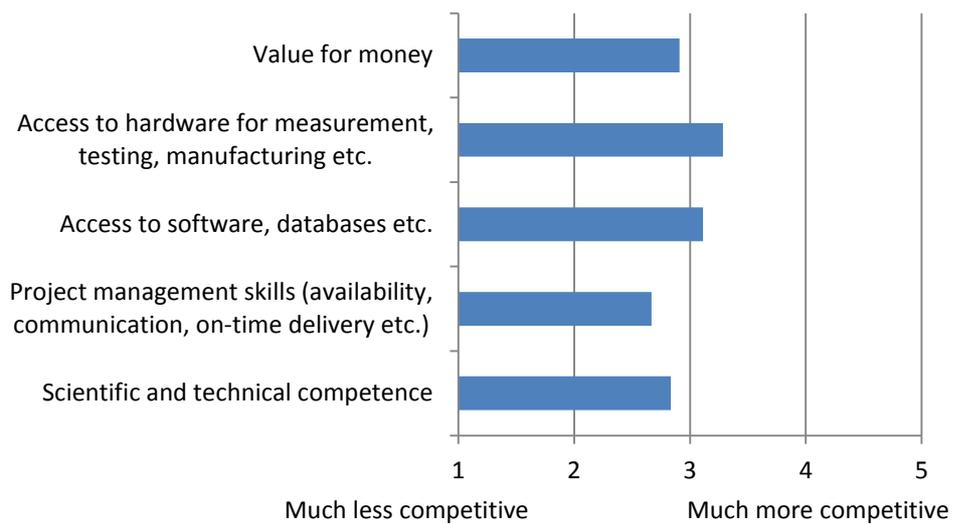
Figure 96 Norwegian universitie's competitiveness against SINTEF Tech.&Soc. Source: Web survey.
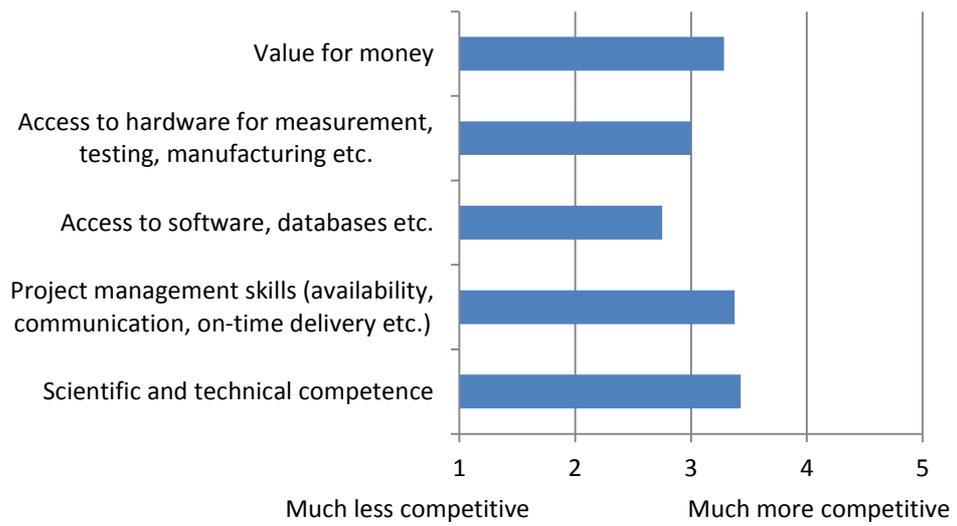
Figure 97 Foreign competitors' competitiveness against SINTEF Tech.&Soc. Source: Web survey.

Appendix S SINTEF Foundation

It is not possible to separate the SINTEF Foundation units from each other based on the in E-Corda. This section therefore presents the result of respondents who are or have been partners of any of the SINTEF Foundation units in FP7 projects.

Table 22 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	0	0	**0**
Public clients	0	0	**0**
Private partners	6	40	**46**
Public partners	6	71	**77**
All	**12**	**111**	**123**
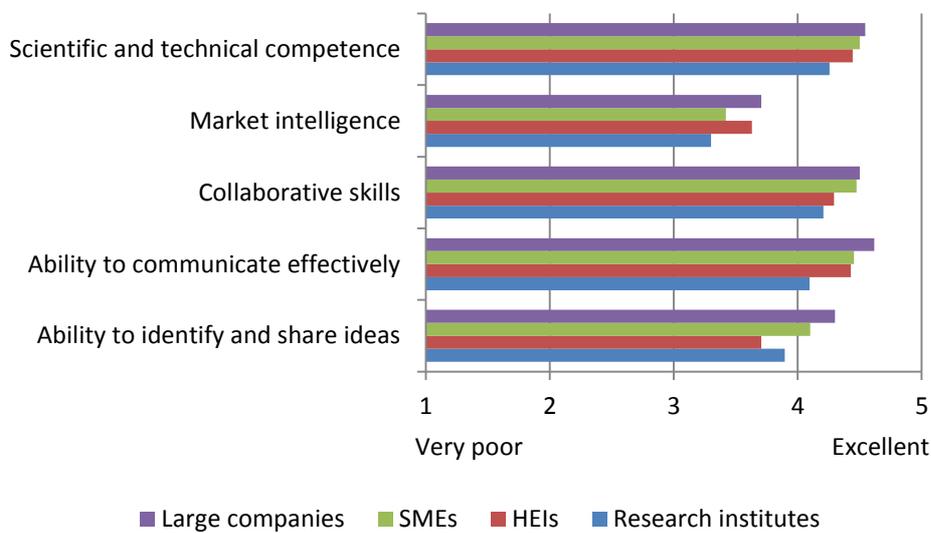
Figure 98 Users' assessments of the institutes' competences. Source: Web survey.

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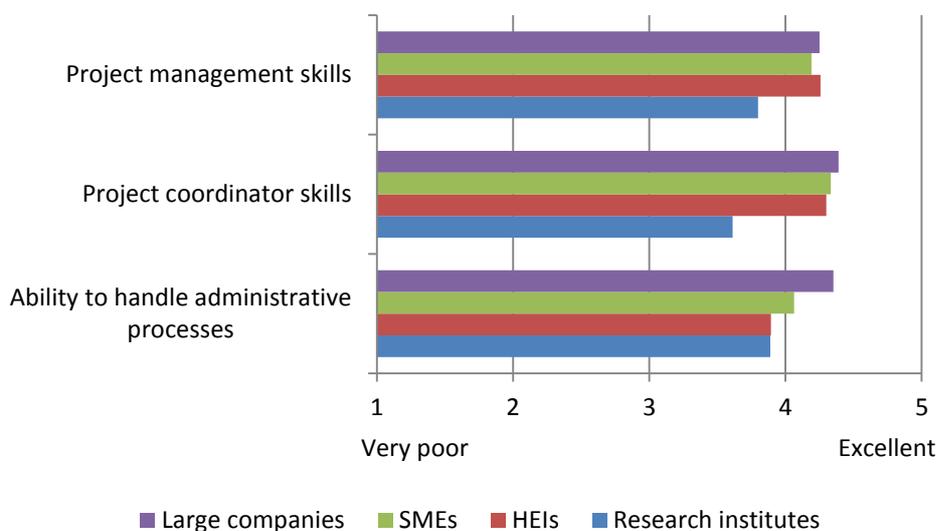
Figure 99 Users' assessments of the institutes' management skills. Source: Web survey.
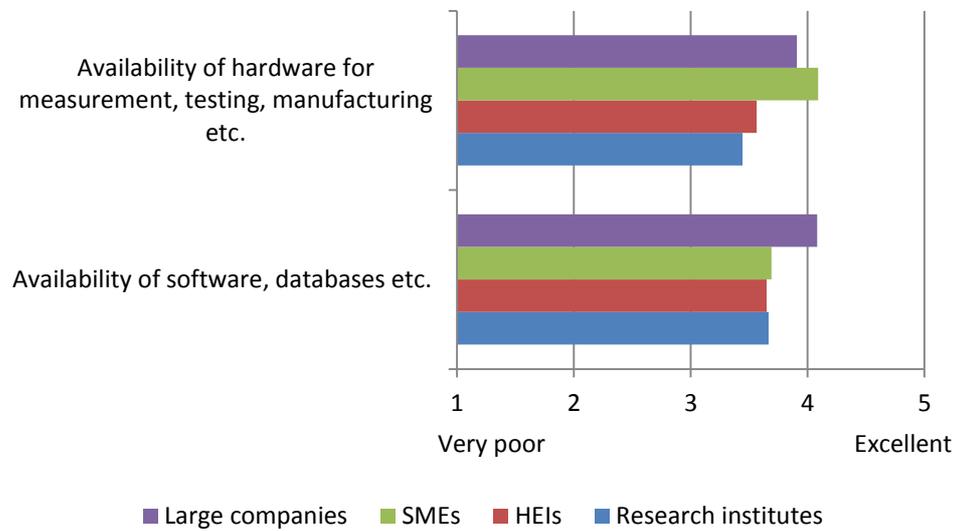
Figure 100 Users' assessments of the institutes' infrastructure. Source: Web survey.
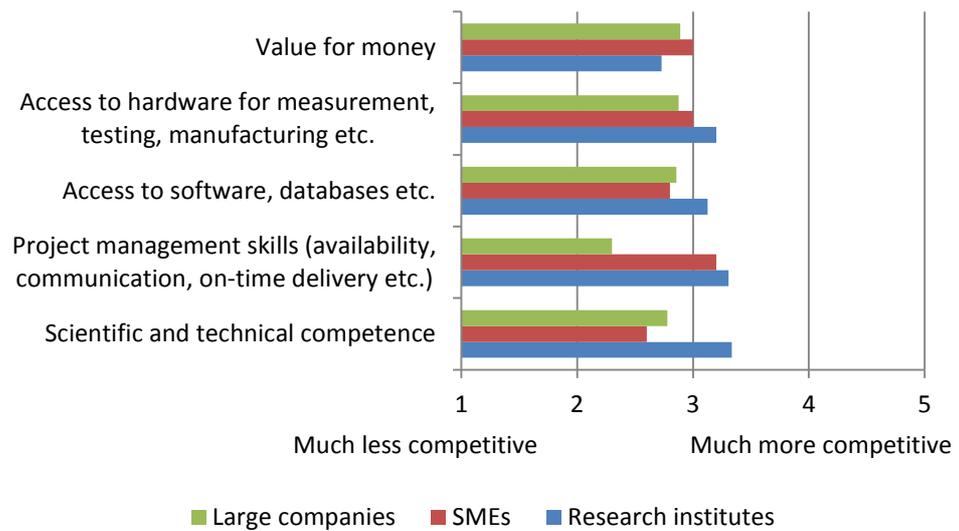
Figure 101 Norwegian universities' competitiveness against SINTEF Foundation. Source: Web survey.

User survey of the technical-industrial research institutes in Norway
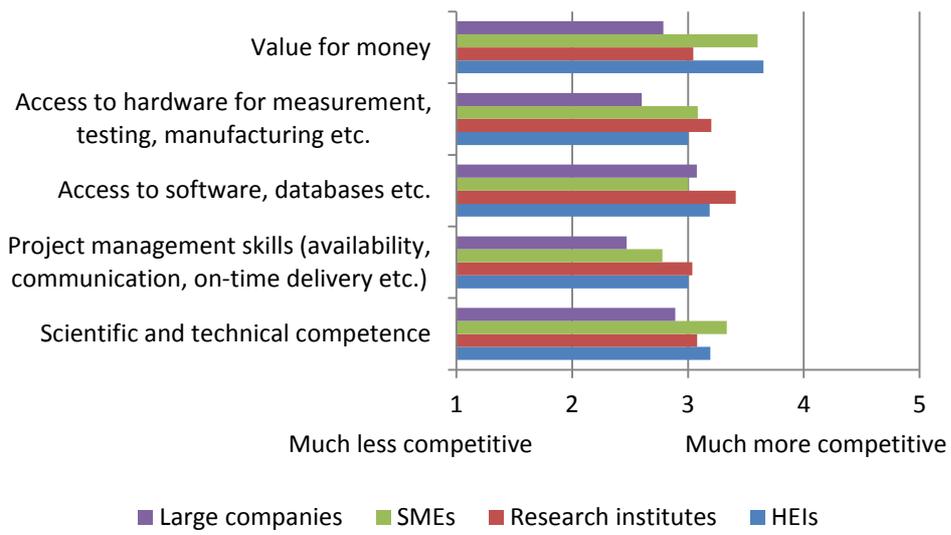
Figure 102 Foreign competitors' competitiveness against SINTEF Foundation. Source: Web survey.

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Appendix T Tel-Tek

Table 23 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	3	0	3
Public clients	1	0	1
Private partners	5	0	5
Public partners	2	1	3
All	11	1	12

Figure 103 Users' assessments of the institute's competences. Source: Web survey.
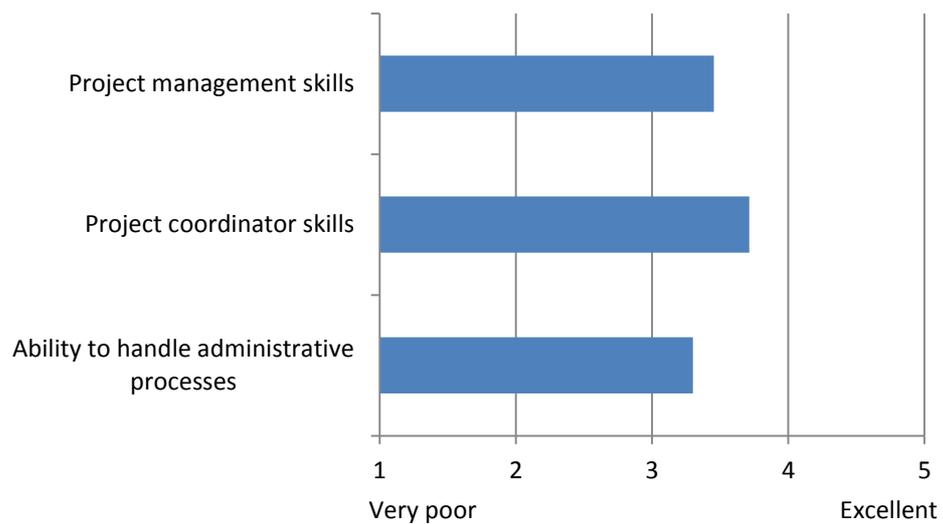
Figure 104 Users' assessments of the institute's management skills. Source: Web survey.

User survey of the technical-industrial research institutes in Norway
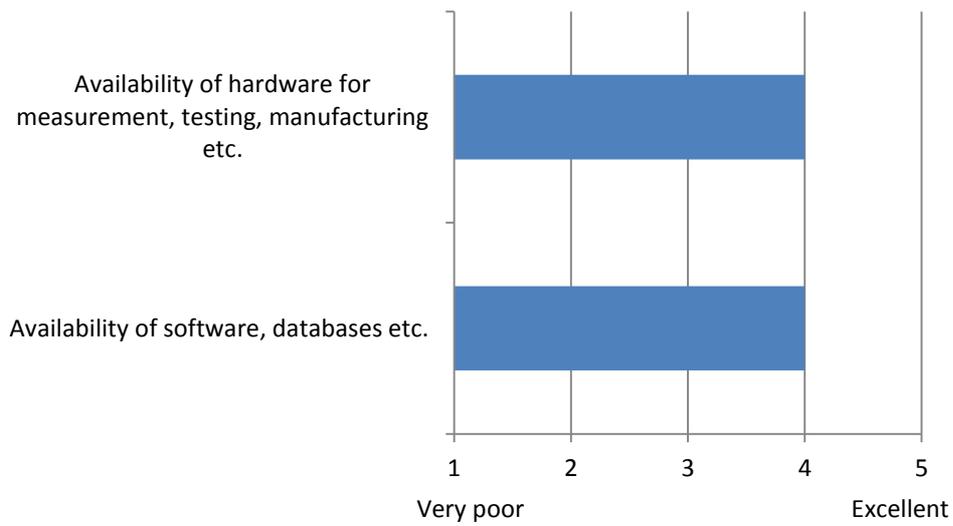
Figure 105 Users' assessments of the institute's infrastructure. Source: Web survey.
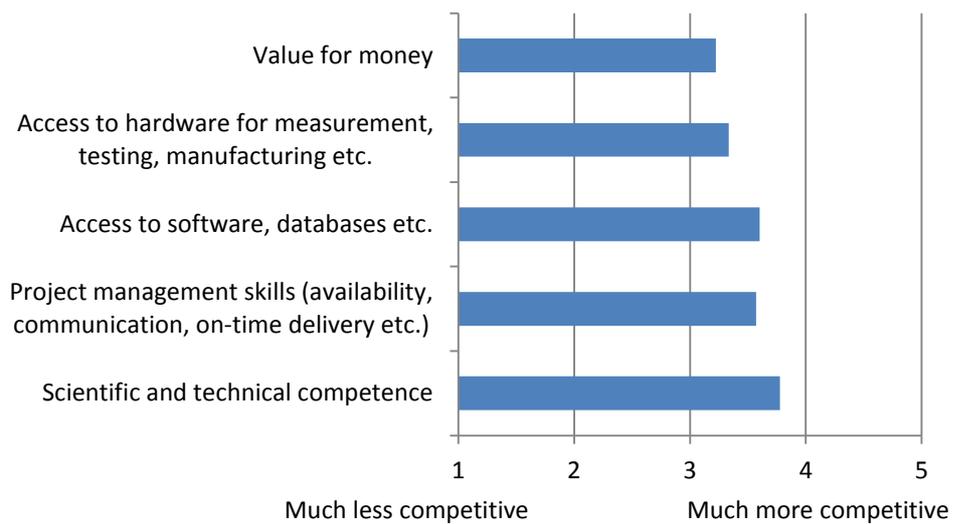
Figure 106 Norwegian universities' competitiveness against Tel-Tek. Source: Web survey.
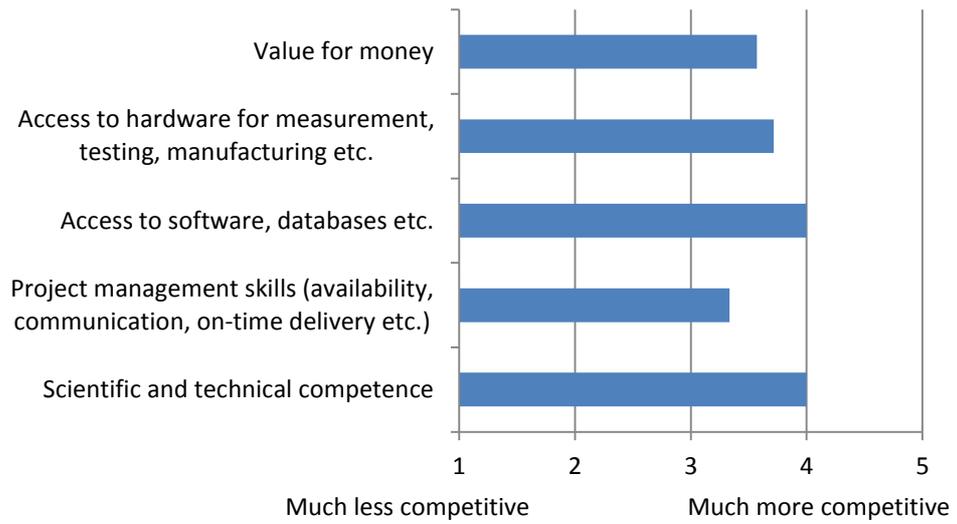
Figure 107 Foreign competitors' competitiveness against Tel-Tek. Source: Web survey.

Appendix U Uni Research AS

Table 24 Distribution of survey respondents on user categories.

User category	Norwegian	Foreign	Total
Private clients	1	0	1
Public clients	0	0	0
Private partners	1	1	2
Public partners	11	3	14
All	13	4	17

Figure 108 Users' assessments of the institute's competences. Source: Web survey.
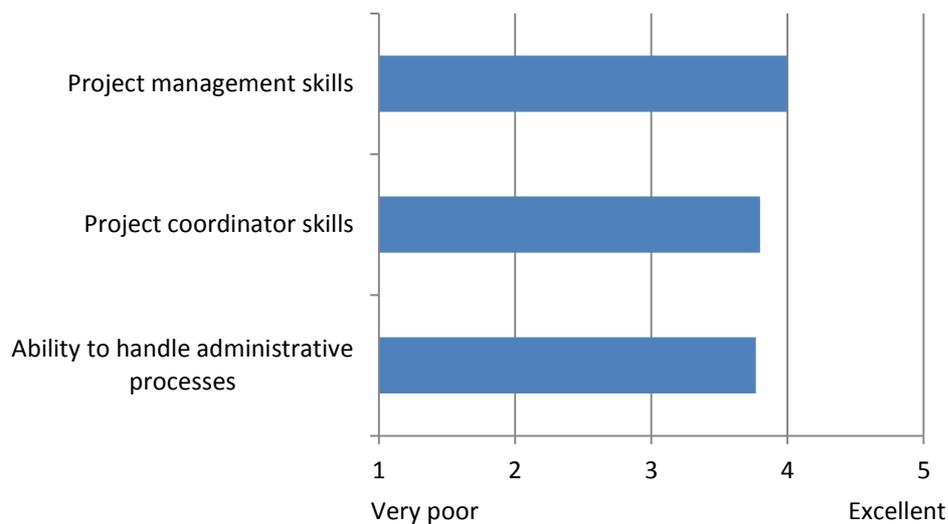
Figure 109 Users' assessments of the institute's management skills. Source: Web survey.

Figure 110 Users' assessments of the institute's infrastructure. Source: Web survey.

Figure 111 Norwegian universities' competitiveness against Uni Research. Source: Web survey.

         User survey of the technical-industrial research institutes in Norway

Figure 112 Foreign competitors' competitiveness against Uni Research. Source: Web survey.