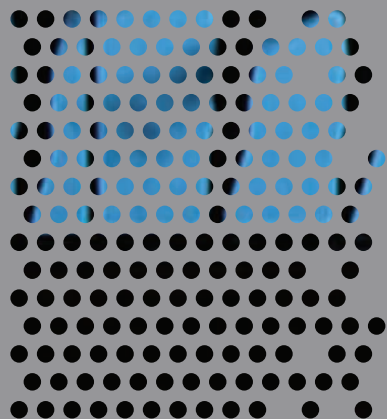


Tekes



Tekes Programme Report 6/2011  
Evaluation Report



# Co-operation to Create Converging and Future Networks – Evaluation of Five Telecommunications Programmes

Annu Kotiranta, Olli Oosi, Mia Toivanen,  
Jaakko Valkonen and Mikko Wennberg



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# Co-operation to Create Converging and Future Networks

## – Evaluation of Five Telecommunications Programmes

Evaluation Report



Tekes Programme Report 6/2011  
Helsinki 2011



## **Tekes, the Finnish Funding Agency for Technology and Innovation**

Tekes is the main public funding organisation for research and development (R&D) in Finland. Tekes funds industrial projects as well as projects in research organisations, and especially promotes innovative, risk-intensive projects. Tekes offers partners from abroad a gateway to the key technology players in Finland.

## **Tekes programmes – Tekes' choices for the greatest impact of R&D funding**

Tekes uses programmes to allocate its financing, networking and expert services to areas that are important for business and society. Programmes are launched in areas of application and technology that are in line with the focus areas in Tekes' strategy. Tekes programmes have been contributing to changes in the Finnish innovation environment for twenty years.

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# Foreword

The Finnish telecommunications sector has changed a lot during the last few years, mainly due to the globalization. The change has meant that the role of manufacturing has diminished and at the same time, the software and mobile services have become more important. The operation environment has also been quite turbulent, and the economic downturns have heavily affected the companies' businesses. In the long run, the telecommunications industry has been growing steadily, and it has been estimated by ITU that half of the world's people will have a broadband access by 2015.

Tekes has had several programmes in the telecommunications sector to foster the capabilities and innovation activities. The sector has been very R&D intensive, and thus the two innovation programmes, NETS and GIGA were among the largest of all Tekes programmes. There were also small-scale research programmes to enhance Nordic co-operation in the sector.

When GIGA and NORDITE programmes were reaching the end and the new SHOK-based programmes began, Tekes started the planning of the evaluation project. The evaluation concentrated on the programmes implemented in the 2000's. The programmes' objectives, results and impacts were evaluated. The evaluation targeted at producing recommendations for Tekes and the innovation policy, strengthening funding co-operation and developing the R&D&I activities of the telecommunications sector.

Tekes likes to thank the evaluation team from Ramboll Management Consulting for its innovative and versatile approach. Tekes also expresses its gratitude to the steering group, workshop participants, survey respondents and all those experts who were interviewed or otherwise participated in the evaluation project. The evaluation and this report are meant to contribute to the future R&D&I activities during the forthcoming challenges.

June 2011

Tekes

The Finnish Funding Agency for Technology and Innovation



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# Abstract

This evaluation report reviews five Tekes programmes conducted between 1997 and 2010. Whereas GIGA and NETS were conducted as national programmes, NORDITE, EXSITE and INWITE were realised in cooperation with Swedish VINNOVA and the Norwegian research council.

The main aims of this evaluation are: to produce recommendations for the innovation policy; to support the future development of Tekes programmes; to strengthen funding cooperation; and to develop the research, development and innovation activities of the industry. The rather long time period has also involved two economic downturns, or even recessions, and both global and national operation environments of the programmes have gone through significant changes, which are discussed in this evaluation.

The evaluation was carried out during 2010 and 2011 by Ramboll Management Consulting (RMC). The RMC evaluation team was supported by the evaluation steering group appointed by Tekes throughout the evaluation work. The composition of the steering group is attached.

Some main conclusions concerning the national and Nordic programmes, as well as Tekes, are presented below.

## Giga and Nets

- The programme management has been functional and well-suited for its purpose.
- The programme services were considered important and useful.

## Nordite, Exsite and Inwite

- Nordic cooperation was seen as well-functioning, reasonably successful, and effortless.
- The objectives of the programmes were not focused enough to provide a well-functioning framework for successful networking.

## Tekes

- The programmes' funding criteria have enabled and created real value chains by integrating research organizations, SMEs and larger companies to joint projects.
- The role and continuity of the Tekes programmes and the role of SHOK's cause uncertainty among the actors of the telecommunications industry.
- The roles of basic and applied research in Tekes programmes need to be clarified with respect to the requirements for national competitiveness, research, and market-end product development.

## 1 Arvioinnin tavoitteet ja toteutus

### 1.1 Tausta

Tämän arviointityön tehtävänä oli arvioida Tekesin viittä tietoliikenneohjelmaa vuosilta 1997–2010. Ohjelmat jakautuivat kahteen kotimaiseen ohjelmaan (GIGA ja NETS) sekä kolmeen yhteispohjoismaiseen ohjelmaan (NORDITE, EXSITE ja INWITE), jotka Tekes toteutti yhteistyössä ruotsalaisen VINNOVAN ja norjalaisen Norwegian research councilin kanssa.

Arviointityön toteutti Tekesin toimeksiannosta Ramboll Management Consulting Oy 2010–2011 välisenä aikana. Koko arviointityön toteutuksen aikana arviointitiimin tukena toimi Tekesin nimeämä arvioinnin johtoryhmä.

### 1.2 Tavoitteet

Arviointityön keskeisimmät tavoitteet olivat:

1. Tuottaa kehitysehdotuksia innovaatiotyön ja tulevien Tekes ohjelmien suunnitteluun

2. Vahvistaa organisaatioiden rahoitusyhteistyötä
3. Kehittää toimialan tutkimus-, kehitys- ja innovaatiotoimintoja
4. Arvioida viiden tietoliikenneohjelman vaikuttavuutta

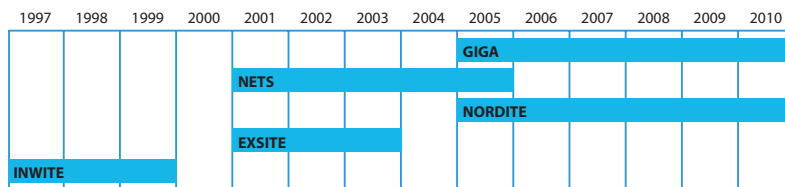
Arviointityön pääpaino keskittyi kotimaisiin GIGA- ja NETS-ohjelmiin. Kotimaisten ohjelmien painoarvo oli koko arviointityöstä noin 70 prosenttia, kolmen yhteispohjoismaisen ohjelman painoarvon ollessa noin 30 prosenttia.

Yhteispohjoismaisten ohjelmien arvioinnin haasteeksi osoittautui dokumentaation puute. Toisin kuin GIGA- ja NETS-ohjelmat, jotka olivat verrattain hyvin dokumentoituja ja varsin tuoreessa muistissa niihin osallistuneilla, ei kolmesta pohjoismaisesta ohjelmasta ollut yhtä kattavasti tietoa saatavilla. Tämän lisäksi ohjelmien projektiorganisaatioiden henkilöstön ja ohjelman muiden keskeisten yhteyshenkilöiden tavoittamisessa oli suuria haasteita, sillä useat tahot eivät enää työskennelleet samoissa organisaatioissa.

### 1.3 Arviointikysymykset

Arviointityö rakentui seitsemän keskeisimmän arviointikysymyksen ympärille:

1. Mitkä ovat olleet keskeisimmät muutokset toimintaympäristössä viimeisen 10 vuoden aikana?
2. Ovatko ohjelmien tavoitteet olleet keskeisiä ja haastavia?
3. Kuinka asetetut tavoitteet ovat saavutettu?
4. Kuinka hyvin organisaatiot tavoittivat keskeisimmät asiakkaansa? Kuinka kansainvälinen yhteistyö on vaikuttanut ohjelman osallistujiin ja heidän asiakkaisiinsa?
5. Kuinka hyvin ohjelmat ja niiden tukitoiminnot ovat vastanneet osallistujien tarpeita? Mitä lisäarvoa näistä on syntynyt?
6. Kuinka rahoittajien välinen yhteistyö on vaikuttanut ohjelmien tuottavuuteen ja vaikuttavuuteen? Onko yhteistyö edistänyt tulosten käyttöönottoa tai luonut uusia yhteistyökontakteja EU-ohjelmiin?
7. Minkälaisia vaikutuksia ohjelmilla on ollut ja/tai on odotettavissa? Kuinka merkittäviä nämä vaikutukset ovat olleet? Kuinka ne ovat vaikuttaneet:
  - T&K&I toimintaan toimialalla
  - Tietotaitokeskittymien syntymiseen
  - Osaajien liikkumiseen eri toimijoiden välillä



- Kansainvälisten verkostojen syntymiseen
- Toimintatapojen muutokseen
- Merkittävien innovaatioiden syntymiseen
- Organisaatioiden tuottavuuteen
- Liiketaloudellisten mahdollisuuksien syntymiseen esim. standardointimuutosten kautta
- Vaikutukset tietoliikenne sektoriin yleisesti.

#### 1.4 Menetelmät

Arviointityön toteutuksessa käytettiin laajasti erilaisia menetelmiä sillä arvioidut viisi tietoliikenneohjelmaa olivat luonteeltaan hyvin erilaisia. GIGA ja NETS olivat strategiaohjelmia, joiden tarkoitus oli erityisesti kehittää innovaatiotyötä tukemalla liiketoimintamahdollisuuksia. Yhteispohjoismaisten ohjelmien painopiste oli tutkimuksessa. Tästä johtuen arviointityössä on käytetty toisiaan täydentäviä ja tukevia arviointimenetelmiä.

Toimintaympäristön muutosta analysoitiin PESTE-analyysin avulla. Analyysin keskeisinä tiedonlähteinä käytettiin eri tutkimus- ja selvitystöitä. Kirjallisten lähteiden tietoja täydennettiin arvioinnin myöhemmässä vaiheessa toteutetuilla tapaustutkimus- ja asiantuntijahaastatteluilla.

Ohjelmien tavoitteita ja vaikutuksia arvioitiin määrittelemällä joukko indikaattoreita odotettujen tulosten sekä vaikutusten perusteella. Keskeisimpänä tiedonkeruumenetelmänä käytettiin rahoitusorganisaatioiden ja muiden asiantuntijoiden haastatteluja. Haastatteluja tehtiin Suomen ohella myös Norjassa ja Ruotsissa. Asiantuntijahaastatteluiden lisäksi arviointityössä toteutettiin 22 tapaustutkimushaastattelua. Haastattavien joukossa oli kaikkien viiden tie-

toliiikenneohjelman osallistujia niin yrityksistä kuin tutkimuslaitoksistakin. Tapaustutkimuskohteet valittiin siten, että ne antavat kattavan kuva kaikista ohjelmista. Ohjelmien projektiorganisaatioiden lisäksi haastateltiin tahoja jotka eivät ole saaneet ohjelmista rahoitusta, mutta ovat muuten osallistuneet ohjelmatoimintoihin kuten seminaareihin, työpajoihin tai projektien johtoryhmätyöskentelyyn. Tämän toimenpiteen tarkoituksena oli saada näkemyksiä ohjelmatoiminnasta erilaisista näkökulmista.

Osana arviointityötä toteutettiin myös sähköinen kysely joka lähetettiin viiden tietoliikenneohjelman osallistujille. Kysely toteutettiin kolmessa eri osassa. GIGA- ja NETS-ohjelmien osallistujille oli oma, kotimaisille NORDITE-, EXSITE- ja/tai INWITE-ohjelmiin osallistuneille oli oma kyselynsä. Ruotsalaisille ja norjalaisille osallistujille toteutettiin myös oma kysely. Sähköinen kysely toteutettiin tammikuussa 2010. Kyselyyn saatiin 58 vastausta, osa näistä vastaajista oli osallistunut useampaan eri ohjelmaan. GIGA- ja NETS-ohjelmien kyselyn vastausprosentti oli 17 kuin NORDITE-, EXSITE- ja INWITE-ohjelmien kyselyn vastausprosentti oli 31.

Tietoliikenneohjelmien vaikutuksia osallistuneisiin pk-yrityksiin tarkasteltiin tilinpäätösanalyysin avulla. Tilastoanalyysillä täydennettiin tapaustutkimuksista saatua tietoa. Analyysissä verrattiin ohjelmiin osallistuneiden yritysten keskeisiä tunnuslukuja talouden yleiseen kehitystrendiin.

Arviointityön loppuvaiheessa järjestettiin työpaja, jossa arviointituloksista keskusteltiin laajemman osanottajakunnan kanssa. Osallistujat edustivat ohjelman projekteja, niin yksityisiä yrityksiä kuin tutkimuslaitoksiakin. Mukana oli edustus myös GIGA-ohjelman koor-

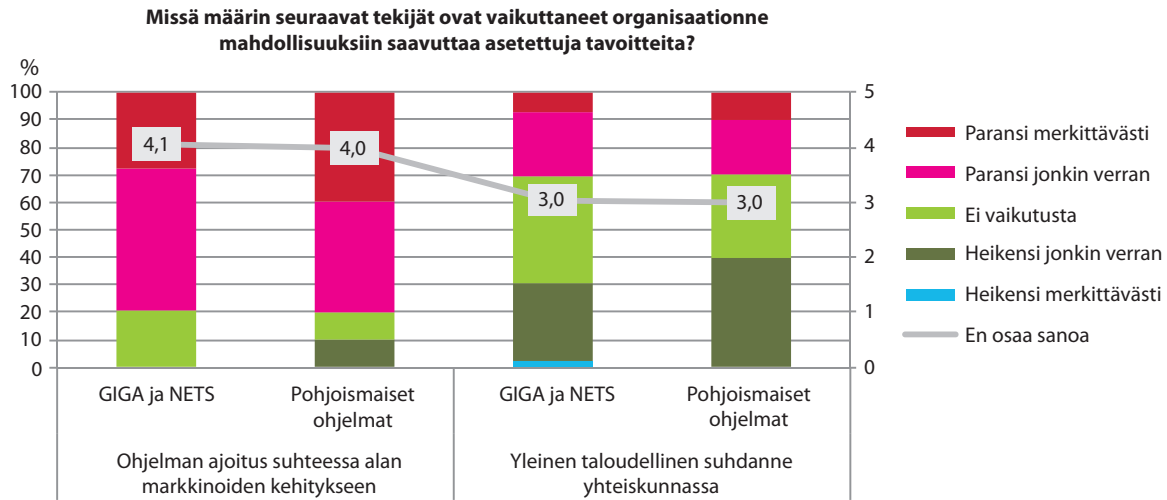
dinaatioryhmästä ja Tekesistä. Työpajan tarkoituksena oli testata arviointityön tuloksia ja antaa eri tahoille mahdollisuus argumentoida tehtyä arviointityötä.

## 2 Tietoliikennetoimialan kehitys

Arvioinnin ajanjaksolle on sijoittunut useita nopeita toimintaympäristön muutoksia. Vuosien 1997–2010 aikana on tapahtunut kaksi taloudellista taantumaa, joilla on ollut suuria vaikutuksia teletoimialaan. Ensimmäisen ns. dot.com -kuplan puhkeamisen aiheuttama kriisiä syvensi USA:n vuoden 2000 9/11-tapahtuman taloudelliset seuraukset. Toinen lähes koko maailman talouteen vahvasti vaikuttanut taantuma ajoittui vuoteen 2008. Taantumat ovat vaikuttaneet erityisesti pk-yrityksiin. Jälkimmäisen taantumaa vakaavien vaikutusten kerrottiin olleen nähtävissä muutamassa viikossa ja tämän seurauksena usea ICT-alan yritys joutui konkurssiin. Taantumat ovat vaikuttaneet erityisesti kahteen kansalliseen ohjelmaan, koska valtaosa hankkeista oli yritysten vetämiä. Ja totta kai vaikutukset ovat heijastuneet myös tutkimuslaitoksiin. Haastatteluissa todettiin, että erityisesti pienet yritykset vetäytyivät kaikista ohjelmatoimenpiteistä liiketoiminnan epävakauden ja kaikkien ylimääräisten kulujen vähentämisen takia. Pohjoismaisissa ohjelmissa taantumaa arveltiin vaikuttaneen siihen, että osa ohjelmien johtoryhmien yritysedustajista ei aktiivisesti osallistunut johtoryhmätyöskentelyyn matkakustannusten takia.

Arviointiin ohjelmiin osallistujilta kysyttiin toimintaympäristötekijöiden merkitystä organisaation kykyyn saavuttaa hankkeelle asetetut tavoitteet. Noin

Kuva 1. Ohjelmien ajoittuminen suhteessa markkinoiden kehittymiseen sekä taloudellisten suhdanteiden vaikutus ohjelmiin.



70 % vastaajista näki ohjelman ajoittuneen juuri sopivaan hetkeen markkinoiden kehittymisen kannalta.

Toinen keskeinen muutos ohjelmien toimintaympäristössä on viime vuosina ollut painopisteen muutos teknologian kehittämisestä palveluiden tuotantoon. Tällä hetkellä palvelutuotanto ja teknologia kytkeytyvät tiiviisti toisiinsa eikä niitä enää tyypillisesti käsitellä erillisinä kuten vielä muutama vuosi sitten. Tämä on luonnollisesti vaikuttanut myös liiketoimintaan. Lisääntyvät palvelut haastavat tiedonsiirron kapasiteetin eikä kehitykselle ja tarpeille ole vielä osoitettavissa kattoa. On selvästi nähtävissä, etteivät kaikki alan toimijat ole tunnistanee tiedonsiirron tarpeiden lähes räjähdyksmäistä kasvua tuotekehityksessään.

Kansainvälisyys on toki ollut osa alan yritysten ja tutkimusorganisaatioiden toimintaa koko arviointiajanjakson ajan, mutta sen nähtiin yhä korostuneen viime vuosina. Tämä on näkynyt erityisesti pk-yritysten toimintaan liittyvissä haasteissa suurten yri-

tysten ja tutkimuslaitosten ollessa lähes automaattisesti kansainvälisiä toimis- saan. Hyvin ajankohtainen tähän liittyvä toimialaan jo vaikuttanut ja lähitu- levaisuudessa vaikuttavuudeltaan kas- vava muutos on Nokian keväinen pää- tös käynnistää laajamittainen yhteistyö Microsoftin kanssa. Tämä markkinoita hämmäntänyt uutinen julkistettiin siinä vaiheessa kun arvioinnin kaikki toimen- piteet oli jo tehty eli tehdyssä kyselyssä ja haastatteluissa aihetta ei ehditty käsi- tellä. Aineistoa kuitenkin täydennettiin kahdella asiantuntijahaastattelulla No- kian ratkaisun vaikutusten kartoittami- seksi. Vaikka Nokian liiketoiminnan uu- distus ei täysin suoraan kohdistukaan telekommunikaatioalan yritysten ja Te- kesin alaa käsittelevien ohjelmien toi- mintaan, on muutoksella hyvin toden- näköisesti vähintäänkin epäsuoraa vai- kutusta arvioinnin kohteena olevien yri- tysten ja tutkimuslaitosten toimintaan.

Nokian rooli kansallisessa telekom- munikaatioalan kehityksessä puhuti haastateltavia muutoinkin. Yksi kool- taan ja vaikutusvallaltaan täysin omas-

sa luokassaan oleva toimija on ollut korvaamaton kehityksen moottori. Toi- saalta tämän nähtiin myös olevan mer- kittävä riski, koska Suomen kokoisessa maassa lähes kaikki alan yritykset ja tut- kimuslaitokset kytkeytyvät tähän jollain tavoin. Tämä voi heijastua esim. jonkin erityisasiantuntemuksen kehittymiseen, koska ulkoistaessaan tai siirtäessään joi- tain kehitystoimintoja pois Suomesta saattaa myös jonkin tietyn erityisosa- amisen kehittyminen heiketä.

Kansallisessa kehityksessä näke- myksiä on jakanut myös SHOK:ien, eri- tyisesti TIVITin rooli ja toiminta. Monet haastatellut yritysten ja tutkimuslaitos- ten edustajat pitivät TIVITin perustamis- ta uhkana Tekesin tuloksekkaalle ja toi- mivalle ohjelmatoiminnalle. Erityisesti tutkimuslaitokset olivat huolissaan oh- jelmatoiminnan muutoksista ja pelkäsi- vät valitun kehityssuunnan riskeeraavan alan kansallisen tutkimus- ja innovaatio- toiminnan kehityksen. Toisaalta useat näkivät TIVITin tuovan tarvittua muu- tosta melko pitkään, sekä onnistunee- seen, ohjelmajatkumoon.

### 3 Yhteenveto tuloksista ja kehittämissuosituksista

#### 3.1 Tekesiä koskevat tulokset ja suositukset

##### Ohjelmien hallinnointi ja palvelut

Ohjelmien hallinnointi koettiin kaikissa viidessä ohjelmassa hyvin toimivaksi ja tarkoituksenmukaiseksi. Hallinnointimallin koettiin olleen yksinkertainen kaikissa ohjelmissa ja sen katsottiin edistäneen keskustelua ja eteenpäin vievää toimintakulttuuria ohjelman osallistujien ja Tekesin välillä. Annettu kritiikki kohdistui lähinnä ohjelmien tavoitteiden ja roolin epäselvyyteen. Ohjelmien johtoryhmien koettiin olevan aktiivisia kaikissa viidessä ohjelmassa. Kansallisten ohjelmien välillä eroavaisuuksia syntyi lähinnä siinä, että NETS-ohjelmassa johtoryhmällä oli suurempi rooli strategisissa päätöksissä kuin GIGAssa, jonka johtoryhmän edustajat olivat hieman turhautuneita vähäiseen rooliinsa.

Johtoryhmän työskentelyä hankaloitti myös pelko rahoittajien ja projektitoimijoiden roolien sekoittumisesta.

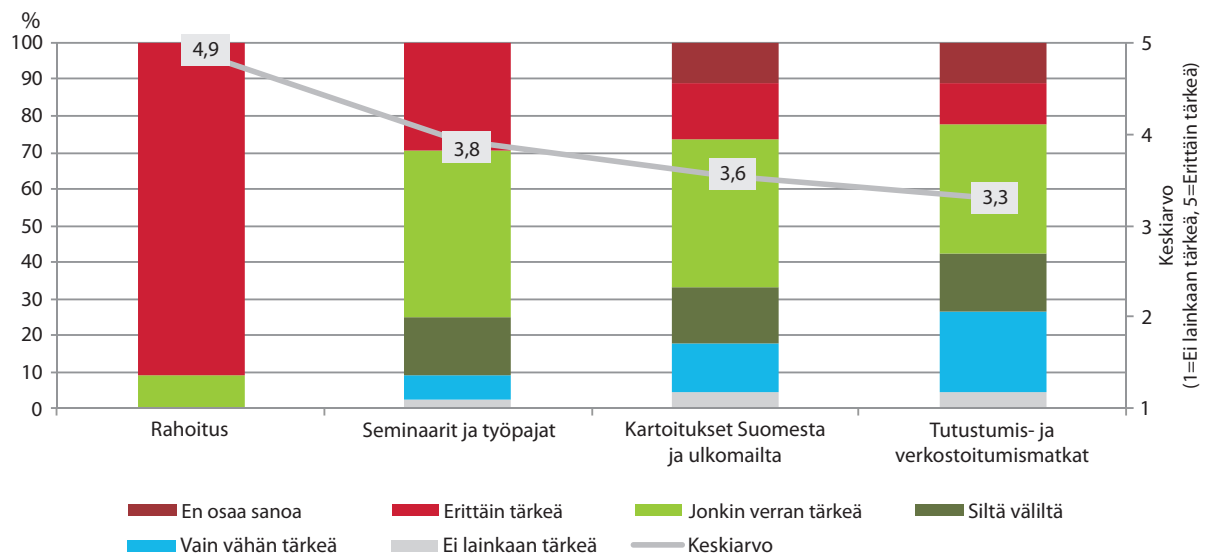
Osallistuneet organisaatiot arvioivat ohjelmapalveluiden olevan varsin hyödyllisiä ja toimivia. Näkemykset ohjelmapalveluista vaihtelivat huomattavasti eri ryhmien – pienet yritykset, suuret yritykset ja tutkimuslaitokset – välillä. Esimerkiksi järjestettyjen seminaarien hyödyllisyyttä arvioitaessa yritykset pitivät niitä usein liian teoreettisina kun taas tutkimuslaitokset kommentoivat niiden oleen heidän tarpeisiinsa sisällöltään liian pinnallisia. Eri kohderyhmien tarpeisiin vastaaminen onkin haastavaa, sillä yritysten tavoitteena on usein kehittää uusia tuotteita markkinoille mahdollisimman nopeasti kun taas tutkimuslaitokset näkevät ohjelman kuuluvan hankkeen olevan osa jatkuvaa tutkimustoimintaansa. Useat ohjelmapalvelut olivatkin erityisen hyödyllisiä juuri pk-yrityksille, koska nämä pystyivät parhaiten kasvattamaan kansallista ja kansainvä-

listä verkostoaan. Suuret yritykset ja tutkimuslaitokset tuntevat toisensa useimmiten jo useiden vuosien ja eri hankkeiden myötä. Keskenään hyvin erilaisiin näkemyksiin ohjelmapalveluiden sisällöstä vaikutti myös se, että arvioitujen ohjelmien sisällöt olivat laajoja.

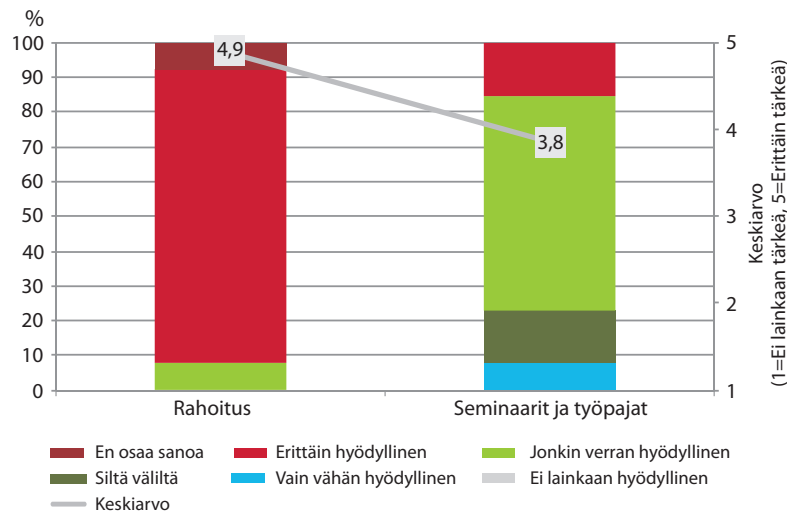
Huolimatta siitä, että joitain uusia ohjelmapalveluita esiteltiin mm. GIGA-ohjelmassa, oli palvelutarjonta varsin tyyppillistä Tekesin ohjelmapalvelutarjontaa. Tekesin tarjoamat kansainväliset palvelut olivat varsin huonosti tunnettuja ohjelmaan osallistuneiden organisaatioiden keskuudessa, joskin kansainvälisille verkostoitumismatkoille osallistuneet henkilöt pitivät näitä erittäin onnistuneina. Tapaustutkimusten tuloksena olikin toimijoiden toive kansainvälisten toimintojen vahvistamisesta kansallisten toimijoiden kansainvälistymisen tueksi.

Pohjoismaisissa ohjelmissa eräät operatiiviset hankaluudet, kuten projektien erilaiset tavoitteet, hidastivat ohjel-

Kuva 2. GIGA- ja NETS-ohjelmien ohjelmapalveluiden hyödyllisyys.



Kuva 3. NORDITE-, EXCITE- ja INWITE-ohjelmien ohjalmopalveluiden hyödyllisyys.



mien toteuttamista. Pohjoismaisen yhteistyön nähtiin toimivan verrattain hyvin vaikkakaan se ei ollut kovin syvällistä. Syvemmälle yhteistyölle koettiin kuitenkin olleen tarvetta ja kysyntää.

### Kehittämissuosituksia

1. *Yhteispohjoismaisissa ohjelmissa tavoitteiden tulisi olla kunnianhimoisempia.*

Mukana olleet maat ovat sekä sosioekonomiselta taustaltaan että tietoliikennealan kehitystasoltaan hyvin samanlaisia. Tätä tulisi pyrkiä hyödyntämään laajemmin ohjelmatöinnässä.

2. *Johtoryhmän roolia tulee harkita tarkasti.*

Tällä hetkellä rooli on ollut enemmän tarkkaileva kuin strategisesti ohjaava. Eri toimijoiden roolien sekoittumisen riski on otettava vakavasti vahvistettaessa johtoryhmän roolia ja varmistuttava siitä, että kehitystyötä viedään laajasti kansantalouden näkökulmasta parhaaseen suuntaan.

### Ohjelmien tulokset ja vaikuttavuus

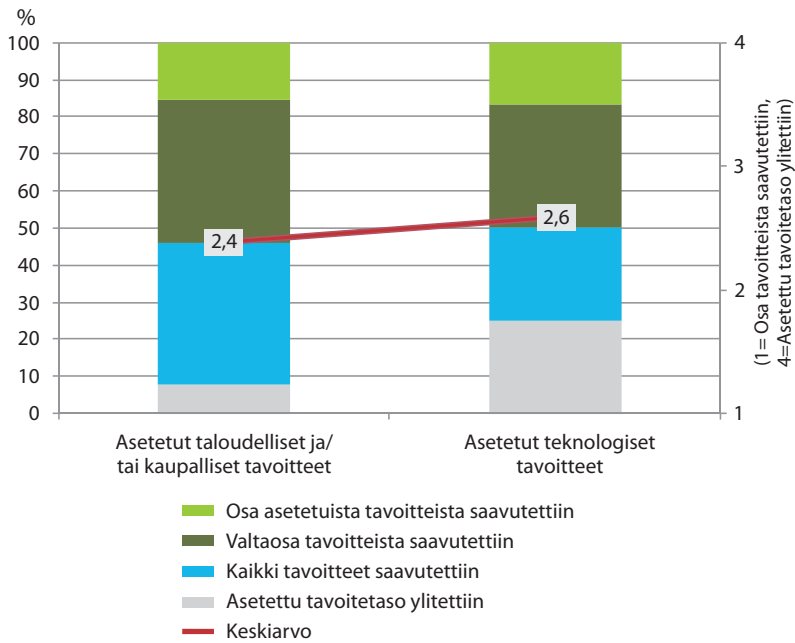
Viimeisen kymmenen vuoden aikana tietoliikenneohjelmien tavoitteiden fokus on muuttunut. NETSin tavoitteet olivat varsin laajat, joten sopivien projektien löytäminen oli melko helppoa. GIGA-ohjelman tavoitteet olivat puolestaan jo hieman fokuoituneempia, joskin kotimaisten markkinoiden pienuus hankaloitti sopivien projektikandidaattien löytymistä. Vuonna 2011 käynnistetty Trial-ohjelma puolestaan on rajannut sisältöään edeltäjänsäkin enemmän.

Ohjelmissa saavutetut tulokset ovat osittain useiden Tekesin tietoliikenneohjelmien jatkumon seurausta, eivätkä toimijat usein osanneetkaan erotella sitä mihin ohjelmaan heidän hankkeensa on kuulunut. Tätä toki hankaloittaa se, että monilla yrityksillä ja tutkimuslaitoksilla on ollut useita peräkkäisiä ja samanaikaisia hankkeita. Kahteen kotimaiseen ohjelmaan yritettiin myös houkuttaa mukaan erityisesti pk-yrityksiä, mutta tässä ei onnistuttu niin hyvin kuin oli toivottu.

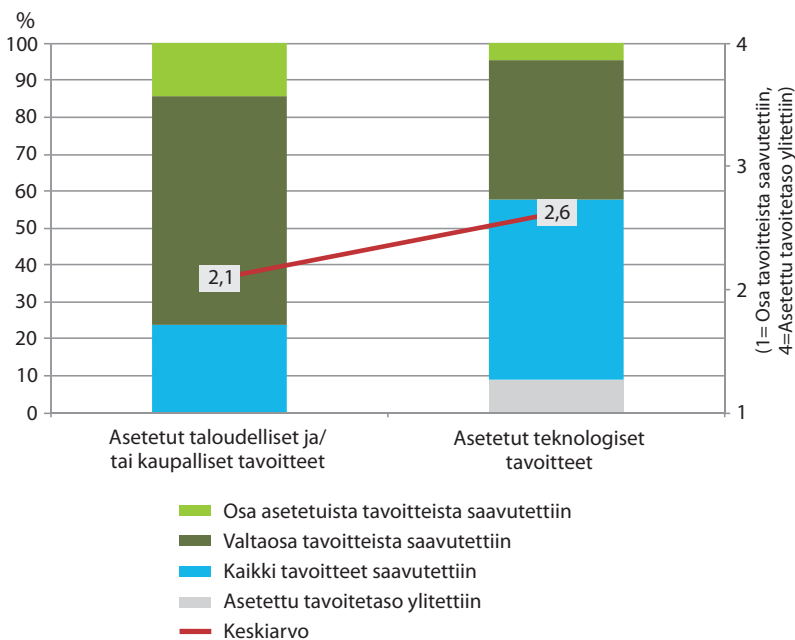
Yrityksillä ja tutkimuslaitoksilla on usein hyvin erilaiset tavoitteet tutkimustyölle, mikä näkyy selkeästi saavutetuissa ja tavoitelluissa tuloksissa. Myös ulkoiset tekijät, kuten toimintaympäristönmuutos ja ohjelmalinjat, vaikuttavat hyvin eri tavalla eri toimijoihin. Tapaus-tutkimushaastattelussa tuli esille mm. se, että usealle pk-yritykselle Tekesin taloudellinen tuki oli merkittävä apu lamasta selviytymisessä. Tutkimuslaitoksille Tekesin rahoitus oli usein vain yksi monesta rahoitusvaihtoehdosta. Organisaatioiden erot näkyvät myös tuloksissa. Tutkimuslaitoksissa tavoitellut ja saavutetut tulokset olivat akateemisia kun ne yrityksissä olivat liiketaloudellisia. Ohjelmien tuloksien arviointia hankaloittaa myös se, että ohjelmien loppumisesta on kulunut vaihtelevasti aikaa. Arviointityötä tehtäessä esimerkiksi osa GIGA-ohjelman projekteista oli vielä käynnissä kun taas osa yhteispohjoismaisista projekteista oli ehtinyt loppua jo kymmenen vuotta sitten.

Kansallisiin ja kansainvälisiin ohjelmiin osallistuneilla organisaatioilla oli erilaiset näkemykset sekä kokemukset saavutetuista tuloksista. Eriäviä mielipiteitä kuvastaa mm. se, että puolet haastatelluista organisaatioista kertoi vahvistaneensa yhteistyöverkostoja ohjelmien kautta, mutta yhtä usea totesi osallistuneensa ohjelmiin vain saadakseen rahoitusta sisäiseen tutkimukseen, verkostoitumisen ollessa toissijaista. Silmiinpistävä havainto oli myös se, että organisaatioiden välinen yhteistyö pohjautui pääasiassa jo olemassa oleviin suhteisiin. Tämä ei ole välttämättä ole pelkästään negatiivinen havainto, sillä usein hedelmällinen yhteistyö vaatii toimiakseen pitkäaikaista kumpuuta. Yhteenvetona voidaan tode-

Kuva 4. Tavoitteiden saavuttaminen pohjoismaisissa ohjelmissa.



Kuva 5. Tavoitteiden saavuttaminen GIGA- ja NETS-ohjelmissa.



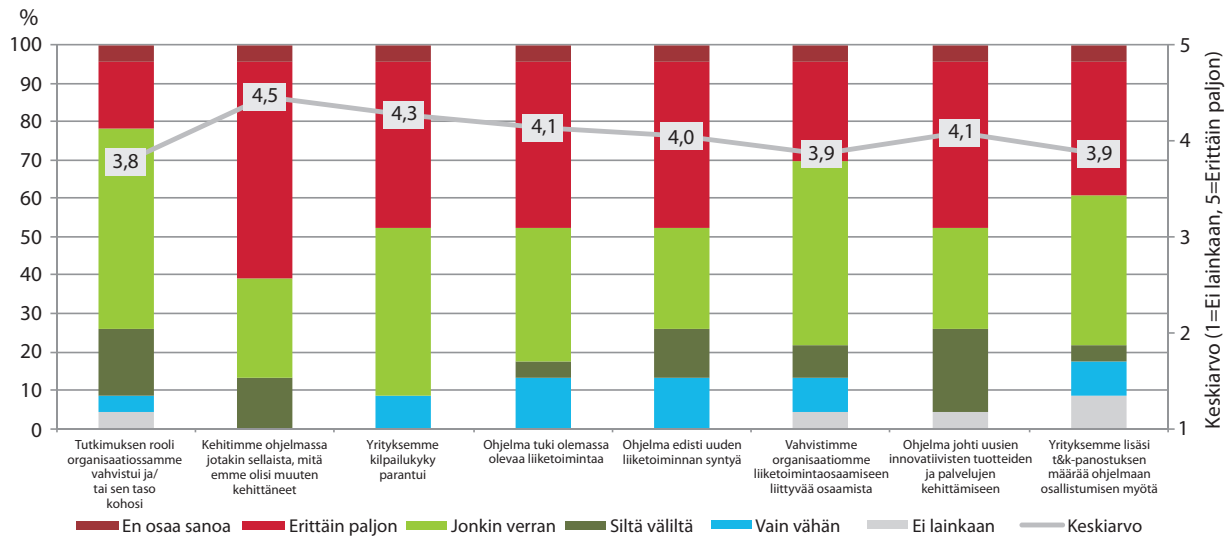
ta, että kaikissa niissä projekteissa joissa oli organisaatioiden välistä yhteistyötä, syntyi myös jollain rintamalla lisäarvoa.

Tapaustutkimusten havaintojen perusteella lähes kaikissa projekteissa tutkimus- ja kehitystyö oli pidempiaikaisen työskentelyn jatkumoa jota oli tehty ennen ohjelmaa ja jota jatketaan ohjelman päättymisen jälkeen. Tästä johtuen oli hyvin vaikeaa todentaa Tekesin tietoliikenneohjelmien vaikutuksia varsinaiseen innovaatiotyöhön. Tästä huolimatta lähes kaikki haastatellut organisaatiot olivat tyytyväisiä hankkeissa saavuttamiinsa teknisiin tuloksiin. Taloudellisia tavoitteita ei saavutettu projekteissa yhtä hyvin kuin teknisiä, mikä osoittaa sen, että yksi ohjelmakausi on varsin lyhyt aikaväli lopullisen tuotteen markkinoille saattamiselle. Kaikkien viiden ohjelman projektit kokivat saavuttaneensa itse asettamansa ja odottamansa tavoitteet varsin hyvin. Merkittävimpiä yksittäisiä saavutuksia ohjelmissa olivat pk-yrityksien kehittelemät tuotteet joita ei muutoin olisi välttämättä pystytty toteuttamaan.

Ohjelmien vaikuttavuus näkyikin parhaiten juuri yksittäisissä pk-yrityksissä. Vaikka ohjelmat ovat vaikuttaneet myös tutkimuslaitoksiin ja suuriin yrityksiin, nämä vaikutukset eivät ole niin näkyviä. Tarkasteltaessa ohjelmien vaikutuksia koko Suomen tietoliikenne-sektoriin, ilmenevät vaikutukset parhaiten pidempiaikaisen tutkimustyön tukemisessa. Tekesin tietoliikenneohjelmat ovat muodostaneet pitkän jatkumon Suomen tietoliikennesektorin tutkimus-, kehitys- ja innovaatiotyössä.

Vaikka suuria innovaatioita ei ole juuri syntynyt, ohjelmatoiminnalla on ollut suuri vaikutus tutkimustyöhön panostamiseen ja tätä kautta koko toimi-

Kuva 6. GIGAan ja/tai NETSiin osallistuneiden yritysten näkemyksiä ohjelmiin osallistumisen vaikutuksista.



alan kehittämiseen. Koko tietoliikenne-sektori on viime vuosina käynyt läpi suuria mullistuksia jotka ovat mm. muuttaneet alan painopisteitä. Ohjelmien suurin vaikutus näkyy organisaatioiden tietotaidon kasvussa ja panostuksessa tutkimus- kehitys- ja innovaatiotyöhön joka mahdollistaa tässä muutoksessa mukana pysymisen.

#### Kehityssuosituksia

- Ohjelmien tavoitteiden tulee olla hyvin selkeitä ja riittävän tarkkoja. Arvioinnin tulokset osoittavat, että ohjelmien sisällön ja tavoitteiden fokusointi tukee ohjelman sisäistä verkostoitumista ja yhteistyötä sekä vahvistaa ohjelmatoimenpiteiden kohdentuvuutta.
- Rahoituksen painopisteen tulisi olla pk-yrityksissä. Rahoituksen sekä muun ohjelματοiminnan merkitys ja vaikuttavuus realisoituvat parhaiten pk-yrityksissä.

- Yksityisen sektorin toimijat tulisi sitouttaa tiukemmin ohjelmiin. Omarahoitusosuus ei aina ole riittävä motivaattori sitouttamaan yrityksiä projekteihin, joissa kehitystyön hoitaa pääasiassa tutkimuslaitos tai yliopisto. Tutkimuslaitosten ja yritysten tiivis yhteistyö vahvistaa tutkimuksen ja markkinatarpeiden välistä yhteyttä ja motivoi näin molempia toimijoita.
- Tekesin ohjelmajärjestelmän tulisi vahvistaa rahoituksen vaikuttavuutta erityisesti pk-yrityksissä. Pk-yritykset kaipaavat usein apua sekä verkostoitumisessa että liiketoimintasuunnittelussa maksimoidakseen rahoituksesta saatavat hyödyt. Hyväksytyille projekteille voitaisiin tarjota esimerkiksi muutaman päivän konsultaatiota, joko ilmaiseksi tai tuettuun hintaan. Tällainen liiketoiminnan arviointi voisi olla myös pakollista pk-yrityksille, jolloin var-

mistuttaisiin siitä, että niillä on realistiset mahdollisuudet sekä toteuttaa hanke että erityisesti hyödyntää siinä syntyviä tuloksia.

#### 3.2 Tutkimus- ja innovaatiopolitiikka

Arvioitujen kansallisten ohjelmien erityisvahvuutena on ollut Tekes-rahoituksen mekanismi, jonka mukaan yritysten tulee integroida rahoitusta saaneeseen hankkeeseen myös tutkimuslaitoksia ja alihankkijayrityksiä. Tämä mekanismi mahdollistaa alan toimijoiden arvoketjujen syntymisen, joka paitsi tukee osaamisen välittämistä niin myös mahdollistaa innovaatioita ja tukee uuden liiketoiminnan syntyä. Useat pienet yritykset kommentoivat juuri tämän yhteistyön suurten yritysten kanssa olevan näille yrityksille uutta ja mahdollistuvan ohjelmatoiminnan kautta. Mekanismi ei ole tärkeä vain rahoituksen näkökulmasta vaan tällä on suurta merkitystä

myös osaamisen välittymisen ja vahvistumisen myötä. Voidaankin todeta, että suuret yritykset eivät välttämättä tarvitsisi ohjelmia mutta ohjelmat tarvitsevat suuria yrityksiä. Ohjelmien myötä luodut arvoketjut ovat sekä vahvistaneet olemassa olevia verkostoja että luoneet uusia. Suuret yritykset kertoivatkin ohjelmien myötä luodun sellaista yhteistyötä tutkimuslaitosten kanssa, jota ei ilman ohjelmia olisi syntynyt. Tätä kuvattiin myös hyvin suomalaisiksi piirteeksi - samanlainen yhteistyö toimijoiden välillä ei välttämättä ole tässä mitakaavassa mahdollista kaikkialla maailmassa.

Muutaman vuoden toimineet SHOK:t ovat muuttaneet kansallista tutkimus- ja innovaatiopolitiikkaa. Haastatellut yritykset ja tutkimuslaitokset suhtautuivat TIVITIin uutena toimijan hyvin ristiriitaisesti. Vaikka monet pitivät TIVITIä toivottuna ja välttämättömänä uutena toimijana kokivat useat sen nykyisen ohjelmatoiminnan uhaksi. TIVITiltä muutosta odottavat tahot pitivät Tekesin nykyistä ohjelmatoimintaa omaan toimintatapaansa toistavana, joskin pääasiassa tuloksekkaana. TIVITIin liittyvät riskit liitettiin pääasiassa rahoituksen jatkuvuuteen. Tätä korostivat erityisesti pk-yritykset sekä tutkimuslaitokset.

Kaikki haastatellut toimijat pitivät alan perus- ja soveltavaa tutkimusta kansallisten innovaatioiden syntyamisen edellytyksenä. Raja joidenkin Tekes-rahoitusta saaneiden hankkeiden ja yliopiston perustutkimuksen välillä on kuitenkin epäselvä ja voidaankin todeta, että erityisesti osaa pohjoismaisten ohjelmien hankkeista voidaan pitää hyvin lähellä perustutkimusta. Pohjoismaisten ohjelmien hankkeiden kytkenät yrityksiin olivat paikoitellen liian

heikkoja. Muutamat osallistuneet tutkimuslaitokset totesivatkin, että hankkeiden tulosten hyödyntäminen yrityksissä jää usein vain arvailuksi ja tämä on tutkijoille usein epämotivoivaa ja turhauttavaa. Samoin kontakti yrityksiin oli josain määrin puutteellista erityisesti pohjoismaisissa ohjelmissa, joissa kaikki yritykset olleet osallistuneet pohjoismaisissa ohjelmissa johtoryhmän työskentelyyn riittävästi.

Kansallista tutkimus- ja innovaatiopolitiikkaa käsiteltäessä tulee huomioida myös kansainvälinen viitekehys, erityisesti EU-tason strategiat ja toimenpiteet. Digital agenda for Europe on yksi Europe 2020 -kasvustrategian tärkeimmistä aloitteista, jonka odotetaan vastaavan ohjelmamuotoisen kehitystyön tarpeisiin. Suomen näkökulmasta tämä on hyvin kiinnostava aloite, mutta sen ei oleteta vastaavan kaikkiin tutkimustarpeisiin. Erityisesti kansallisesti luotu arvoketju, jossa pk-yritykset integroidaan osaksi tutkimus- ja innovaatiopolitiikkaa, tulee vaatimaan tukevia mekanismeja, mikäli se halutaan edelleen säilyttää. EU-ohjelmat koskevat kuitenkin pääasiassa suuria yrityksiä.

Keskeinen kansallinen tietoliikennealan kehitystä koskeva haaste kuluu minoiinkin rahoittajatahojen roolien määrittämiseen. Nyt riskinä on, että osa keskeisistä teemoista ja toimijatahoista jää ilman rahoitusta. Samoin olisi tärkeää käsitellä sitä, missä määrin ja minkä tasoista tutkimusta pyritään rahoittamaan EU-hankkeilla ja miten kansalliseen rahoitukseen halutaan panostaa.

#### **Kehittämissuosituksia**

- 7. Kansallisten toimijoiden monitasoisen vuorovaikutuksen säilymistä ja vahvistumista tulee tukea.*

Pk-yritysten, suurten yritysten ja tutkimuslaitosten muodostama arvoketju vahvistaa alan kansallista osaamista ja kilpailukykyä. Tämän säilymisestä ja vahvistumisesta on tärkeää pitää huolta esim. ohjelmatoiminnan keinoin.

- 8. Tekesin ja muiden rahoittajatahojen roolit perustutkimuksessa ja soveltavassa tutkimuksessa tulisi selkeyttää.* Yhtenä Tekesin rahoituksen tavoitteena on tukea julkisella rahoituksella kehitystyötä, joka ei rahoitusta välttämättä muutoin saisi. Tekesin rahoituksen ei tulisi kuitenkaan kohdentua perustutkimukseen. Siksi vastuita tietoliikennealan eri tutkimustarpeiden kansallisesta rahoituksesta tulisi määrittellä.
- 9. Yritysten roolin tulee olla soveltavan tutkimuksen hankkeissa selkeä ja sitä tulee tarvittaessa vahvistaa.* Yritysten sitoutumisen varmistamiseksi niiden rooli tutkimushankkeissa tulee määrittää riittävän yksityiskohtaisesti. Tämä on erityisen tärkeää silloin kun yritys ei osallistu hankkeeseen rahoittajana.
- 10. Tekesin tulisi vahvistaa rooliaan EU-tason ohjelmissa.* Tekes voisi vahvistaa Suomen roolia EU-ohjelmissa tukemalla kansallista valmistelutyötä sekä eri toimijoiden verkostoitumista kansallisen tutkimus- ja innovaatiopolitiikan profiilin vahvistamiseksi. Tutkimuslaitoksilla ja suurilla yrityksillä on yleensä paljon kokemusta kansainvälisistä hankkeista, sen sijaan pk-yritykset kokevat jo pelkän hakemuksen laatimisen vaikeaksi ja työlääksi.

# 1

## Introduction

This evaluation report reviews five Tekes programmes conducted between 1997 and 2010. The first programme, INWITE, started in 1997 and the two most recent programmes, GIGA and NORDITE, ended at the end of 2010 (Figure 1). Whereas GIGA and NETS were executed as national programmes, NORDITE, EXSITE and INWITE were realised in cooperation with Swedish VINNOVA and the Norwegian Research Council.

The two national programmes also differed from the three Nordic programmes in terms of their size, as their individual budgets were significantly larger than that of the three Nordic programmes combined. Consequently, the main focus in this evaluation re-

port (70 percent of the contribution) is on the two large national programmes – GIGA and NETS.

The main aims of this evaluation are to produce recommendations for the innovation policy; to support the future development of Tekes programmes; to strengthen the funding cooperation; and to develop the research, development and innovation activities of the industry.

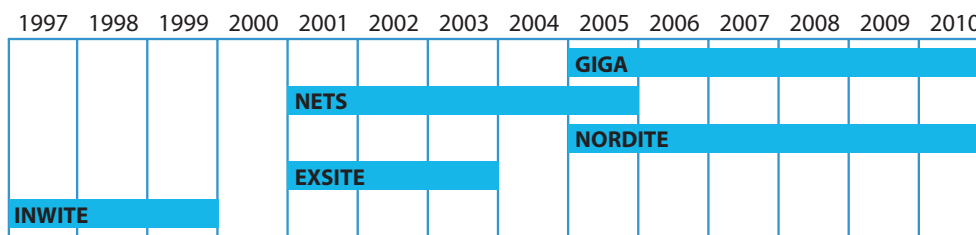
The evaluation was carried out during 2010 and 2011 by Ramboll Management Consulting (RMC), which was selected through a public tendering process. The evaluation team of RMC was supported by the evaluation steering group appointed by Tekes through-

out the evaluation work. The composition of the steering group is attached.

This evaluation report is composed as follows. Chapter 2 introduces the five programmes and the methodology used for the evaluation. Chapter 3 provides background information on the topic by discussing the changes in the operating environment during the programme years (1997–2010).

Chapters 4 and 5 describe the objectives, execution, results and effects of the programme. Each subsection consists of a description of the model, observations and conclusions. Chapter 6 sums up the conclusions of the previous chapters and includes the evaluators' recommendations in brief.

**Figure 1. Timelines of the five telecommunications programmes.**



# 2

## The target and evaluation methodology

### 2.1 The programmes

The Finnish Funding Agency for Technology and Innovation (Tekes) is the main public funding organisation for research and development projects in Finland. Tekes finances innovative and risk-intensive industrial and research projects. Tekes also offers expert services for organisations and builds networks between the main operators in Finland. Small and medium-size enterprises (SMEs) may also apply for funding for services that supports innovation activities. Young growth companies can apply for specific funding for growth and internationalisation. Tekes' annual budget is over 630 million Euros and finances approximately 1,500 business projects and approximately 600 public research projects each year. Tekes' funding is for projects that aim to provide long-term benefits to the economy and society. Tekes does not earn any financial profits or claim intellectual proprietary rights from its activities.<sup>1</sup>

Tekes' strategy is to advance innovations that increase the wellbeing of

humans, companies, the environment and society. Tekes currently focuses on the following main areas:<sup>2</sup>

- *Capabilities in innovation activities:* Innovation activities for key sectors and clusters in Finland; research and development activities, networks and competence base.
- *Productivity and renewal of industries:* New innovations and productivity are essential to the economy.
- *Wellbeing:* Integration of economic growth and environment and wellbeing of people.

Tekes allocates 50–60 percent of its funding to programmes and strategic centres for science, technology and innovation; 40–50 percent of the funding is directed to individual projects in any sector, and these projects are selected individually. The focus areas for funding is conducted through Tekes' programmes and Strategic Centres for Science, Technology and Innovation. Selected focus areas are important for the Finnish economy and society. Companies and research organisations work

together in strategic centres, carrying out research that has been jointly defined as strategically important for each centre. Tekes plans the programmes together with partners and customers and the programmes are intended to increase development in a special industry or technology sector. The programme participants are chosen through competition; participants are responsible for a project's planning and execution. Tekes' programmes are platforms for the exchange of information and networking between businesses and research groups. These programmes allow organisations to complete innovative research and development projects together with their partners. The average programme lasts for approximately four to six years.<sup>3</sup>

The ICT sector has been one of Tekes' main focus areas in recent years. The long-term continuum of ICT programmes has been ongoing since 1997. This evaluation focuses on Tekes' five ICT programmes: NETS, GIGA, NORDITE, EXSITE and INWITE.

<sup>1</sup> Tekes – the Finnish Funding Agency for Technology and Innovation – [www.tekes.fi](http://www.tekes.fi)

<sup>2</sup> Tekes – the Finnish Funding Agency for Technology and Innovation – [www.tekes.fi](http://www.tekes.fi)

<sup>3</sup> Tekes – the Finnish Funding Agency for Technology and Innovation – [www.tekes.fi](http://www.tekes.fi)

## 2.2 Short descriptions of the programmes

### GIGA, Converging Networks, 2005–2010

The GIGA programme was planned to speed up the development of wireless broadband technologies and services. One of the aims of the programme was to help Finnish SMEs internationalise their markets and cooperation.<sup>4</sup> The programme was for collaboration projects wherein companies and research organisations work together towards a common goal. The programme involved a total of 117 projects, with a total value of approximately 280 million Euros, Tekes portion was 99 million Euros. The main focus areas were wireless access networks, network transparency, network support, and changes of business models and value chains.<sup>5</sup>

The main objectives of the GIGA programme were:<sup>6</sup>

- To strengthen public and industrial research so that technological know-how can be found in Finland
- To strengthen, diversify and reform the national broadband telecommunication business
- To improve the telecommunication cluster's networking, implement the research results and improve business opportunities
- To strengthen international research cooperation and promote the internationalisation of companies

- To have an effect on international standards.

The GIGA programme was developed especially for wireless broadband technologies and related business potentials and new services. The purpose of the programme was to connect different actors in the form of collaboration. The programme strengthened Finnish telecommunication technology's competence on global markets as well as international cooperation.<sup>7</sup>

### NETS, Future Networks, 2001–2005

The NETS technology programme was designated to the telecommunications sector broadly from radio interfaces to services and applications. The NETS project focused mainly on long-term research work, such as application-oriented research and the development of service projects. Development and research work accounted for over 260 million Euros in the NETS programme. There were a total of 156 organisations in the programme, made up of 130 companies and 26 research organisations. The programme's three main focus areas were technologies and architectures of future wireless system, technologies of broadband packet networks, and service and application concepts that utilised the new networks.<sup>8</sup>

The NETS programme's main objectives were:<sup>9</sup>

- To strengthen the technological lead in future wireless sys-

tems, broadband packet technologies, and areas of communications technology that are important to Finnish industry and new businesses

- To generate new businesses in the areas of wireless and broadband network terminals and software in which an international leading position can be achieved
- To reinforce the position of Finnish companies as leading developers and innovators of applications, services and content based on mobile and broadband technologies
- To expand and diversify company and service operations that take advantage of communications technologies.

According to the NETS programme's final report, the achievements of the programme were diverse and important for Finnish telecommunication industry.

### NORDITE, 2005–2010

The Nordic cooperation programme (NORDITE) was conducted between 2005 and 2010. The NORDITE programme was implemented through the collaboration of VINNOVA, the Norwegian Research Council and Tekes. "The programme was designed to promote cooperative research in the fields of technology development for SW radio, wireless sensors, short-range wireless networks and RFID or MEMS utilising RF

<sup>4</sup> Tekes – the Finnish Funding Agency for Technology and Innovation – [www.tekes.fi](http://www.tekes.fi).

<sup>5</sup> GIGA – Converging Networks – Brochure.

<sup>6</sup> GIGA – Converging Networks – Brochure.

<sup>7</sup> GIGA – Converging Networks – Brochure.

<sup>8</sup> NETS – Networks of the Future 2001–2005, Final report. Technology programme report 1/2005. Tekes, Helsinki.

<sup>9</sup> NETS – Networks of the Future 2001–2005, Final report. Technology programme report 1/2005. Tekes, Helsinki.



technology, and to assist Swedish, Norwegian and Finnish research institutes and companies to further develop and demonstrate their technical expertise in that area".<sup>10</sup> The programme's main purpose is to support Swedish, Norwegian and Finnish research institutes and universities in their efforts to develop research in the abovementioned fields.<sup>11</sup>

The programme was funded in two phases: 2005–2007 and 2008–2010. Projects were chosen and funded for three years at a time. The combined funding for both phases was 7.5 million Euros (Tekes: 3 million, RCN 2.25 million and VINNOVA 2.25 million).<sup>12</sup>

### **EXSITE, Finnish-Swedish R&D programme, 2001–2004**

The EXSITE programme was planned for cooperation projects between research groups in the Finnish and Swedish research organisations; all of the programme's projects had Finnish and Swedish counterparts. The main aim of the programme was to develop wireless telecommunication technology and microelectronic devices. The programme's overall funding for six projects was over 4.8 million Euros. The main goals of the programme were to improve the long-term competitiveness of the Finnish-Swedish telecommunications sector, form new research and development groups and deepen the Nordic cooperation.<sup>13</sup>

The main objectives of the EXSITE programme were:<sup>14</sup>

- To strengthen scientific and engineering competence in Finland and Sweden, especially in the area of wireless systems
- To strengthen trans-national research by promoting cooperation between research teams in both countries
- To strengthen the scientific application-oriented academic competence in the area and to promote cooperation between universities and industry

According to the EXSITE programme's evaluation report, the scientific and technical quality of the results ranged from good to excellent, and the results were certainly useful for the industry in Finland and Sweden, from the point of view of international competitiveness. The EXSITE programme also improved the cooperation between Finnish and Swedish researchers.

### **INWITE, Integrated Technologies for Wireless Telecommunication, 1997–1999**

The INWITE programme was a cooperative effort between Tekes and Nutek. It started based on informal discussions between Tekes, Nutek, Nokia and Ericsson. These discussions led to the conclusion that applied research in mi-

croelectronics should be boosted because Nordic cooperation research was seen as an important factor for effective development. The key objective of the INWITE programme was to increase the long-term competitiveness of Swedish and Finnish companies, especially in the field of design, utilisation and manufacturing of wireless devices. The programme gave a framework to the pre-competitive research. The total volume of the programme in Finland was 12.7 million FIM, and in Sweden it was 13.2 Million SEK. A total of six projects were funded.<sup>15</sup>

## **2.3 Context and objectives of the evaluation**

The main objectives of the evaluation are to provide recommendations for the development of Finnish innovation policy and the programme processes of Tekes, as well as to produce guidelines for strengthening the cooperation between the funding organisations and for developing the strategic development of the research, development and innovation activities.

Following the assignment, the evaluation focused on the two largest programmes, GIGA and NETS, the importance of which in the evaluation is 70 percent. (The weight of the three smaller programmes – NORDITE, EXSITE and INWITE – executed in Nordic coopera-

<sup>10</sup> Nordite – SWEDEN-NORWAY-FINLAND CALL FOR PROPOSALS.

<sup>11</sup> Tekes – the Finnish Funding Agency for Technology and Innovation – [www.tekes.fi](http://www.tekes.fi).

<sup>12</sup> Nordite ohjelma käynnistämisesitys, Juha Tanskanen.

<sup>13</sup> Louhenperä, Ristä & Nilsson, Olle. Evaluation of the EXSITE Programme – Technology programme report 21/2003. Tekes, Helsinki.

<sup>14</sup> Louhenperä, Ristä & Nilsson, Olle. Evaluation of the EXSITE Programme – Technology programme report 21/2003. Tekes, Helsinki.

<sup>15</sup> Salo, A. et al. (2000). R&D Programmes in Electronics and Telecommunication ETX, TLX, INWITE and Teleelectronics Technology Programme Report 5/2000 Mid-Term Evaluation.

tion is 30 percent.) While the weighting of the three financially smaller projects was initially defined as being substantially smaller, it was also soon recognised that there were significant differences between the possibilities of obtaining data from the different programmes. While GIGA and NETS were relatively well documented and the project participants were easy to track down, the collection of data from the three smaller programmes required greater effort. The project participants, coordinators and funders no longer worked for the same companies. When the investiga-

tive work was successful and the relevant persons were contacted, their recollection of the programmes proved out to be somewhat anecdotal.

One important objective of the Tekes technology programmes is to provide functional added value to the companies and research organisations participating the programmes. This target is also highlighted in this evaluation.

The evaluation is built around seven evaluation questions, which are constructed using the focus areas outlined in the original assignment. The evaluation questions are as follows:

<b>Changes in the operation environment</b>
1. What are the relevant changes in the international operating environment during the last 10 years?
<b>Programmes' objects, results, and impacts</b>
2. How relevant and challenging are the programmes' objectives?
3. How have the objectives been reached?
4. How well were the most relevant customers reached? How has the international cooperation affected the participants and customers?
5. How well have the programmes, their services and administration met the needs of the participants? What kind of additional value have thematic working groups achieved?
6. How has the cooperation between funders (schedule, coordination) impacted the productivity and impressiveness of the programmes? Has the cooperation enhanced the utilisation of the results in companies or created new cooperation relations to EU-programmes?
7. What kind of impacts have been realised in the programmes or are expected? How permanent, broad and significant can these impacts be considered to be? How have they been affected by:
i. the R&D&I efforts of the industry
ii. the development of knowledge, researcher education and emergence of knowledge clusters
iii. the mobility of experts within the industry and its actors
iv. the emergence of international networks
v. changes in the operating procedures
vi. significant innovations
vii. productivity
viii. business opportunities via, for example, standardising
ix. the business sector in a broader sense
How have points i–ix affected the business sector– (using the case examples)?

## 2.4 Evaluation activities

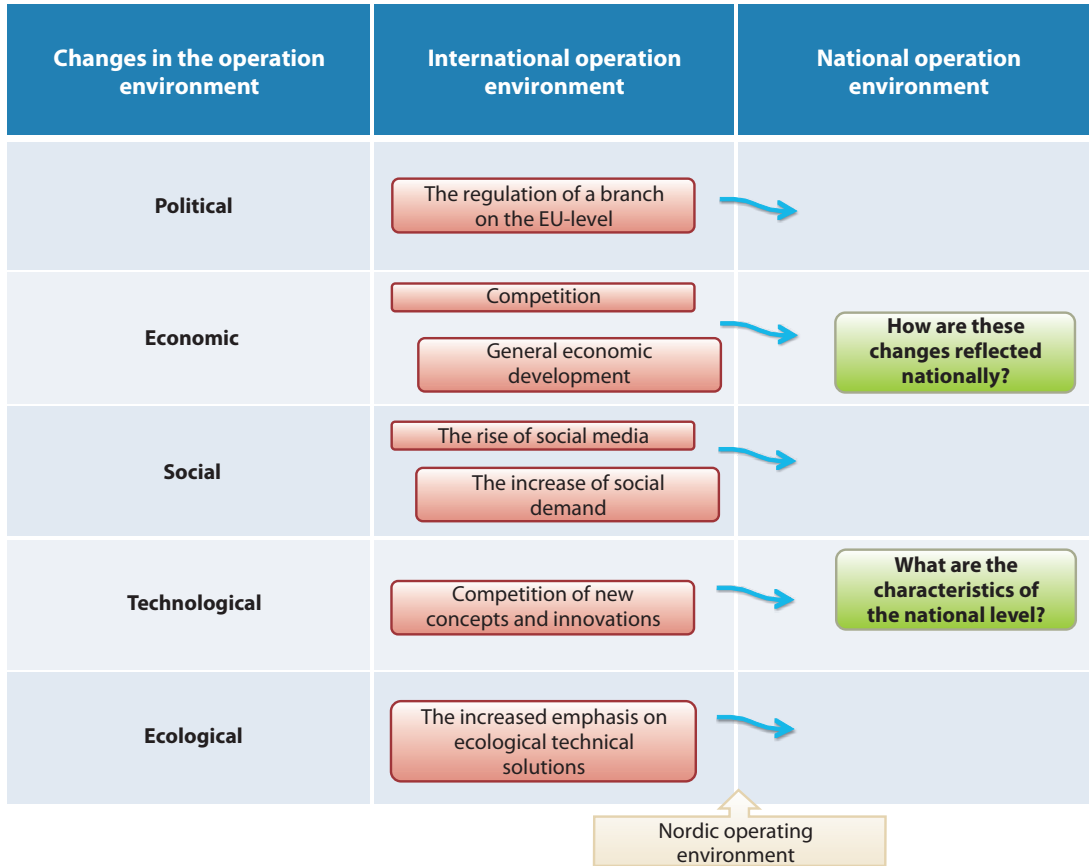
The evaluation is conducted using a mixture of ex-post and final evaluation methods, due to the different natures of the five evaluated programmes. While GIGA and NETS are national and strategic programmes that aim to develop the innovation activities through supporting businesses, the three Nordic cooperation programmes are more research-oriented. Therefore, the evaluation has also been realised using several, both complementing and overlapping methods.

### Changes in the operation environment

Changes in the operation environment are analysed using the classical PESTE model, in which the main source of information consists of a research and report overview. The basic sources of information are the annual reports of the ICT branch and the financial outlooks produced by the Ministry of Employment and the Economy, as well as publications by Statistics Finland and international research publications. This information is complemented by the views collected in the other phases of the evaluation concerning the changes of the national operation environment.

The PESTE model is described in Figure 2 (below) from a reporting perspective. In the figure, the different areas are subtitle-level examples of those changes that are analysed in the section concerning the operating environment. In addition to international changes, purely national phenomena are also analysed.

Figure 2. The framework of the PESTE method.



### Analysis of the objectives, impacts and results of the programmes

The evaluation is based on indicators that have been formulated during the evaluation work on the basis of the expected outcomes. During the evaluation work, this listing of indicators has been updated constantly.

Several methods have been used for collecting data concerning the objectives, impacts and results of the programmes.

As a central part of the evaluation, the evaluation team conducted interviews of the representatives of the

funding organisations and other experts. Four of the interviews were conducted in Sweden and two in Norway. The complete list of the interviewed experts is attached.

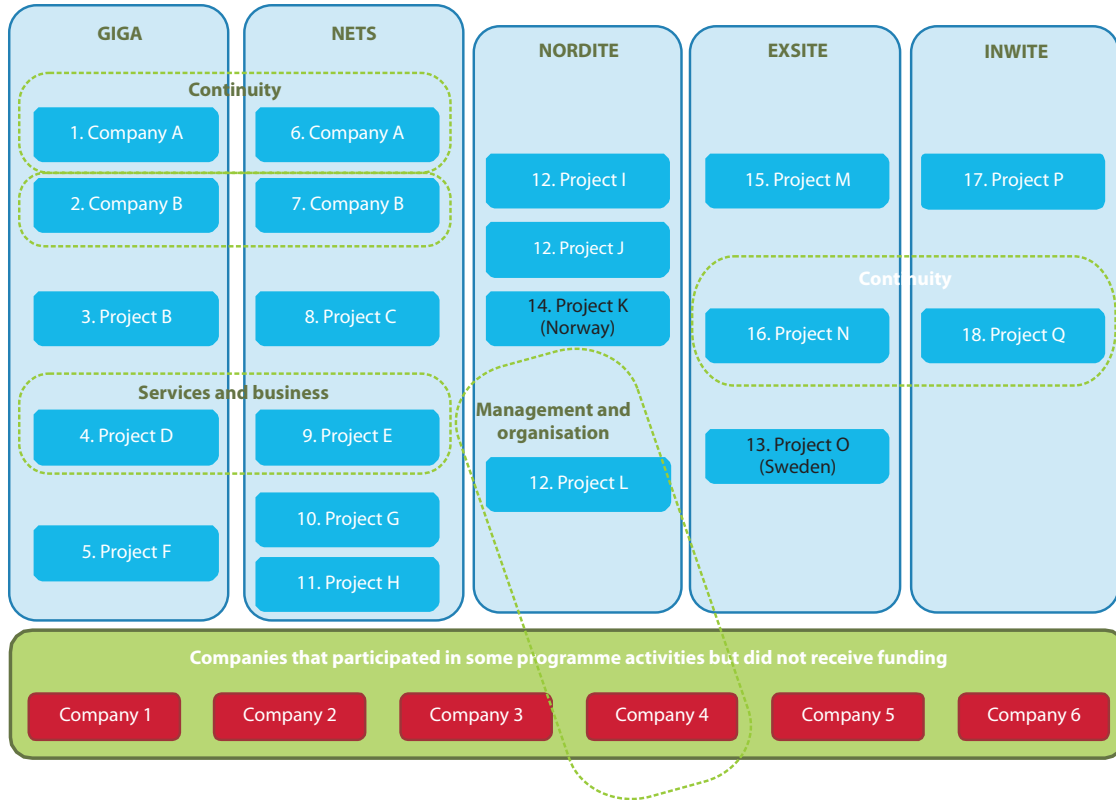
The evaluation team also had the opportunity to consult with the steering group of the evaluation. The steering group consisted of several experts from Tekes as well as outside consultants, who had been responsible for several practical matters concerning the latest national programme (GIGA). The composition of the steering group is attached (Appendix 1).

In addition to the expert inter-

views, the evaluation team conducted a total of 22 case interviews. The interviews covered all five programmes and were selected in such a manner that they provided a comprehensive oversight of the programmes, including aspects on continuity and service and business-oriented projects. In the selection of the Swedish and Norwegian projects, the local funding organisations had the opportunity to propose possible candidates. The selection criterion is described below in Figure 3.

In addition to the companies and research institutions that took part the programmes and received funding, sev-

Figure 3. The selection and realisation of the case studies.



eral companies that were present in the seminars and other programme activities but did not receive funding, were also interviewed. The aim was to gather comparable information on the programme operations and their additional value through a natural comparison group for the programme participants. The case interview sheets and the evaluation questions are attached in Appendix 2.

At the very end of the evaluation work, the preliminary findings of the evaluators were discussed in a work-

shop. The workshop participations were representatives of the Tekes funding agency, coordinators of the GIGA programme and programme participants, from both business and research organisations. The core idea of the workshop was to test the conclusions and preliminary recommendations of the evaluators, to find pro and contra arguments for their accuracy and also to provide a wider audience with the opportunity to explain the phenomena and context behind the conclusions. A valuable debate was also held on the topic of

the development of the telecommunications industry over the past 12 years.

In addition to the different types of interviews, an extensive survey was also sent out to the participants of the five programmes. There were three separate surveys: one for the participants of GIGA and/or NETS, one for the Finnish participants of NORDITE, EXSITE and/or INWITE, and one for the Swedish and Norwegian participants of NORDITE, EXSITE and INWITE.<sup>16</sup> The surveys were sent out in January 2010, followed by one reminder.

<sup>16</sup> The first two programmes, EXSITE and INWITE, were conducted in Finnish-Swedish cooperation. The most recent of the three programmes, NORDITE, was executed in Finnish-Swedish-Norwegian cooperation.

A total of 58 responses were received. However, several respondents had been the contact persons of projects that had participated in more than one programme. The number of responses per survey and the response rates are presented in the table below.

The impact of Tekes' ICT programmes on the participating compa-

nies' economic performance was measured by financial analysis. The aim of the statistical analysis was to complement the results of the case interviews and to provide independent data on the financial effects of the Tekes funding. The financial analysis concerned only small and medium-size companies, according to the decisions made togeth-

er with the steering group of the evaluation. The analysis compares the general economic performance of the companies in the industry with the performance of those companies that participated in the programmes. The analysed statistics are collected by Suomen Asiakastieto Oy. Although the long time span of the five programmes provided great possibilities for a statistical follow-up and analysis, it also posed some challenges. In particular, the change of the industry classification in 2005 resulted in some breaks in the time series and resulted in poorer quality of the comparability between the beginning and end of the evaluation period.

**Table 1. Number of respondents and the response rates of the electronic surveys.**

Programmes covered	No. of responses	Response rate
GIGA, NETS	45	17%
NORDITE, EXSITE, INWITE	13	31%

## The telecommunications industry

### 3.1 Change in the telecommunications industry over the last decade

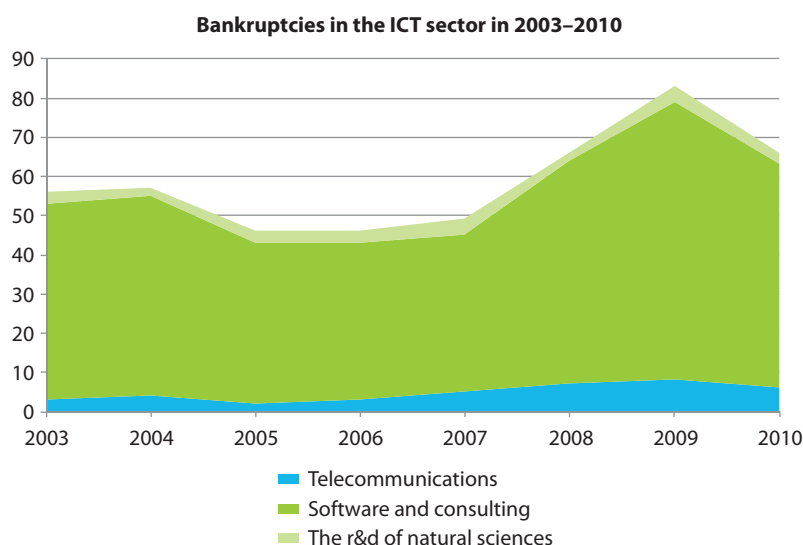
There has been rapid development in the ICT sector over the past 13 years. The period from 1997 to 2010 includes two economic recessions that hit the ICT sector severely. The burst of the so-called dot-com bubble in 2000, followed by the 9/11 attack in the United States, were only an introduction to the

“In 2008, the recession struck like a million volts. We had just got our first few customers. The situation had a direct impact on financiers, all the discussions stopped abruptly, and the year when the recession was going on felt extremely long.”

– SME

financial crisis in 2008, which led most of the world into a severe recession. In addition to, or perhaps also as a result of these changes in the global operation environment, the ICT industry has renewed rapidly over the past decade. In particular, small and medium companies struggled to retain financing in all industries and the amount of bankruptcies increased in the ICT sector (Figure 4).

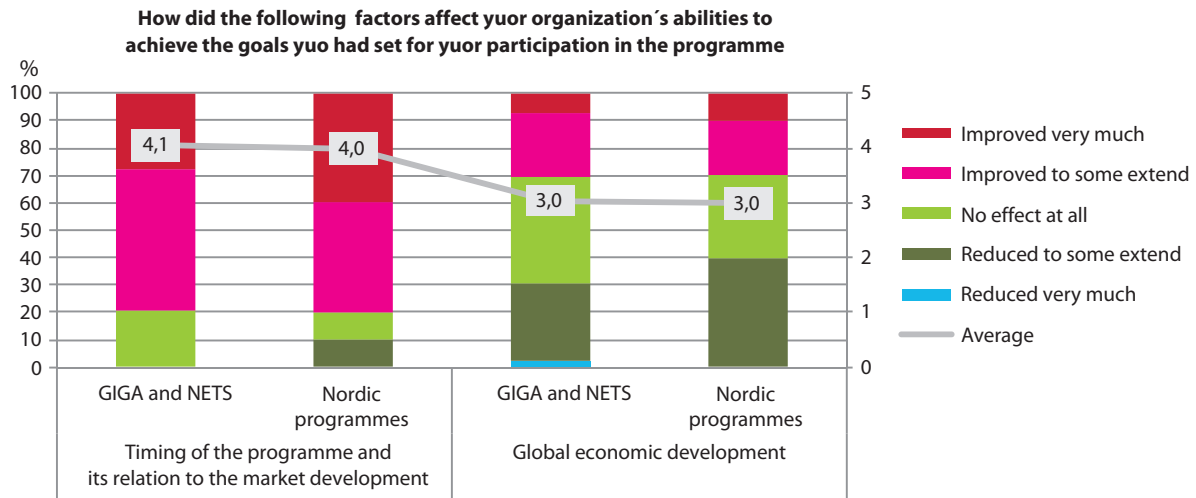
Figure 4. Bankruptcies in the ICT sector. Source: Tilastokeskus



The impacts of the global economic crises were mostly reflected in the two largest programmes, NETS and GIGA, since a vast majority of the projects in the programmes were led by companies. According to the survey results, however, approximately 70 percent of the respondents estimated that the global economic development had either positive or neutral effects on the realisation of the projects (Figure 5). According to the interviews, the main implication of the economic situation was that smaller companies were particularly unwilling to take part in the pro-

gramme operations that involved investments in terms of time or other resources. Also, many companies, particularly, operators, reduced their investments in research. By the beginning of 2011, the largest operators had cut back their R&D departments completely. According to the manufacturers, this not only meant outsourcing of service R&D to the component manufacturers, but it also destroyed the fruitful discussion connection. Many of the interviewees agreed that GIGA played a crucial part in maintaining the research at least at a moderate level.

Figure 5. Impacts of the timing and the global economic development on the programmes.



The effects on the NORDITE, EXSITE and INWITE research programmes were only minor. In INWITE and EXSITE in particular, Nokia and Ericsson were actively involved in the planning and preparation phases of the programmes. INWITE was prepared purely by the funding organisations and the companies were present only in the management board and in the management boards of the individual projects. Although the roles of the enterprises in the Nordic programmes were only minimal, the interest of the enterprises was said to be slightly diminished due to economic difficulties, which resulted in absence from the management board work. The supposed reason was the cost of travelling to the meetings. It was also believed that the enterprises may not have seen a strong enough link between the research and the business they themselves represented.

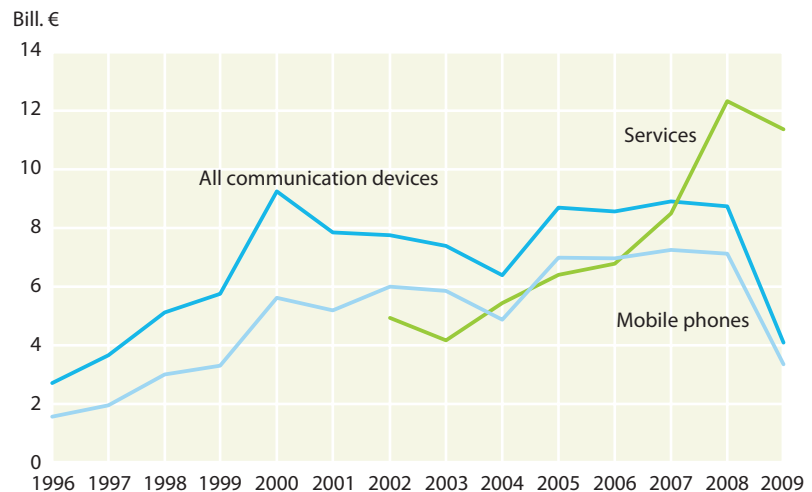
One of the main changes of the telecommunications industry over the

last few years has been the shift from technology development to service production. In the current situation, technology and services are combined tightly together and can no longer be handled separately. This has also changed the focus of the companies.

Large companies are expanding their business and, for example, technology-based companies have taken a notable share of the service business as well.

The increased service demand also sets new criteria for the data transfer. Understandably, the technical require-

Figure 6. The ICT clusters exports in billions of Euros. Source: Pajarinen et al. (2010)<sup>17</sup>

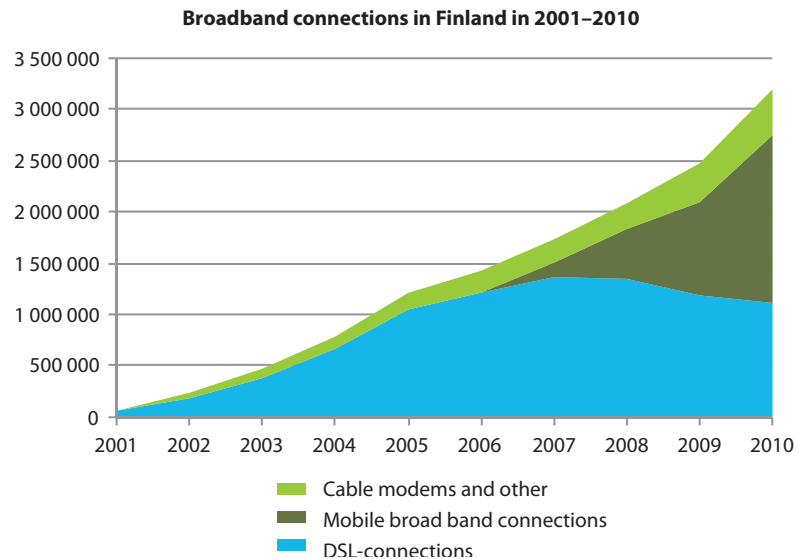


<sup>17</sup> Pajarinen, M.; Rouvinen, P.; Ylä-Anttila, P.; (2010) Missä arvo syntyy? Suomi globaalissa kilpailussa.

ments for transferring data for watching television from a mobile device are vastly different from those for sending text messages. This phenomenon is closely connected to the increasing amount of new mobile broadband connections that, over the last few years, have become the single most common broadband technology in Finland (Figure 7). As people learn to utilise the mobile broadband connections and the devices offer a growing amount of applications utilising the new possibilities of the data transfer, the demand for the amount of data that must be transferred instantly to the growing number of mobile devices has grown at an accelerating pace. It is already clear that not all actors realised the potential of the service production. Many experts questioned whether there is readiness to react to the challenges of the explosive demand for fast and secure mobile connections.

The past decade has also dramatically changed the role of international

**Figure 7. The number of broadband connections in Finland.** Sources: Tilastokeskus and Ficora



cooperation, especially in the telecommunications industry. All of the major players in the industry are large multinational companies and the various parts of the value chains are scattered

around the globe. This is illustrated in Figure 8, according to which the value chain of mobile phone production has been scattered around the world.<sup>18</sup>

As this evaluation work was being conducted, the news from the largest actor of the Finnish telecommunication actor, Nokia, was, if not alerting, at least confusing. In February 2011, Nokia announced that it would start comprehensive cooperation with the American software developer Microsoft. According to Nokia's announcement, the cooperation would result in thousands of lay-offs, of which around 1400 would take place in Finland. The majority of the lay-offs and reorganizing will affect the software development. At the time when this evaluation report is being finalized, the turmoil in Nokia has not resulted in significant changes

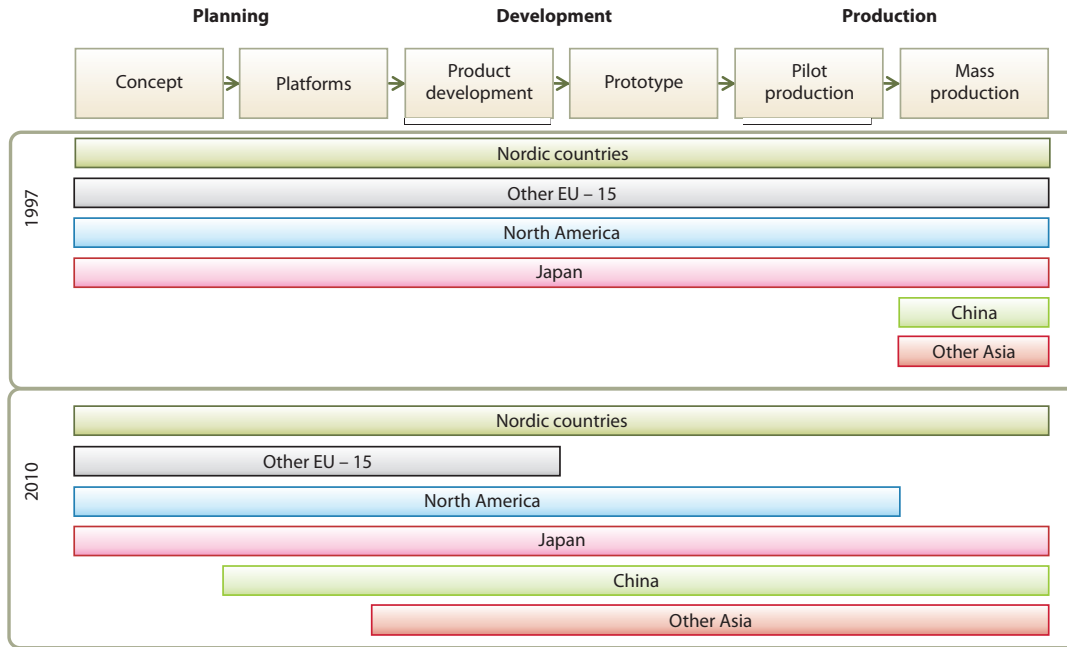
### "The change of the business environment – SMEs point of view"

"Our company's operation model has changed a lot during the past few years. We decided to focus on the product designing; we do not do anymore subcontractor business because it is not profitable. The main reason for this was the fact that we cannot compete with Indian manufactures and we wanted to focus on our main know-how sector."

"Company's turnover has been modest compared to the previous plans that we had few years ago, this was the main reason why we changed our business strategy, now we are focusing on the ICT services, not on the hardware manufacturing. This was good decision, now the turnover has turn to the positive direction. Today our cash flow comes from the license fees. In the future the license fees are generating more and more revenue for us when our applications are taken widely in the use. The growth of mobile application use has changed most our business environment; this development is increasing the demand of new advance applications."

<sup>18</sup> Pajarinen, M.; Rouvinen, P.; Ylä-Anttila, P.; (2010) Missä arvo syntyy? Suomi globaalissa kilpailussa.

**Figure 8. The geographic development of the value chains of mobile phone production.** Source: Pajarinen et al. (2010)



in the planning of the future telecommunications programmes. However, the changes will have an impact on the national economy, as the software development is in most part moved away from Finland. Although there have not yet been an announcements on the future plans of Nokia, it is speculated that the model where the software development is outsourced to Microsoft, could also be only a short term solution.

The high level of internationalisation not only concerns large multinational companies, but also research organisations and SMEs acting in the telecommunications industry. A SME in the telecommunications industry must be prepared, if it is successful, to deliver its products all over the world. While this might be possible in cases of software or applications, the pattern in the telecommunications industry is different. Small companies with good products

**“The changes made at Nokia will have a drastic impact on the national economy, at least in the short run, as the export of software turns into import of software.”**

or ideas that are ready to be commercialised are often sold to large companies that have the realistic ability to utilize these inventions in their products. If the only aim of small, high-growth companies is to be sold, the role of the public funding in this pattern can be considered problematic.

While the small actors of the telecommunications sector struggle with the high demands of the global market, pose prominent actors different kinds of challenges to the national innovation environment. In a country, where practically all companies and re-

search organizations are in some way connected to one market leader, the danger of compromising the diversity of the research must be taken seriously. Especially in cases were prominent actors decide on outsourcing or offshoring some parts of their development, it can result in vanishing all business and research in that specific area. Although it was agreed that big players, “the engines”, are necessary for the

**Many industries need large companies, “engines”, which push the whole sector forward. Without the engines the development tends to be slow and incremental. However, in the best case there would be more than one engine in order to ensure healthy competition and versatile development within the industry.”**

development of an industry, it was also formulated that in the most optimal case there would not only be one, but at least two “engines” propelling the development.

The global market also demands international research. As formulated by the research institutes, the international cooperation is self-evident when the focus is on top-class international research, as it must be when cooperating with world leaders with the aim of producing something globally competitive. It was even described that while the pros of the international research co-operation are obvious, does national cooperation sometimes seem like an unnecessary, superimposed requirement, for which added value is less easy to recognise. The issue of standardisation is on point of view to the research. The standards used to be meaningful to the companies but the situation has changed in recent years. Nowadays, standards are created by the market leaders, as a good solution is first adapted by the consumers and then by the other actors on the market.

### The role of Tekes and SHOKs

**“The SHOKs are feeding machines of large companies.”**

There were two totally opposite opinions concerning the future of the Tekes programmes on the sector of the telecommunications industry. Many of the interviewees stated that the programmes had worked fine to that point and there is no reason why the system would not work as well in the future. They strongly emphasised the role of Tekes as an enabler of the growth of the business. They were also very con-

cerned about the consequences if the system of conducting programmes was changed drastically. In particular, research institutes were unanimous in their opinion that the absence of such programmes would leave a gap between the basic funding and the actual product development, which had, to that point, been largely funded by Tekes’ programme funding. It was also recognised that, although the programmes have been at least somewhat successful in attracting SMEs, they would barely have the opportunity to participate in the SHOKs.

The opposite group of opinions regarded the Tekes programmes as good and saw many positive impacts of the programme work. However, they stat-

ed that the same system had been used so many times that if there was willingness to progress, it would be time to try something totally new. Also, the interviewees usually regarded the initiative of SHOKs very welcome renewal of the system. It was also stated that the role of companies in defining the actions and objectives of the SHOKs had been too great, and that Tekes has had a better understanding of the national development and challenges.

The most crucial challenge that was pointed out is definitely the question of the entire Finnish telecommunications industry. The role of Finland’s national competence and business opportunities were also seen very differently among the interviewees.

#### “An outsider’s vision”

“I have followed the Tekes’ programmes for a long time, and considered taking part some time, especially in the wellbeing programmes. In our business, welfare services, 3G and 4G applications have brought a lot of new business opportunities but implementation of these new innovations is difficult, particularly in the public sector operations, where changes do not happen so fast. Innovation work is not simple, funding is not sufficient, leadership and individual visionaries are the most important factors in innovation work; this why innovation work is so difficult to steer outside.

The world is moving more and more towards the digital environment, which creates a bunch of new opportunities to the companies but does not mean that the ICT sector would grow bigger; it’s more about the focus of content is changing in Finland from manufacturing to service design. Obviously, the financial crises have also had an effect on the ICT business, although the overall economic generation is looking positive right now. Cooperation between private companies and research organisations has developed steadily for a few years and we have learned to know each other better; nowadays the cooperation is running more naturally. I think that this is one area in which Tekes has done a good job. Also, TIVIT’s activities are positive and heading in the right direction. I think that, in future, Tekes should concentrate more on financing large projects instead of small ones. Bigger projects have bigger results”.

*- SME company, did not have a project in the programmes*

### **GIGA & NETS: “It’s all over now?”**

“We have been actively present in the Tekes programmes in recent years, and also in these two ICT programmes. I think that these programmes are especially good opportunities for networking and, from an economic perspective, they allow for bigger risk-taking, and there is always funding available that fits your needs. Seminars and knowledge changes are also important and provide good opportunities to have dialogue with other companies before the products that they are developing becomes business secrets; this is really useful and important for learning business knowhow. The programmes’ biggest influence for us was that the Tekes funding made it possible to use subcontractors on research work and that we could concentrate on what we know best and outsource the areas that we are not good at.

Besides subcontractors, our research project was entirely internal; Tekes did not have any influence on the content of research. Even so, the projects that we had on the programmes did have a huge effect on our company because we created our key product in the project and, during the projects, we certified many technological patents. The majority of our company’s products go to exports, so naturally the international perspective is important for us.

Tekes has managed to build domestic networks that we also benefit from, so international networking was not so successful from our perspective. In fact, I have to say that Tekes does not offer anything in the international field. From a company’s perspective, cooperation with Tekes has been easy and good but it is only one part of the big and complex picture, which is why we have to think about a lot of other things beside Tekes funding and programme objectives.

It seems that Tekes’ support work on the communication field has reached its end; at least, there are no new programmes for it. Although TIVIT’s activities look good for the large companies and, obviously, innovation work needs long-term research work, unfortunately the time frame and the focus of these new operations does not fit for the SMEs.

*- Company, participated the GIGA and NETS programmes*

## Objectives and execution of programmes

### 4.1 Relevance of the objectives

#### Observations

The common opinion was that the objectives of all five programmes were relevant. However, it was also stated that the objectives set to the programmes were so vast that all topical issues could be integrated to the programme. This was also seen as the right way to conduct programmes that cover this long time period.

#### GIGA and NETS

With regard to the objectives, GIGA was set to follow the work that has been successfully done in NETS. Also, the set objectives can be seen as a continuation of the work that had already been conducted.

The main goals, with regard to promoting the position of the Finnish telecom industry in technologies of wireless broadband communication and strengthening the strategic basic research, were seen as being crucial. At the time the goals were set, the national position in the industry was seen as very strong and the GIGA programme was supposed to be one factor that would ensure that Finland would not drop off the pace of development. Although all of the goals were seen as relevant, the ones related to new business opportunities and the support of expansion of

company business to global markets, as well as increasing international cooperation, were not seen as being so significant.

The GIGA programme also had a strong emphasis on goals concerning international cooperation. The emphasis of international cooperation was a central point that was taken more strongly into the agenda of the GIGA programme compared to the NETS. There were high hopes the work that was supposed to be conducted would create and promote international connections that would enhance Finland's role in research. The role of standardisation was also emphasised. International forums were seen as crucial for matching the pace of other global actors.

When evaluating the objectives set for GIGA, it was stated that the growth of the Internet and mobile communication was identified and considered, but the amount of growth could not have been totally foreseen. The key actors of the GIGA programme named two of the four focus areas as being most important: the wireless access area and seamless networking. Network support was also expected to turn out well and it was considered a relevant choice. However, the fourth focus area – the evolution of value networks in telecommunication business – was not seen as being so relevant for the participating actors.

There were also a few issues that became more relevant than had perhaps been expected at the time GIGA was planned. Cognitive networks is one central theme that was discussed during the NETS programme, but it became more focused and strongly emphasised in the GIGA programme. It was identified as an important issue when GIGA was planned, but it was only one theme integrated into the focus areas. The relevance of cognitive networks grew during the GIGA programme.

#### NORDITE, EXSITE, INWITE programmes

According to the interviews, the targets of the three Nordic programmes were mostly to foster Nordic cooperation, to strengthen the existing networks and to create new ones. Even though all three programmes were purely research projects, were companies tightly involved in the preparation phase of both EXSITE and INWITE. In NORDITE the companies were present in the project management boards.

While the cooperation was described well-functioning and significantly less bureaucratic than in most international programmes the programmes' participants were not convinced that the level of research was as high as it could have been. It was stated to be rather "easy" funding mainly due to the set objectives.



## Conclusions

It can be concluded that the objectives of all five programmes were seen as relevant. However it has to be pointed out that the objectives remained mainly the same throughout the programme even though the time period of five year could be regarded as quite long time especially considering the dynamic nature of telecommunication sector. The objectives could have been evaluated during the program. This was done in the middle of the GIGA programme and would have been recommended to be done in others as well.

## 4.2 Management and funding

### The model

Nearly all of the projects in GIGA and NETS were realised in cooperation with companies. Out of GIGA's total budget of 279 million Euros, roughly 180 million Euros were invested by the participating companies. Even though the public research spending (99 million Euros) remained close to the budgeted level, the total programme budget was significantly larger than expected, due to the high activity of industry. Half of the funded industry projects in GIGA were led by SMEs. Naturally, the size of the companies was also reflected in the size of the project budgets; the projects managed by SMEs generally had much smaller project budgets than the other projects. However, mainly due to extensive subcontracting to SMEs, research institutions and universities, the actual Tekes funding to large companies was only about 3.5 percent of the project

budgets. In the SME projects, the corresponding average fraction of Tekes funding was 48 percent of the project budget.<sup>19</sup>

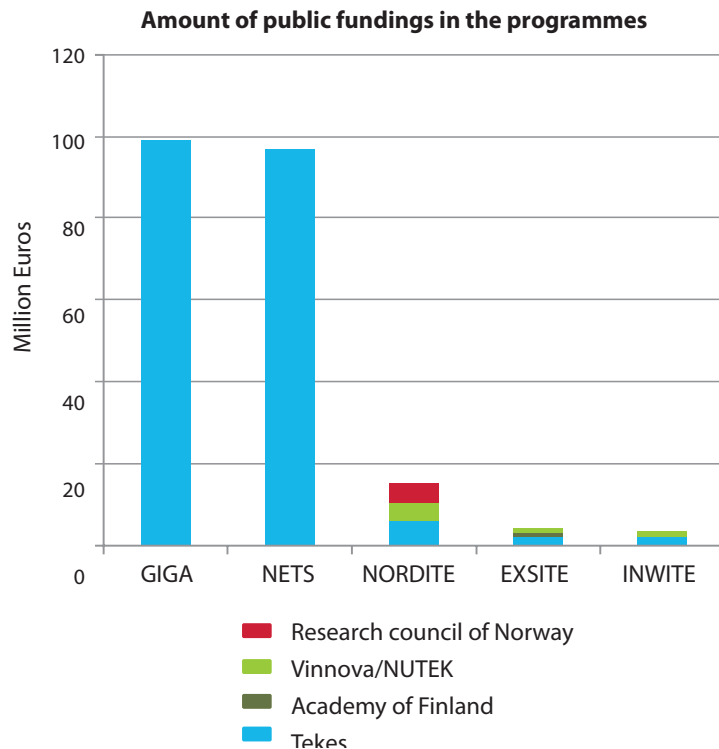
The total programme volume in NETS was roughly 261 million Euros, 31 million Euros of which was research funding and 230 million Euros of which was industry funding. The planned total volume of the programme was 120 million Euros, which was more than doubled due to the activity of the industry and its willingness to invest in the programme's projects. The public research investment remained within the original project budget. Altogether, Tekes allocated 22 million (an average of 70 percent of the project budgets) into public

research and 75 million Euros (an average of 33 percent of the project budgets) to industrial projects.<sup>20</sup>

As Tekes has worked as the provider of funds of the Finnish projects, Swedish VINNOVA and the Norwegian Research Council have been responsible for funding in their respective countries. While Tekes and VINNOVA ran NORDITE as its own programme, NORDITE in Norway was launched as one part of the national Verdikt programme.

In NORDITE, EXSITE and INWITE were research projects and the funding was allocated to Nordic research institutes and universities. In NORDITE and EXSITE, however, the companies were also represented in the manage-

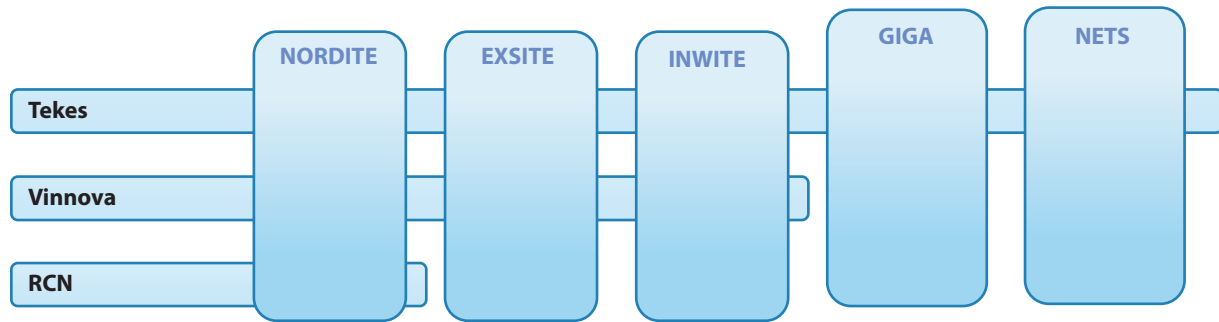
Figure 9. Public funding of the programmes (in millions of Euros).



<sup>19</sup> Giga end report.

<sup>20</sup> Nets end report.

Figure 10. Major funding organisations of the programmes.



ment board and also participated in the funding of the programmes. In EXSITE, roughly 15 percent of the project budget was funded by Nokia and Ericsson, who were also involved in designing the programme. As illustrated in Figure 9, the weight of the three Nordic cooperation programmes is, in monetary terms, only a fraction of the two national programmes. The total public funding of the three programme budgets is roughly 22.5 million Euros.

In order to receive funding from EXSITE and INWITE, the Finnish participants had to have a Swedish collaboration partner. The funding decisions of the partial projects in Finland and Sweden applied for funding from their own national funding organisations using their application procedures. In NORDITE, collaboration with Norwegian research institutes was also possible. Although projects with participants from all three countries were favoured in the selection process, it was mandatory to have partners from only two countries. In NORDITE, companies were represented in the projects' steering groups. The companies were required to participate actively in the projects' steering groups in order to guide the research objectives.

### Observations

#### GIGA and NETS

GIGA's management system closely followed that of its ancestor, NETS, with only minor adjustments. In NETS, the programme was coordinated by Tekes and the management was outsourced, while in GIGA the programme coordination was outsourced and the programme was managed by Tekes.

*"On a scale from four to ten, Tekes' work in GIGA deserves a ten. The communication with the projects has improved, the interaction is more straightforward and the threshold for contacting is low. From a participant's point of view, the Tekes experts' change from civil servants to customer servants is definitely a positive thing."*

In particular, the programme participants considered the organisational structure to be positively "flat", easily accessible, and cooperative. According to the interviews, the management of GIGA and NETS followed the traditional lines of Tekes programme management quite closely. Although both the management boards and the pro-

gramme management were considered to be well-functioning and competent, a wish was raised for more innovative and "fresh" ways of managing programmes. The interviewees had the impression that the continuum from NETS to GIGA was not utilised as much as it could have been in terms of developing the organisation model of the programme management. While the management models were seen as functioning ways of managing a programme, it was stressed that both the coordinators and programme managers should be involved in the planning phase, regardless of their organisation, in order to ensure a fluent information flow within the management team from the very start.

In GIGA, some of the interviewees had hoped that a well-networked outside coordination would have been able to bring more SMEs that had not previously received any Tekes funding to the programme. The programme activities realised by the coordinators were evaluated positively and the overall opinion was that both the coordinators were able to bring added value to the programme participants. The coordinators of GIGA were able to work rather flexibly within the given funding

frame, which enabled them to provide seminars and organise benchmarking trips when there was demand. In general, the programme coordination and its management as a whole were considered to have functioned well.

One topic that aroused a lot of opinions and discussion was the role and profile of the management board. It was mutually agreed that the management boards of both GIGA and NETS were successfully composed of experts who were able to see past their own interests and those of their companies, and were therefore able to provide constructive insights for the pro-

*"In the beginning, the management board tried to take a stronger role in following and directing the programme. However, the possibilities of following the projects were not there and the management board was left feeling like an outsider."*

grammes. However, some questions were raised about the role of the management board. Although it was agreed that the management board was extremely active in both programmes, the management board members in particular concluded that the actual information on the content of the programme was rather superficial and consisted mainly of statistics. The role of the board was weighted towards the beginning of the programme, when the board was tightly involved in drafting the project portfolio and defining the criteria for the projects together with the representatives of Tekes. All in all, the members concluded that the expertise of the board was not uti-

lised throughout the programmes as much as it could have been, and nearly all of the board representatives of GIGA wished for a more active role for the management board throughout the programme. The management board of NETS casted a vote on the funding decisions, which was utilised by Tekes in the final decision making. The GIGA management board was only informed after the decisions had been made. Simultaneously, the dilemma concerning the commercial secrets and competition between the actors represented in the board and the project participants were also recognised as hindrances for increased openness. This problem is magnified in a small country, where the same actors of a certain industry are involved in planning, guiding and participation of the programmes. According to the discussions, Tekes has deliberately used the management board for monitoring more than managing purposes. The role of the board can also be seen as a response to the public discussion around some other programmes, where Tekes' credibility has been challenged due to the management and funding model.

The role of the GIGA management board was weighted towards the beginning and planning phase of the programme. The management board was closely involved in setting the strategic focuses and refining the contents of the calls for proposals aimed at the research organizations. This guiding role of the management board was seen as supporting the accurate timing of the programme.

While the role of the management board was criticised as too invisible, also some critical remarks were made on the role of the companies that were active-

ly involved in the planning of the programmes. It was questioned, whether the influential participants of the programme boards were really able to allow and courage the inclusion of focus areas that involve the development of technologies that could potentially challenge the technologies they themselves had chosen to use and develop in their company.

In other Tekes' programmes, such as the Verso (Vertical Software Solutions), the input of the management board was channelled to the development of the programme services. As the management board consisted of experts who were familiar with the industry, its knowledge and experience aimed at developing suitable and productised programme services aimed to overcome the most common obstacles. The development of tools that helped the programme participants expand their businesses and internationalisation, for example, were seen as instruments that, if successful, could help the whole industry move forward.

#### **NORDITE and EXSITE**

The same observations concerning the organisational structure were also raised in the interviews concerning the Nordic cooperation programmes. The interviewees, from both funding and participating organisations, concluded that the management system in the Nordic programmes was simple and straightforward in such a way that it enabled and encouraged active and infor-

*"In my opinion, the management model, where each country has its own programme manager, has served its purpose well."*

mal cooperation between the funding organisations and funded projects. In fact, there was no actual management or coordination structure, which was natural since the programme budgets were rather modest, at least when compared to GIGA and NETS.

Several interviewees compared the organisational structure of the three Nordic programmes to the EU programmes and concluded that the level of bureaucracy was significantly lower and that the cooperation was easier in the Nordic programmes. Although the managing system was considered very simple, the representatives of the Nordic cooperation organisations in particular considered the review process of the tenders to be even too decentralised and hoped for more coordination and common discussion about the selection process.

The interviewees felt there was a good consensus on the aims of the programmes and also the opportunities for networking, sharing views with experts from other Nordic countries, and learning.

**“NORDITE enables the development of those companies that feel that competition on the EU level is too high. It lets them operate in a familiar environment with simpler rules.”**

The major asset of the Nordic cooperation was seen in its strengthening of the strong points of all three countries in the ICT field and bringing together the best actors from Finland, Sweden and Norway. However, not all interviewees were convinced that the model of purely Nordic cooperation was the best possible, when the scope is on internationally significant results and research.

**“There is nothing wrong with Nordic cooperation. However, we also need to have to look for complementary skills from, for example, India, China and Brazil, in order to keep up with the big players.”**

According to the case interviews, the operating model provided a more familiar and less competitive operating environment for the projects. The operation environment formed by the Nordic cooperation was described as a “safe haven”, in which the research projects that were not yet internationally competitive were able to operate with their long-established research partners, supported by public funding. While it was agreed that continuity, stability and familiar partners provide good conditions for basic research, it was questioned whether this operating model provided the best framework and incentives for creating something truly innovative, risk-taking or globally competitive.

The Nordic cooperation was also considered to be easier to conduct than the international cooperation usually is. The operating environments in all countries were considered to be quite similar. The informal nature of the cooperation, which stemmed from flat organisational structures and active, informal and straightforward discussion cultures, was considered a good starting point for a successful collaboration. Therefore, it was also questioned whether these ‘optimal’ conditions had been utilised to their

**“NORDITE provided us with the advantages of national programmes without the disadvantages of the European programmes.”**

full potential in the programme. According to the interviewees, the scientific ambition level of the projects was not very high, which was accepted by both the participating organisations, companies and funding organisations. On the other hand, it was also noted that the main target of the programmes was to experiment the cooperation model, strengthen existing international connections and forge new ones, rather than create products that were ready for the commercial markets.

It was also pointed out that the absence of large, multinational companies dictating the conditions of the programmes made it possible to pursue the goals set by the funding organisations, rather than by individual companies. This was especially the case in NORDITE, which was prepared by the three national funding organisations. Also, the low level of bureaucracy was seen as good practice.

**“What we were interested in with INWITE and EXSITE was the lightness of the organisation. There was no need to form an artificial consortium packed with unnecessary, non-contributing partners.”**

While the communication among and between the funding organisations and projects was generally considered good, some practical matters were noted that had some room for improvement.

One of the practical difficulties concerned the different processes of reviewing the project applicants. As in Finland, Tekes makes the funding decisions internally, which is different from the approaches used in Norway and Sweden. In Norway, the applications

are reviewed by an international panel of experts. In Sweden, the decisions are made not only within the organisation, but some outside experts are also involved in the process. The variety of review processes results in different kinds of schedules already in the very beginning of the programmes and projects. Also, the different lengths of the funding periods were seen as inconvenient. The varying systems of allocating funds and funding period lengths both resulted in delays in starting and realising the projects. A concrete example of this is that after the NORDITE projects in Finland and Sweden were finished at the end of 2010, the Norwegian research units continued until the end of 2011.

**“The Nordic cooperation programmes have been well in line with the strategic focus of VINNOVA. In fact, the amount of funding for NORDITE was increased afterwards, as it proved to be even more successful than expected.”**

Varying approaches and decentralised decision-making also created uncertainty for the projects that had managed to receive funding from one of the countries but still faced uncertainty concerning the project funding as a whole. Another significant component was the fast labour turnover in VINNOVA, the Swedish funding organisation. This resulted in inconvenience in terms of the contact between the funding organisations. Therefore, an ex-post evaluation concerning the two first programmes also turned out to be very challenging, since none of the persons who were involved in the programmes still worked at VINNOVA.

The programmes were also seen as complementing components in the programme portfolios of the funding organisations. In Norway, however, the NORDITE programme only served as a one-focus area of the national VERDIKT

programme, and its scope was considered rather narrow compared to the other programmes. However, the fact that the programme fell within other programme and was executed as part of a national programme also reflects

### **NORDITE case: “Time well spent”**

“We were asked to take part in NORDITE as a corporate member in one project’s steering group. Although our company does not operate in the telecom sector directly, we are interested in the development in this area and how we could utilise these technologies in the future. This was not the first time we

had been involved in a Tekes programme and there are several Tekes projects going on at the moment in which we are actively involved. All in all, I would say that we are very familiar with the programmes and other funding activities of Tekes. In general, when the right and competent partners are there, as well as a research plan that works well with what we are doing, we do participate. Everything else is a matter of organisation.

Although NORDITE was an international programme, it did not result in any international networking on our part. Within NORDITE, we did have contact with the other participating organisations in the project meetings and our connections with domestic actors were strengthened. The larger seminars are nice events, but I feel that smaller projects and meetings are more efficient in terms of networking and gaining results. In my opinion, real and fruitful cooperation is possible with between three and five participating organisations. If there are 10, or even more parties involved, the projects are so scattered that the actual cooperation is left shallow.

In NORDITE, it was apparent that the research projects struggled to get companies involved in the steering groups. Only a few companies were involved and the commitment was not there. At the beginning of the research work in particular, the possibility for a more active role was available, but the companies involved were not interested in taking it. As a result, the research organisations progressed as they had planned barely without any company guidance or control. As we were not involved in the actual realisation of the project, time spent on orientation was limited. After all, the programme provided us with the opportunity to keep up with the recent developments in the research world and if a similar request would reach us in the future, we would participate again. In my opinion, the time spent among this project was time well spent.”

**“The Nordic collaboration has, in our case, resulted in an EU project that led to our research network being expanded further. As a matter of fact, the Nordic collaboration has also generated national collaboration.”**

*- A company involved in a steering board of a NORDITE project*

how seamlessly NORDITE fitted into the thematic of the national organisations.

The programme participants felt that the most significant added value of the Nordic cooperation was the strengthening of existing connections, rather than the creation of new ones. The Finnish-Swedish connections had been especially strengthened during the programmes. According to the interviews, the strengthened connections also resulted in new cooperation projects after the programmes and applications to EU projects.

The interviewees also pointed out that the participation from several countries also raised the quality of the research in the projects, compared to purely national projects. The participants also stated that after the successful cooperation and the broad international

connections of the participants, moving to the next level was an easy and natural progression. In the electronic survey, the project participants evaluated that the Nordic cooperation contributed greatly to achieving the organisations' goals (grade 4.6/5, Figure 11).

**Conclusions**

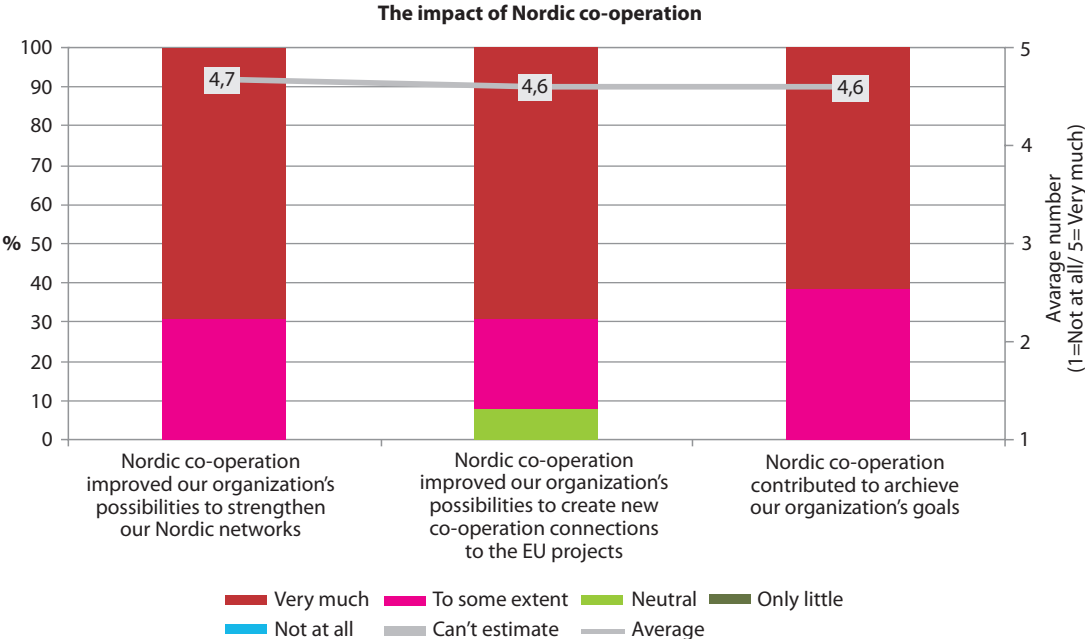
**GIGA and NETS**

The management systems of all five programmes were considered functional and well-suited for their purpose. All programmes were applauded for their simple, straightforward and communicative management system between the project participants and the management team. The Tekes experts also received excellent appraisals regarding their work in all five programmes. The management structure

was well tested and closely followed the traditional lines of programme management of Tekes. Despite the security of familiar ways of working, more innovative and fresh ways of managing were also desired.

The management boards of the programmes were considered to be both competent and active. However, it was seen that they were not utilised throughout the programmes as much as they could have been. It was emphasised that close cooperation between both programme manager, management board and programme coordination is essential from the very start of the programmes in order to form a common understanding of the contents and the objectives of the programmes. On the other hand, it was pointed out that companies' role in designing the contents of the pro-

**Figure 11. Please evaluate the following statements concerning Nordic cooperation from your organisation's point of view – Participants of NORDITE, EXSITE and INWITE.**



grammes should be critically assessed in order ensure that the motivation for the programmes' focuses is based on the right motives from the national economy's point of view.

### **NORDITE, EXSITE, and INWITE**

The overall opinion on Nordic cooperation stated that it has had several positive impacts on the realisation of the projects. The networking possibilities provided by the programmes were particularly appreciated. However, most of the cooperation was based on existing connections, which were only strengthened during the programmes, and the probability of creating completely new connections was considered rather low.

The Nordic cooperation was also considered functional, since the operating environments of the three countries are very similar. The operation environment formed by the Nordic cooperation was described as a "safe haven", where the not yet internationally competitive research projects were able to operate with their long-established research partners, supported by the public funding. While continuity and stability provide good conditions for executing long-term basic research, it can be questioned whether this operating model provides the best incentives for creating something truly innovative, risk-taking or globally competitive. On the other hand, this raises the question of whether the optimal conditions, such as similar cultures and structures of the three countries, were utilised to their full potential in upgrading the level of research. However, if the main target of the programmes was to strengthen competence and create networking platforms, it can be said that the goals were met. In addition, new lessons

must have been learned regarding organising international cooperation initiatives, which can be used when planning new cooperation programmes.

The low level of bureaucracy was considered a strong point of the inter-

national cooperation, especially compared to other EU-level projects. Also, the Nordic cooperation enabled the participants to form new partnerships with EU level actors, using the existing connections of the consortium.

#### **Case INWITE: "Normal product development with public funds"**

"In our field of research, Nordic cooperation has already existed for a long time; there was a lot of cooperation with the Swedes already in the 1980s. However, the competition between Nokia and Ericsson in the 1990s ruined the atmosphere and cooled down the contacts. From our perspective, this programme was an attempt to create Nordic cooperation "by force" so that the research operations would not be overwhelmed by the EU projects. In a way, these targets were met, since although new connections were not established, the existing connections with our Swedish colleagues were strengthened during the programme.

As I see it, nothing revolutionary has been invented in this business since the 1920s. Also, the aim of this project was to continue the existing research and provide the businesses with the outcomes and results they had asked for, rather than try to create something truly innovative. In addition, the ambition level of the companies was rather low. As I see it, we were conducting normal product development with public funds. Also, from the perspective of my organisation, participating in Inwite was not strategically or operationally very significant. We had had international cooperation before and our operations in the programme were more "business as usual" than anything else. Also, the project itself didn't exactly turn out to be a success – the results were not utilised or invested in by the industry later on.

From our perspective, participating in Tekes's international programmes nowadays is rather difficult. First there should be domestic consortium, which should then be complemented with the international partners. However, in our business, international cooperation is extremely important since all of our clients are non-domestic. Today, our international cooperation is usually carried out in EU projects. The importance of international cooperation is so significant that it even makes the advantages of domestic cooperation difficult to recognize.

As we see it, from a research organisation perspective, Tekes' funding instruments are aimed more at companies than research organisations. There are so many funding instruments for research organisations that the importance of Tekes has been decreasing. In my opinion, the way to achieve new innovative openings is to support more SMEs instead of large companies."

*- A research institute participating in INWITE*

### 4.3 Programme services

#### The model

Tekes' programme services are intended to support organisations' research and business activities. In addition to funding, services provide a wide range of forums for networking and knowledge exchange. Programme services also share information about new innovations in a specific industrial sector. Tekes has offered the following programme services for organisations: financing, seminars and workshops, domestic and international surveys, benchmarking and networking trips. All of the Tekes' programme services are free of charge.<sup>21</sup> Tekes provides programme services to anyone and programme funding is not a criterion for using the services. The domestic GIGA and NETS programmes were open for companies and research organisations, while the Nordic programmes were only for research organisations. The Nordic programmes, which operated on a significantly smaller budget than NETS or GIGA, also provided minimal programme features or services. The programme services consisted of some seminars that were targeted at all programme participants.

#### Observations

This evaluation collected observations about the utility of the programme services through various types of interviews, as well as an electronic survey. The theme was also discussed in the workshop that was arranged after the case interviews and electronic survey. Observations about the importance of Tekes' programme services to the par-

ticipating organisations are based on these information sources. The following chapter presents those results.

#### GIGA and NETS

Most of the organisations that answered the electronic inquiry for GIGA and NETS programmes did participate in the GIGA programme (89 percent). Around one-third (36 percent) participated in the NETS programme and approximately 24 percent of the organisations reported that they had participated in both programmes. Just over half (56 percent) of the responses came from research organisations, with the remainder of the respondents representing private companies and other organisations.

**"The main reason for the participation was to get money; the project application was made so that the funding would be admitted."**

Programme participants were asked how important the programme services have been from their organisation's point of view. Not surprisingly, the funding was the most important programme service; over 90 percent of the electronic survey respondents ranked financing services in the 'very important' category. The case interviews supported the same observation; for many of the participants the project funding was the driving force to adjust the content of the project. Seminars and workshops were also seen as an important programme service, at least to some

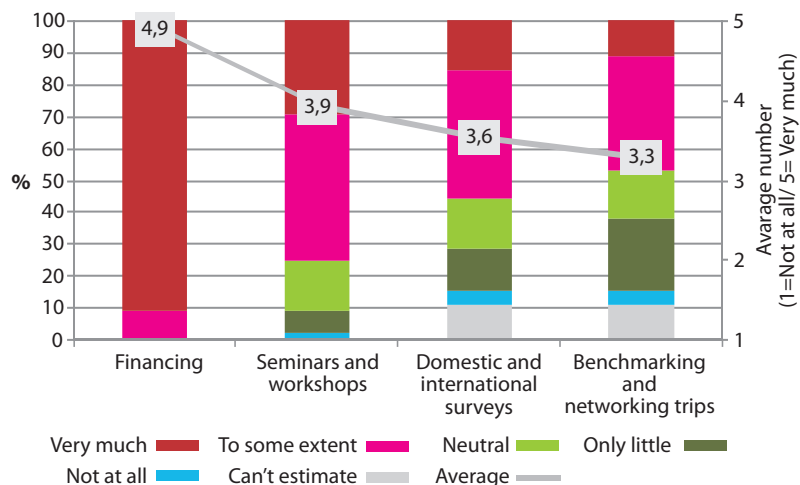
**"Workshops are useful because knowledge change is important, especially at the time of technological turning point."**

extent. Most of the survey respondents felt that the seminars and workshops were generally useful, especially for networking purposes. Case interviews pointed out that companies and research organisation did make contacts in these events and, in some cases, even made subcontracting deals. For example, the one essential benefit that was mentioned in the interviews was that the knowledge change is important, especially at times when technological changes are happening; in such times, Tekes' seminars are especially useful. Networking and international surveys were not seen as being so important. The range of answers concerning surveys and networking was wider, and some organisations could not estimate the importance at all. Organisations estimated, on average, that programme services had some importance for their organisations. There was no significant difference between the answers of the GIGA and NETS programme participants (Appendix 3).

In addition to the importance of the programme services, participants also evaluated the usefulness of the programme services from their organisation's point of view. The results were almost identical to the answers about the importance of the services and there was no significant difference between the GIGA and NETS programme participants' answers (Appendix 3).

<sup>21</sup> Tekes – the Finnish Funding Agency for Technology and Innovation – [www.tekes.fi](http://www.tekes.fi).

**Figure 12. Importance of the programme services for the organisations.**

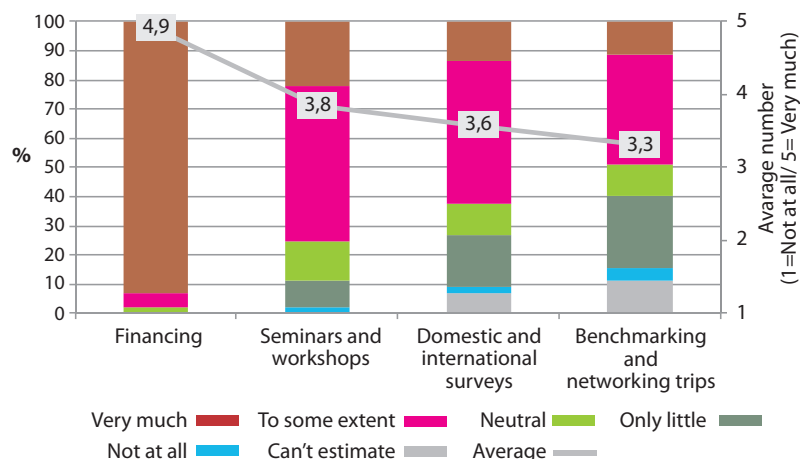


participants were asked questions concerning the importance and usefulness of the financing and seminars and workshops from their organisation's point of view.

"The utility of seminars was that you met some Nordic colleagues, although you meet them at other international conferences anyway."

For the domestic programme's participants, financing had been the most important programme service. It had also been the most crucial service for the Nordic programme participants; over 84 percent estimated it as very important service. Seminars and workshops were also seen as an important programme service, to some extent; in the interviews, the importance of seminars and workshops were not seen as important as financing. The case interviews pointed out that, for most of the research organisations, the content of seminars and workshops were too general, although they were seen as good networking opportunities. However, it was also stated that participants knew each other from the past, as the research community is relatively small in the Nordic countries.

**Figure 13. Usefulness of the programme services for the organisations.**



### NORDITE, EXSITE, INWITE programmes

Most of the organisations (77 percent) that responded to the electronic inquiry participated in the NORDITE programme and approximately 25 percent participated in the EXSITE programme. There were no answers from the INWITE programme. The total number of

answers was 13. The low number of responses is explained by the long time-frame of the evaluated programme. The highest response rate came from the newest NORDITE programme, which started in 2005, while the INWITE programme, which took place in the late 1990s, had no answers at all. From the three Nordic cooperation programmes,

The usefulness of the programme services was seen in almost the same way as importance, with financing being the most useful programme service to the participated organisations. Only a few of the respondents could not estimate the usefulness of financing. Seminars and workshops were also seen as generally being a useful programme service, though not as useful as the financing.

Figure 14. Importance of the programme services for the organisations.

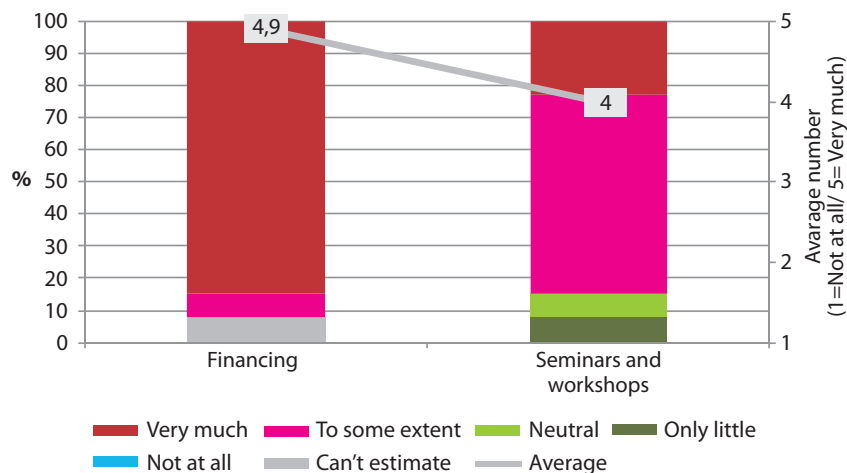
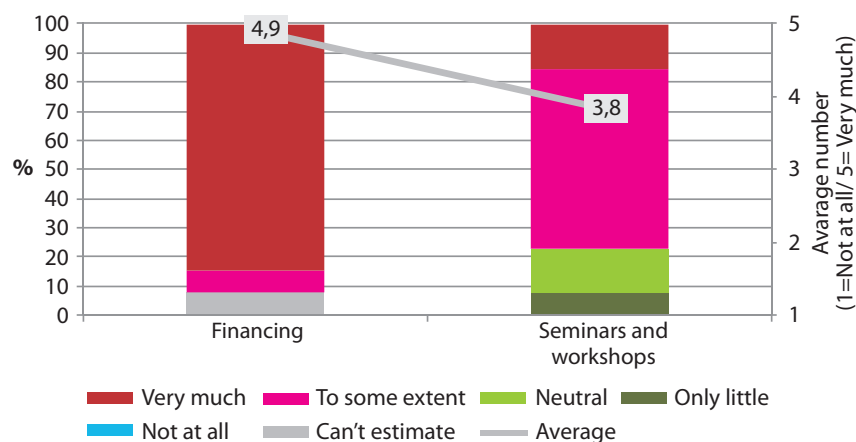


Figure 15. Usefulness of the programme services for the organisations.



In general, case interviews and the survey pointed out that financing is the most important programme serv-

*"Seminars and workshops are generally useful, if they are somehow focused."*

ice that Tekes' had in all of the ICT programmes; this result was a more or less expected. Other programme services were seen more as good opportunities to network and get to know other projects and researchers rather than essential support for organisation's operations. Most of the criticism aimed at the

seminars was due to the lack of focus; the seminars' agendas were too general for most of the interviewees.

According to the surveys, the seminars were considered quite useful. However, as the programmes' project portfolios were rather broad, the participants also agreed that the added val-

### Case NORDITE: "A very nice initiative"

"We participated in NORDITE through one research project. I personally found the programme very appealing and it also aroused enthusiasm among our partners.

Although the study itself was not strategically that significant, it provided a good starting point for generating further cooperation and projects. It also improved our position in the research field, both nationally and internationally, by strengthening our project portfolio, and it resulted in hiring more employees to this field of research.

This programme was one of the first occasions in which there was real and concrete cooperation that continued after the programme. In my opinion, this programme had a very strong impact on both domestic and international networking. We presented our results to the international research community and they were received well. This project has also led to several new cooperation partnerships. Also, the results were utilised by the companies that were present in the company board – a manufacturer will actually introduce a new technology this year based on one of the ideas developed in this project.

From my point of view, this was all in all a very nice initiative. Parallel development projects, lack of cooperation and duplication of research results waste a lot of resources. Nordic and European projects strive to bring actors together. The NORDITE seminars were a good example of an opportunity to hear what others are doing, which can also prevent duplication.

In a European context, the competition is harder, but at the same time it increases critical mass and support if you are successful. Still, I feel that the similar conditions and industries of the Nordic countries justify Nordic cooperation. However, the focus should be on coordinating these different programmes.

I would like to stress that, in my opinion, the idea of NORDITE was very good and the programme should, if possible, be continued in connection with both national and European funding. This programme provided possibilities for those companies that are not ready for the competitive European market but want to 'rehearse' in a familiar environment with simpler rules."

*- A research organisation that participated in NORDITE*

ue of the programme services was rather modest. Although the seminars and workshops were considered interesting, it was also stated that the programme

services provided an opportunity to discuss with colleagues and see what they are up to, more on "a nice to know" than a concretely useful basis.

### Conclusions

In summary, the most significant differences in the participators' opinions were formed between SMEs, research organisations and large companies. Enterprise representatives were critical of the programme's seminars for being too theoretical; correspondingly, research organisations criticised the lack of depth in the agendas. This contrast is explained in the participators' different kind of aims; enterprises were focused on developing new products rapidly, and research organisations were concentrating on long-term research work.

**"Programme events have been okay, but they are more important to the small companies than research organisations; we know what happens in the research world anyways."**

*- Research organisation*

Also, the scopes of the five programmes were rather wide, which meant that different projects within one programme concentrated on different kinds of research topics. The divergence of the organisations' aims and functions was also revealed in the usefulness of Tekes networking services. Although, in general, all organisations pointed out that the seminars and workshops help to advance cooperation, it was much more important for the SMEs than research organisations and large companies, which already had wide connections in the ICT field. Tekes seminars and workshops were also seen as important

opportunities to meet young and new professionals. Even though the Finnish ICT community is rather small, there are always new 'rising stars' coming through. International and domestic benchmarking trips were important to some participants, but insignificant to almost the same number. Those interviewees who had been on Tekes international benchmarking and networking trips were satisfied with the value

gained. The message from the case interviews was that Tekes should develop more international connecting activities because ICT markets and cooperation are international. For some interviewed project leaders, however, Tekes' role as an international operator was not so obvious; Tekes was seen more as domestic organisation. This indicates that Tekes' international services are not so well known in the target

group. The combining factor was that the Tekes funding was an important element for the participating organisations. This is not surprising if one considers Tekes' role as a funding organisation. As a conclusion from the observations, the programme services has been more important and useful to SMEs than for the bigger organisations.



# 5

## Results and effects

### 5.1 Results

Tekes programmes are intended to improve business and research activities in the participating organisations. All participating organisations have at least some objectives to achieve from the programme, whether they are economic, commercial, technological, etc. The objectives of each of the programmes are described in Chapter 2.

#### Observations

Different types of interviews were used to evaluate the realisation of the goals that organisations set. An electronic survey was sent out to the participants of the five programmes. Three separate surveys were created: one for the participants of GIGA and/or NETS; one for the Finnish participants of NORDITE, EXSITE and/or INWITE; and one for the Swedish and Norwegian participants of NORDITE, EXSITE and INWITE. In addition, more than 20 case interviews were conducted in Finland, Sweden and Norway with the programmes' participants. The overview of the results and the programmes' other impacts on the organisations were also analysed.

#### GIGA and NETS programmes

Generally speaking, almost all the participating organisations achieved nearly all the goals that they have expect-

ed from the programme. In particular, technological objectives were achieved and, in some cases, even exceeded. Nearly all economical and commercial objectives were also achieved. Only a few of the organisations did not achieve all of their technological and economic objectives. There was no significant difference between the answers of GIGA and NETS programme participants (Appendix 3).

Programme participants were asked what were the most important external factors that affected the achievement of their goals. The pro-

"The 2008 depression hit like lightning; everything stopped"

gramme's timing and relation to the market development, along with new cooperation and networks were the most important factors in achieving the goals that organisations had set. For over quarter of the participants, timing of the programmes and building cooperation networks had an important influence on much of their operations. The general global economic trend had a reducing factor for some or-

Figure 16. Achieved objectives in the GIGA and NETS programmes.

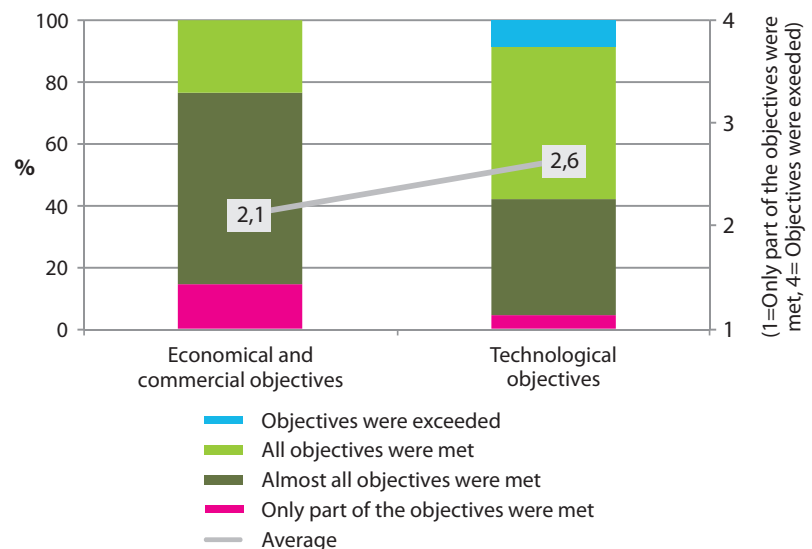
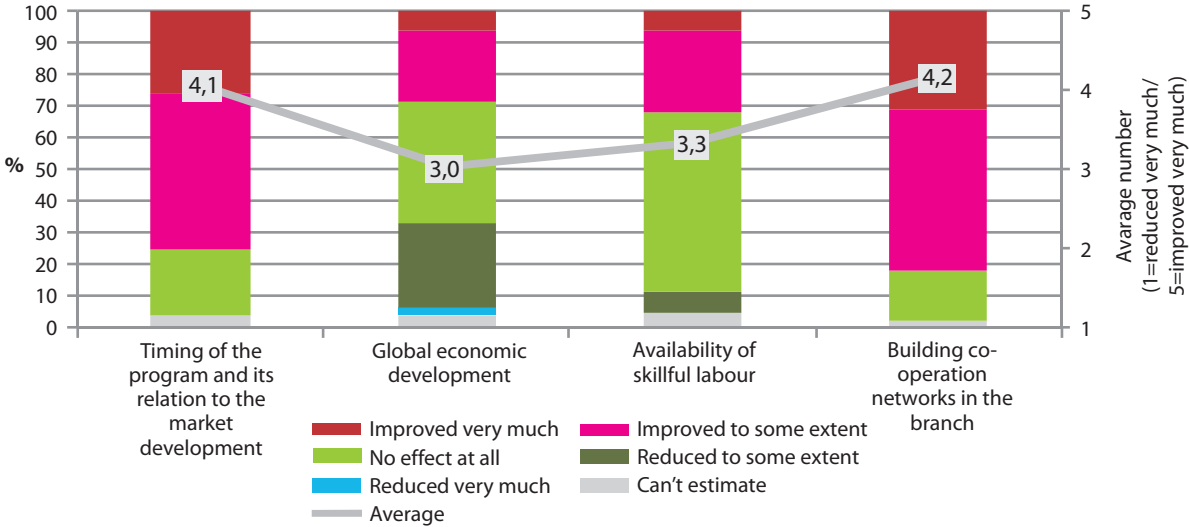


Figure 17. Factors that effected organisations' abilities to achieve their goals.



organisations, though for others it was an improving factor. The same divergence can be seen in the question about the availability of skilled labour. This contradictory influence results from the fact that some organisations benefit from the economic depression at same time as it causes damage to others. There was no significant difference between the answers of the GIGA and NETS programmes (Appendix 3).

Targeted survey data about the other impacts of programmes were collected from the participating private companies; 42 percent of all GIGA and NETS electronic inquiry participants were private enterprises. These questions were not asked of the research organisations because of the business-oriented focus. Programmes' impacts on the research organisations were

*"We created a product that is unique in the world."*

mapped by case interviews. One of the programmes' most significance impacts was that a majority of the participating companies did develop something new that would not have been created without the Tekes' ICT programmes. Programmes had been especially important for boosting small and medium-sizes companies' research and development activities. The role of the research and development operations did increase in most of the participated companies due to the programmes. The majority of the companies also evaluated that their economic competitiveness increased due to participation in the programme. Nearly all of the companies had at least some positive impacts from participation. Only a few companies felt that the programme impacts were modest. The only major difference between the answers of GIGA and NETS participants were that they stated that GIGA supported the business of the participating companies

more than the NETS. Otherwise, there were no significant differences between results of the survey (Appendix 3). Although the influence of the Tekes programmes on the participating organisations varied from case to case, a common factor was that the support of the Tekes programmes was essential for many SMEs to continue through the deepest times of the economic recession. The case interviews pointed out that the programmes ensured research work and risk-taking in spite of economical turbulence for many small companies. The research organisations respected that there was funding available in the darker economic times. Case interviews indicated that the aims were not set technologically high in the project, which explains why the results were modest, at least from the research organisations' point of view. Nonetheless, some smaller companies did achieve technological results from which they could benefit economically.

Figure 18. Programmes' other impacts (question only for the companies).

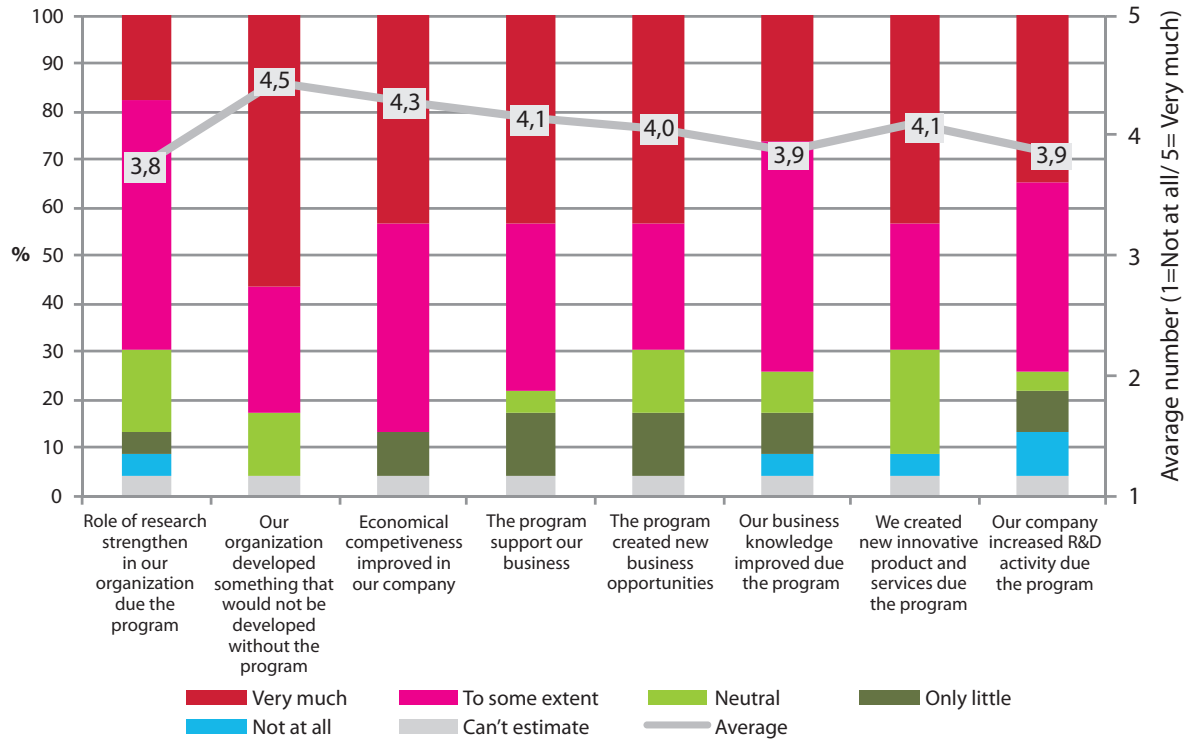
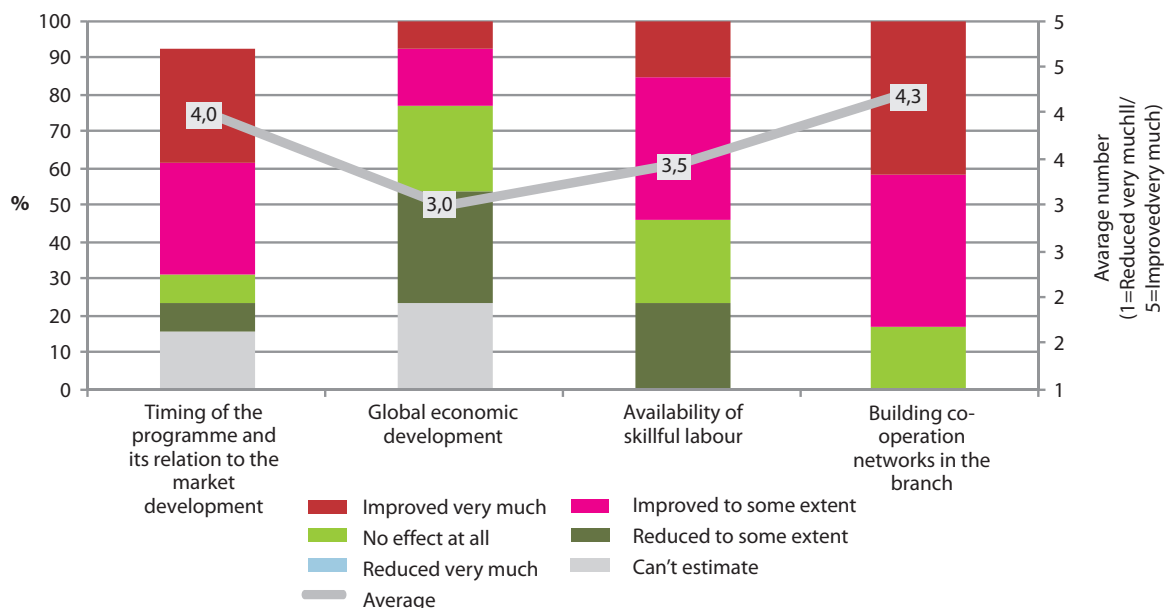
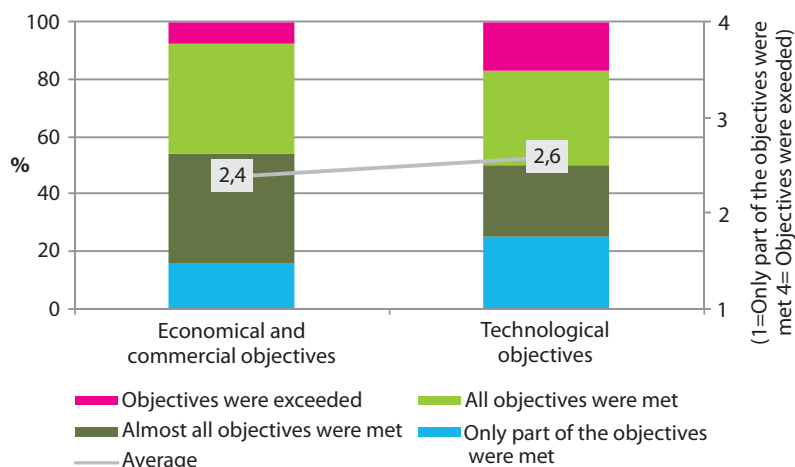


Figure 19. Factors that effected organisation's abilities to achieve set goals.



**Figure 20. Achieved objectives in the NORDITE, EXSITE, and INWITE programmes.**



### NORDITE, EXSITE and INWITE

The essential difference between the NORDITE, EXSITE and INWITE programmes and the GIGA and NETS programmes are that the three former ones were only for research organisations, while the latter two were also for private companies. NORDITE, EXSITE and INWITE were also Nordic cooperation programmes. For the participants, building new cooperation and networks were the most important factors for achieving the goals that organisations had set in the programmes. The timing of programmes and relation to the market development were also factors that essentially improved the organisations' ability to carry out the project successfully. The general global economic trends had varying effects on the organisations; for some it was reducing, and for others it was an improving factor. The observations concerning skilled labour were also varied. This is explained by the long time-frame on the projects and that the

recession did not affect research organisations in the same way that it affected the companies.

The participating research organisations achieved almost all of their goals. In particular, technological objectives were largely achieved and, in some cases, even exceeded. Almost all of the economic and commercial objectives were also achieved. Only just over 10 percent of the organisations did not achieve all of the goals for which they had aimed.

### Conclusions

As the most important conclusive notice concerning the results, it can be stated that the participating organisations achieved nearly all the goals they had expected to gain. All organisations in the GIGA and NETS programmes, as well as those in the three smaller ones (NORDITE, EXSITE and INWITE), managed to achieve the goals, both technological and economic, quite well. One

of the programmes' most important impacts was that a majority of the participated organisations, especially the SMEs, did develop something new that would probably not have been created without the Tekes' programmes. The biggest difference between the participating organisations in NORDITE, EXSITE and INWITE, and those in the GIGA and NETS programmes, was that the former ones were only for research organisations, while the latter two were also for private companies. This explains the kind of goals that organisations achieved and how various phenomena have influenced them. Case interviews pointed out that, in many cases, Tekes' support was essential for the SMEs to survive the financial crises. In general, Tekes' ICT programmes have been particularly important for the R&D activities of SMEs. The impacts of the recession varied among the companies: for some companies, economic recessions create opportunities, while for others they cause damage. Research organisations were able to focus more on long-term research work than companies operating more under the business laws, which is why financial crises and other external impacts do not affect their activities to the same degree. The results of the programmes are not always yet visible. Different programmes started at different times (for example, some GIGA programme projects are still continuing) and programmes have differing objectives. The projects' different aims also show in the character of their results; research-oriented projects achieve more knowledge-based results and business-oriented projects achieve more commercial products.

## 5.2 Impacts

### 5.2.1 Investments on R&D

The ICT sector's R&D personnel have accounted for almost half of the entire Finnish research and development personnel in recent years. According to Statistics Finland, the number of R&D personnel increased in the late 1990s and became stable in the early 2000s. These statistics do not reflect the impact of the latest economic recession.

*"Without Tekes' funding we could not do so much R&D work – the impact has been important."*

*– Research organisation*

*"Participation was maintaining R&D activity more than increasing it; though we did invest more of our own money than we first planned."*

*– Research organisation*

*"R&D personnel has partly reduced due to the economic depression and partly because of subcontract deals; Tekes funding made subcontracting possible."*

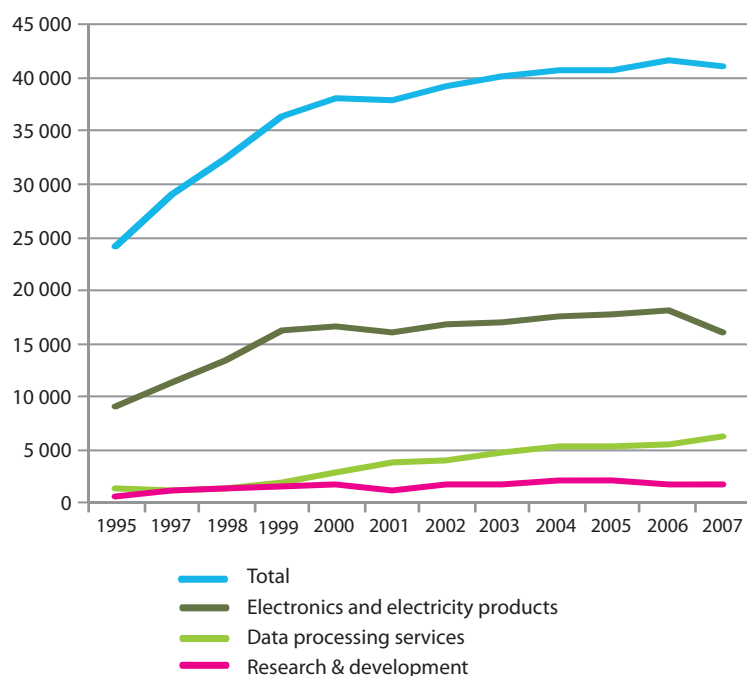
*– Company*

The impact of Tekes ICT programmes on the participating organi-

sations' R&D activity was measured by interviews. In general, companies and research organisations estimated that Tekes programmes boosted their research and development activities, al-

though the dimension of impacts was diverse and varied between participants. In particular, SMEs estimated the impacts to be very important for their R&D functions. Research organisations and large companies did not see the effects on the research and development functions as being as significant as smaller counterparts, although the impacts were estimated to be positive. Participating organisations used Tekes funding in various ways. For many organisations, the purpose of the programme participation was more to maintain existing R&D activity than for the funding to add any new research activities. In some cases, the programmes' funding terms regarding cooperation with other organisations led to part of the R&D functions being outsourced to subcontractors. Some organisations had certainly also strengthened their own activities by hiring new personnel. There is no coherent conclusion as to how organisations have invested in the R&D activity due to the programme participation; it all depends at the case. For example, the R&D activities of small companies runs entirely on Tekes funding, while research organisations' Tekes funding is only one potential source of money. Tekes funding was seen as a key element for starting up companies' R&D projects. However, in addition to the programme participation, there were other major factors that had an impact on the organisation's R&D activity investments, not least of which was the 2008 economic recession.

**Figure 21. R&D personnel in Finland.** Source: Statistics Finland



### 5.2.2 Development of expertise, doctoral-education, knowledge clusters

The number of ICT sector graduates increased steadily during the early 2000s. Despite the absence of statistics from the last three years of the decade, it is expected that the number of graduates has increased since the 2007 statistical year. The amount of vocational school education has been stable through the time-frame of this analysis. The number of master's and polytechnic degree graduates has seen the greatest increase, with the number of graduates more than doubling in the last seven years. The popularity of bachelor's degrees has increased most in relative terms; in the last seven years the numbers of graduates has decupled, though it is not the most favoured ed-

Figure 23. ICT sector graduates by labour affair. Source: Toimiala Online

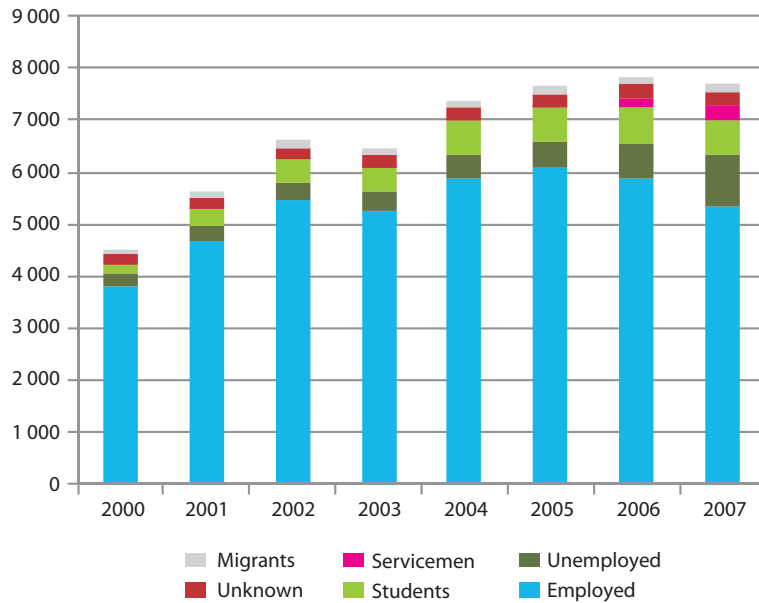
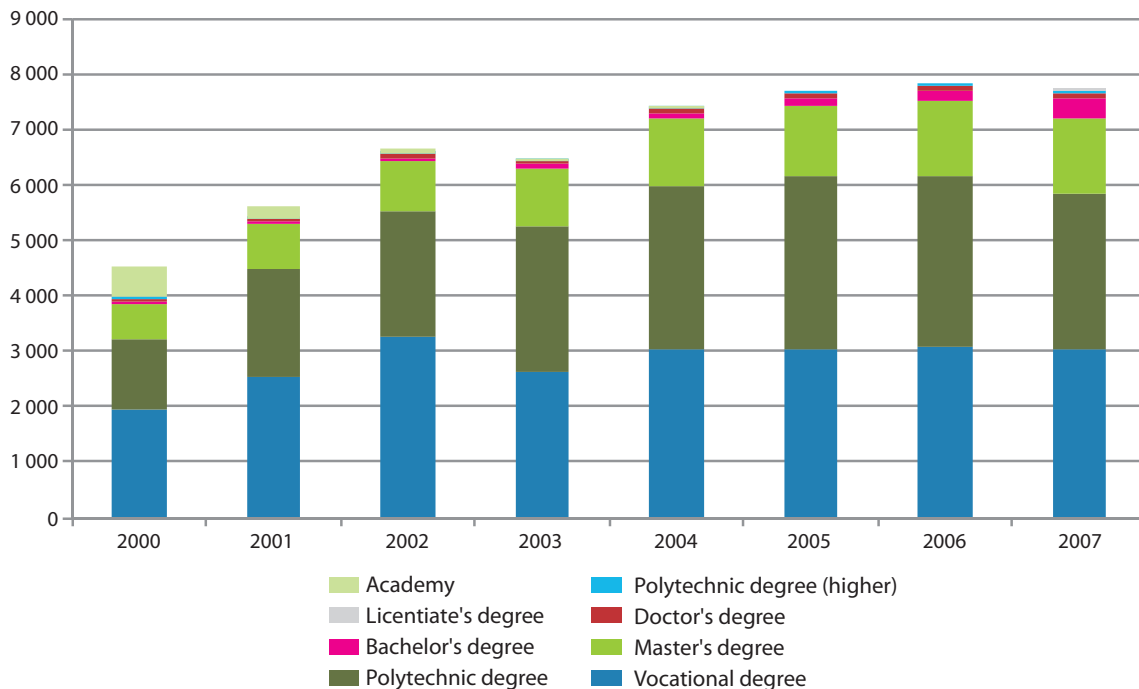


Figure 22. ICT sector education graduates by degree, 2000–2007. Source: Toimiala Online



ucation degree in absolute numbers. The amount of higher degree graduations has been more stable during these years. One exception is that doctorate degrees have increased in popularity by almost 20 percent over the last two years.

ICT sector graduate's labour situations have changed negatively in the past seven years. The number of graduates has increased but, at the same time, it has become more difficult to gain employment. The portion of employed people has reduced by approximately 12 percent from its peak in 2005. At the same time, the number of unemployed people has increased and, in the past seven years, the level of unemployment among ICT sector graduates has quadrupled. The number of students

has also grown due to the increased popularity of post-graduate studies. Despite the increased unemployment, the migration of graduated people has not increased in the past seven years.

Most ICT sector graduates have traditionally been employed by information and communication and manufacturing companies. In recent years, employment of these lines of business have reduced rapidly, most likely because of structural changes in the manufacturing business. Despite this, these lines of businesses remain the largest employers in the Finnish ICT sector. Correspondingly, administrative and support service activities have increased steadily in the 2000s, while professional, scientific and technical activities have also employed an increasing number of

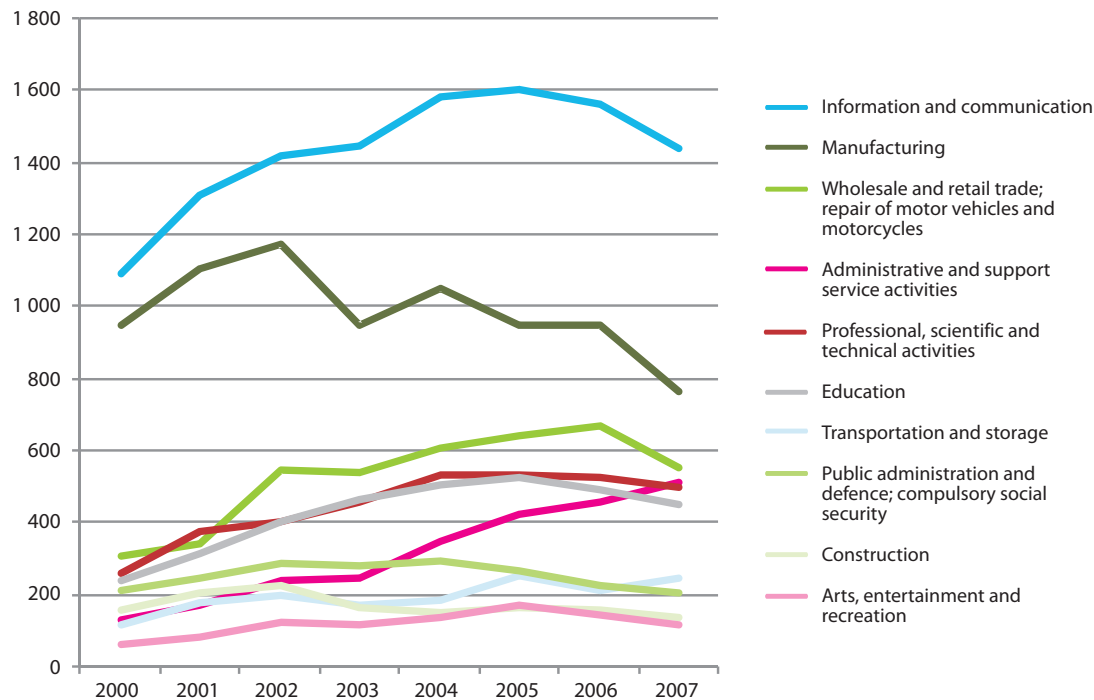
graduates. Other lines of business have not undergone any major changes during the examined time-frame.

*"We gained knowledge and professionals from the project, but due to the internal structure changes, most of them are no longer working here."*

*- Company*

The core message from the case interviews is that the knowhow always increases when an organisation cooperates with others in projects of this nature. Even though a project may fail in a business sense, it can be technological-ly successful. The majority of the organisations received a knowledge boost

**Figure 24. ICT sector graduates by line of business.** Source: Toimiala Online



from project participation, although it was difficult for them to retain individuals. The Tekes funding and programme services have ensured long-term research work for many interviewed organisations, thereby increasing the organisations' knowhow. Comparing participated organisations' visions on knowledge absorbing, SMEs were more satisfied than research organisation, which in many cases described knowledge changes in the programmes as business as usual.

Numerous theses were produced in the projects, both master's and doctorate degrees. Despite numerous research projects, a conclusive assumption about the number of theses cannot be made because this information is not comprehensively gathered from the participated organisations. Although Tekes programmes supported and boosted the knowhow of the participating organisations, there were many other variables in the big picture, which makes it hard to indicate the programmes' influence on the organisations' professionalism.

**"We didn't recruit new personnel but we trained professionals from our own students and post-graduates."**

*– Research organisation*

### 5.2.3 Transition of experts between the actors in the branch

According to the case interviews, experts – quite understandably – shifted from research organisations to private companies more often than the other way around. Case interviews also indicated that people who made theses as

**"It's all about business cycles; when is the best time to move on?"**

*– Research organisation*

part of the projects did employ particularly well to the private companies.

The majority of the interviewed organisations estimated that economic cycles are the most important factor that influences an organisation's ability to recruit and keep experts on their pay list because professionals move between organisations depending on their general economic situation.

**"Experts tend to leave to private companies as soon as they get their diplomas."**

*– Research organisation*

Despite the universities' desire to keep a certain amount of doctorate level professionals on their payroll, interviewed university representatives were realistic about their economic resources and their role as educators. Research organisations cannot afford to keep all the professionals that they have educated. For most of the research organisations, this is an accepted fact; in fact, for some it was one of their goals. In many cases, the private sector was a more tempting option for graduates. The general

**"Some went to the private sector and investor organisations, but this has also been our goal. Some people fit better with long-term research work and some for short-term business work."**

*– Research organisation*

vision on the transition of experts between the actors was positive; transition happens all the time and individuals have their own reasons to move on. The influence of Tekes programmes on the expert transition is hard to estimate because it is normal phenomena; the causal connection is hard to point out.

### 5.2.4 Development of national and international networks

To some extent, Tekes' ICT programmes developed national and international networks between participating organisations. Case interviews pointed out that in most cases, programme participation deepened existing networks rather than created new ones.

**"We had cooperation with Swedish organisations in the 1980s, so networks did exist before the programme"**

*– Research organisation*

Almost all of the interviewed organisations had, to at least some extent, already cooperated with the organisations they worked with within the programme. According to the case interviews, programmes managed to network better with SMEs and research organisations than with larger enterprises and universities, which usually had existing networks from previous operations. In general, programmes did advance networking and, in some cases, even created new ones. For example, one medium-sized company made great new connections with several research organisations during the programme, which are still active. Having said that, in most cases the networks already existed.



Tekes' role as a networking organisation in Finland was well recognised, but it is not so well known as an international networker. This is explained by the fact that most of the interviewed case projects were not Nordic cooperation projects. Despite that, most of the organisations did not have international cooperation in their projects. Also, NORDITE, EXSITE and INWITE programme participants pointed out that the networks already existed before the project.

*"Domestic networking has formed but Tekes does not offer any assistance to the international networking; in this case it has actually gone the other way around."*

*– Company*

### 5.2.5 Procedures of organisations

The impacts of Tekes' ICT programmes on the participated organisations' procedures varied. Programmes had a lot of impacts on the SMEs' strategies and procedures, unlike the large organisations, which were virtually unaffected by the programmes. This can be

*"Company's procedures are self-made; project financing does not change it at all."*

*– Large company*

*"The programme had a huge impact on the company's strategy; our key products were designed in the project."*

*– Medium-sized company*

explained by the fact that individual projects are not so significant to the large research organisations and companies that have numerous research projects on the go simultaneously. For SMEs, however, these kind of research projects are essential opportunities to develop new products. Many of the minor companies designed their key products in the Tekes-funded projects and, because of this, the whole company's strategy and procedures were formed at the same time. Tekes' research projects are especially important to small organisation from economic, strategic and informational perspectives, and these are the organisations upon which the programmes had the greatest influence.

### 5.2.6 Notable innovations

According to Statistics Finland, the ICT sector (electronics, software, computing and consultancy) invested over 3 billion Euros in research and innovation work

in Finland in 2010 which is over 60 percent of all private investment.<sup>22</sup> This also shows in the number of new patents. According to Statistics Finland, ICT sectors' share of total patents in Finland has been approximately 30 percent in the last few years. The amount of ICT patents was highest in 2001, when it accounted for almost half of all company patents.

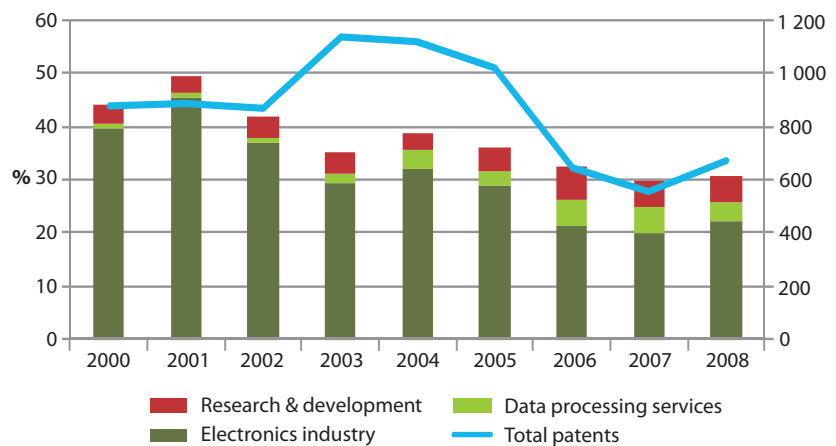
*"We have developed tools for the telecommunication network testing, also we have applied few patents and made business products due the programme but it is too early to say anything about the new innovations. It is long way from the research work to the final product."*

*– Company*

Tekes has been a notable and well-known funder of new innovations in Finland. The absolute number of new innovations or patents created

**Figure 25. Number of companies patents (total), and portion of ICT patents.**

Source: Statistics Finland



<sup>22</sup> Statistic Finland – <http://www.stat.fi/index.html>

in these programmes is difficult to analyse due to the lack of coherent data, as this information was not comprehensively collected from the participating organisations. The aims of research organisations and companies regarding research work was often contradictory, with the most essential difference being that research organisations focused on long-term research works and companies concentrated on developing new business products. According to case interviews, because the programmes' value for research organisations was more about having new knowledge and research work continuum, they did not necessary even try to develop patents. In fact, it was also claimed that research organisations avoided patent applications because they felt they were a waste of time and money given that research organisation patents do not have any value. This differs from the SMEs, which developed their key business product in the cooperation projects. Programmes' reports also indicate that patents and research reports were applied for in large amounts. The exact number of patents cannot be provided due to the lack of data. However, the GIGA and NETS programmes applied for thousands of patents and research reports. According to the GIGA programme's leaders: alone in the GIGA programme over 1000 patents were applied, normally approximately 3600 patents are applied through Tekes programmes, in this perspective, the number of patents applied in the GIGA programme is significant. New innovations and patents have also a significant role in the perspective of a standardi-

sation. For example the GIGA program, and patents that were developed in the program, had large-scale influence

to the new LTE-technology (Long Term Evolution<sup>23</sup>) development. More about standardisation in the chapter 5.2.8.

### Financing a large international company

"We take part to the Tekes programmes almost always when they are asking us to participate. The content of the projects that we had in the programmes was totally self made, research themes come always from the needs of our own company and the projects' goals have been in the focus of our research strategy for a long time. In the ICT field the research work is in a constant change, technology is continuously developing and you have to create something new all the time. This is a fact that companies have to live with. The tightened global competition is also changing our business environment rapidly and this trend is only escalating.

It is hard to estimate what our company's research work would be without Tekes programmes and finance. Surely we would not be the market leaders in the LTE-technology what we now are, and we would not probably have so comprehensive research work that we now have. Tekes finance and programmes have allowed us to have better risk taking in the long-term research work.

In the projects that we had in the programmes we developed a few hundred research patent applications and advanced our previous research work in the ICT field. Normally one research work takes approximately 2–3 years to complete. After this the prototype that we normally create in the research work goes to the product development unit before we have the final product. This takes also a few years, and before we can start to manufacture the products we have to clarify manufacturing practices etc. So the way from the so called innovation to the product is a long and consists numerous of small steps. Our research work is a long-term continuum of previous and present work, surely we have some individual smaller parts in our research table that we can finish in shorter period, but generally this is nonstop technological evolution.

Absolutely the best that Tekes programmes can offer to us is the networking opportunity with universities and SMEs. This way we have a change to look the research topic in three different perspectives and use the strengths of different actors. SMEs are offering open-minded capacity and flexibility that we do not have, large companies tend to be bureaucratic, they are useful in the implementation work and building prototypes etc. Universities and research organisations have the knowledge that we do not have in our company, they are masters in the theoretical research work and developing new ideas. This networking and cooperation is the best that Tekes is offering for us in the innovation work."

*- Large company participating in the programmes*

<sup>23</sup> Also known as 4G-technology

“Researched topics in the ICT sector are part of wider and complex picture which why it is difficult separate which innovations are new and which are just continuum of long-term research work.”

– Research organization

It is hard to evaluate how many of these applied new patents were actually generating new business products. According to case interviews, participating organisations did develop a lot of new results in the programmes, but in most of the cases research work was more like a continuum of previous development work, or participation in the programme was only needed in order to finish the previous research work. As in many other impact categories, the greatest influence of the programmes was on the innovation work of SMEs. Programmes also had effects on large companies and research organisation, but in many cases they could not separate the research work done in the Tekes’ programme and previous research works from each other.

### 5.2.7 Economical performance

The impact of the Tekes’ ICT programmes on the economical performance of the participating companies is estimated in this evaluation through financial analysis and case interviews. In this analysis, which only observed SMEs, the companies’ general economic performance is compared with the performance of companies that participated in the programme. Companies’ economical performance and profitability in the statistics is examined by four main indicators: average revenue, average business prof-

it, average personnel and average profit of invested capital. These four indicators are giving an overall picture of the company’s economical performance due the programmes time-frame.

There have been many structural changes in the participating companies over the 10 year time frame; companies have combined and gone bankrupt, etc. Partly because of this, and because of the fact that financial data about companies’ performance is not available from every year, there are some factors of uncertainty. For this reason, the number of companies varies in the analysis from year to year. Along with companies internal changes there has been two major depressions during this period of time. The incoherence of the available data and economical turbulences makes it challenging to reach comprehensive conclusions on companies’ economic performance or to indicate the effect of programme from statistics without the possibility of miscalculation. The following financial analysis is, therefore, more illustrative than exact.

Over the last 10 years, the average business profit of the companies that participated in the GIGA and in the NETS programmes has followed the general trend of all business branches. There have been only two major declines in the generation. The average business profit in the NETS programme’s companies dropped in 2001, and the GIGA companies experienced the same kind of decrease in 2008. This development is impossible to explain precisely on the available data. One explaining factor might be the investments made when companies join in the programmes; for the rest of the time-frame, the average net profit followed the general business profit trend (Appendix 4).

There are no major differences either in the average business profit between participated companies and the selected ICT branch of businesses (Appendix 5). The overall conclusion is that there are no significant differences in the average business profit trends between the participating companies and ICT companies that did not participate in the programmes. Average number of personnel has not differed from the general trend either; after all, the average size of the participated companies’ personnel is higher than the general size of Finnish companies (Appendix 6).

The average revenue of participated companies in both programmes has been downward trough the 10 year time-frame (Appendix 7.). The biggest decline has settled down in recent years. During the observed period two major depressions has heavily affected the ICT sector and the participated companies. According to the statistics, the average profit of invested capital in the participated companies has increased over the 10-year time-frame, especially in the NETS programme companies. In the case of GIGA programme companies, the trend has not been so positive; after the programme’s start-up, the average profit decreased significantly and has not totally recovered. The average profit of invested capital is lower than the general average in the participating companies (Appendix 8.).

The financial analysis is not comprehensive, and it is only explains companies economical development in the narrow perspective, there are lot of other variables and changes that does not show in the statistics, and this why the analysis describes more the overall economical trends in the ICT sector.

“The programme has been very important; we could not develop our product without the funding. Our company is not profitable yet, we are running with investor money.”

– Company

According to the case interviews, SMEs estimated the programmes’ impact on the company’s economic functions as being very important; in many cases, participation was fundamental for the company. It is challenging to evaluate the influence that the programmes had on the companies’ productivity and economic performance. In many cases, projects were long-term research work and the economic impacts could not necessarily be seen. It is not possible to indicate any significantly different overall economic generation from the statistics. Despite this, the case interviews confirmed that programme participation was very important to the SMEs’ economic performance.

### 5.2.8 Business opportunities with the help of standardisation

According to the case interviews and workshop discussions, standardisation has a huge effect on the companies’ business opportunities. Standardisation is especially important in the platform design; cooperation is smoother between companies in the general platform design than in service design. Standardisation is not yet so important for content design, but it is expected to

## GIGA: Standardisation opened new markets

We have had a few projects in the GIGA programme, and before this we also participated actively in the other programmes. In fact, we received start-up funding a few years ago from Tekes.

The research projects that we had in the GIGA programme have mostly been our own projects, though we have used subcontractors and partners to some extent. These projects have been especially important for us because 90 percent of our company’s research work has been made through these projects. The programme participation enabled us to increase our R&D&I activity by approximately 50–70 percent.

We have created a product that is unique in the world, which is a result of our research projects. Another major factor, along with Tekes’ research funding, has been the changes in US regulations that hospital WLAs should be monitored, which has opened new markets for us. It is also expected that this law will come to Europe in some form or other.

At the moment, most of our customers are still in Finland but we have started to export our products. The financial crisis has slowed our growth and export plans but now everything is looking better, although we are still running on investors’ capital.

Cooperation with Tekes has worked well and our company would not exist without Tekes funding. As a development proposal, Tekes could be more active in the international field; for example, they could cooperate with foreign capital investors. Tekes’ funding kit is also very complex, new entrepreneurs would need more guidance, and there should be more information about the kind of funding that is available to companies in different development stages.

– Company participating in the programme

be in the future. One workshop participant described that cooperation with others is possible in platform design, but not with market products that are designed for consumers. Interviewed professionals pointed out that standardisation is opening new business opportunities for them. Large companies

in particular have a significant interest in standardisation, and they are also investing in it, while small companies do not have so much recourse to this work and research organisations are not so interested in doing it.



### 5.2.9 Broad impacts on the business sector

The impact of Tekes ICT programmes on the ICT business sector, in a broad sense, is difficult to point out, while an accurate causal relationship is almost impossible to identify. Obviously, the impacts have been positive, but the amount of influence on the chances on business sector is hard to estimate. Although that the programmes' effectiveness to the participated companies is obvious, the Finnish ICT sector has gone through major changes in the last 10 years due the financial crisis, the ICT boom, market changes, etc. This is why the programmes' impact on the whole sector is difficult to identify. ICT programmes have guided the research work through programmes' focus areas. In some cases, interviewees criticised the fact that the programmes were designed too heavily by the inter-

ests of Nokia and other major operators. Despite this, the biggest impacts on the ICT sector have been on the steering of research works.

### 5.2.10 Conclusions

The visible impacts of the Tekes' ICT programmes have mostly been on the level of individual SMEs. The programmes have undoubtedly also had an effect on the research organisations and large companies, but they are not as visible as they are in the SMEs. On the level of the whole ICT sector, the impacts are mostly visible on the focus of the research projects, although the focus of the programmes has been rather wide. The five different ICT programmes have been a long continuum of ICT research. This is something that also shows in the impacts; in many cases, results that are developed in the earliest programmes formed the bases of the new projects. Despite the fact that

new innovations and market products did manage to develop, the biggest impact was the input to the general research work, and especially the continuum of research. The results of R&D are not necessarily visible in a short period of time, but they do represent important groundwork for future research works. In recent years, the ICT sector has undergone major changes, which is something that will change the focus areas of ICT sectors markets and research work in the future. As is the case in many other business branches, the ICT sector is also undergoing continuous changes. It is not relevant to mention individual innovations made in the programmes, although there are plenty of them; the impact of the programmes will be shown in the ICT sector's future R&D&I work through the increased knowhow of the organisations.

## Conclusions and recommendations

This chapter compiles the main points and conclusions from the report, as well as development proposals from the point of view of Tekes and research and innovation policy.

### 6.1 Conclusions and recommendations concerning Tekes

#### Programme management and programme services

The management systems of all five programmes were considered functional and well-suited for their purpose. All programmes were applauded for their simple, straightforward and communicative management system between the project participants and the management team. The Tekes experts also received excellent appraisals regarding their work in all five programmes. The management structure was well tested and it followed closely the traditional lines of programme management of Tekes. However the role and objectives of Tekes programmes were, in many cases, unclear, even for the organisations that had participated in the programmes.

The management boards of the programmes were considered to be both competent and active. In the national programmes the NETS' manage-

ment board had a bigger role in managing the strategic choices than GIGA. The participants of the GIGA management board were partly frustrated with their role. The concern that the roles of the funder and the project actor would get mixed if the management board would have more to say to the decisions has hindered the role of the boards.

The programme services – that were mainly very typical for Tekes programmes – were evaluated as useful and well operated. Also, some new services were introduced in GIGA, mainly concerning the promotion of SME participation and enhancing international networking. Despite the efforts that focused on getting new SMEs to participate in the programme, the objectives were only partly met. It appears that SMEs as a target group are very challenging and require some special methods and resources. The international services were only partially known among the organisations. In the Nordic programmes, some operative issues hindered the implementation. These were mainly due to the different criteria the three countries had set for the projects, as well as some problems with the coordination of the timing. The collaboration in Nordic countries was described as hav-

ing functioned rather well. However, the cooperation and services to promote it remained quite narrow. There would have been possibilities for more intense networking to find more mutual interests.

Since there was a continuum of two and three programmes of each programme line – national and Nordic – there could have been more analytical evaluation of the operations that had worked and what should perhaps have been changed or strengthened between the programmes.

#### Development proposals for Tekes

1. *The Nordic programmes should set their objectives at a more ambitious level.*  
Nordic countries are quite similar in terms of their socio-economic system and have a similar level of development of their telecommunications business. These facts could create a solid base for more interactive cooperation to upgrade research using the Nordic approach as a test ground.
2. *The role and the means of the managing board should be considered carefully.*  
The risk of mixing the roles of the actors is taken very seriously – as it should – but the role has part-

ly been to monitor the progress instead of actually managing at the strategic level. In order to avoid compromising the integrity of the management board, their expertise should be utilized especially in creating solutions that aim at solving the most common challenges within the industry by the means of programme services.

### The objectives and the results

The trend of national telecommunication programmes over the past 10 years has ranged from quite wide to more focused when evaluating the content of projects as well as the objectives. NETS' range of approved projects was wide and it was quite easy to get proper projects to match the set objectives. GIGA programme still covered quite a wide range of topical technical issues, but the focus of the programme was set so that there were done some major choices between current issues. However, the fact that the size of the national market and the number of actors is so limited always sets some challenges for the national programmes. So the GIGA programme had some difficulties in getting enough projects in some focus areas that required very special knowledge. This problem considered mostly the focus area "telecom business", which was meant to support the other more technical ICT focus areas. The themes of the focus area are still considered very important, also in the managing board of the next telecommunications programme Trial. Trial programme - Environment for Cognitive Radio and Networks, will take place in 2011–2014.

The evaluated telecommunication programmes were very successful in terms of achieving the objectives set for them. Results and impacts of the evaluated programmes are in many ways part of the continuum of programmes. Also, the participating organisations have in many cases taken part in two or more programmes so that the projects and results are just part of research and development that all has one main objective. In particular, the objectives of the Nordic programmes were seen as having been set at quite an easy level.

The question of innovativeness of a project and its objectives is relevant when funding projects. In typical cases, the projects are part of the participating organisation's normal work in research and development. And the work usually continues after the programme. In many cases, therefore, it is difficult or impossible to identify the exact role of one programme to the innovation as a whole. However, the evaluation results point out that almost all of the interviewed or answered organisations are very content with the technical results of the projects. The economic results were not achieved that often. This again shows that five years is a short period and that achieving set technical objectives is totally different from having the successes seen in the companies' business.

### Development suggestions for Tekes

**3.** *The objectives of the programmes should be focused.*

The more focused objectives and stricter focus of GIGA was seen as an improvement compared to its ancestor NETS. However, in the Nor-

dic programmes the advantages of networking were only modest since the projects had only little in common due to the loose definition of the programme scope.

**4.** *The focus of the funding should be on the SMEs because that is where the best impacts of the programmes can be achieved.*

Although the programmes have undoubtedly had an impact on the research organisations and large companies, the most dramatic effects are visible in the SMEs'. However, SMEs are a very challenging target group and require some special methods and resources already in the promotion phase of the programmes.

**5.** *The private sector actors should be integrated tightly to the programmes.*

The invested money is not always a powerful enough incentive to engage resources to the research done mainly by the universities and other research organisations. The tight connection between research organisations and companies enhances the connection of research and the actual market needs and, in this way, also the motivation of both actors.

**6.** *Specific programme operations should be aimed at SMEs in order to promote networking and development of business operations so that the effectiveness of funding would be maximised.*

Participating to a programme is often a big investment for SME and they would in many cases need specific help to maximise the outcomes of funding. The approved

projects could, for example, be offered a few days' consultancy, either for free or at a subsidised rate. This kind of evaluation of the company's business could also be mandatory for SMEs to make sure that they are able to conduct the project properly and, in particular, to make use of the outcomes.

## 6.2 Research and innovation policy

The strength of the evaluated national Tekes programmes has been the structure and criteria of the funding. It is essential that programmes with the objective of creating innovative technological solutions integrate the major international companies to the projects. The amount of funding is not necessary for the large companies in the same way as it is for SMEs, which in many cases describe the funding as the main condition for them. However, the criteria of the funding that large companies must involve some SMEs as subcontractors as well as research organisations in the R&D work funded by Tekes helps create the value chain. It can be said that the big companies do not necessarily need Tekes programmes but that the programmes need the big companies. Tekes uses the funding criteria to formulate a kind of intervention logic for the national innovation policy funding. The positive outcome of this funding model for SMEs and research organisations is not only the economic resources but also the knowhow of both technological knowledge and trends.

The value chain created in the programmes has built up new networks

and strengthened the existing networks. According to the large companies, the key value of the programmes is that the large companies can also cooperate in the field of research and product development. This was described as something distinctively Finnish; cooperation does not work this way in every country.

The establishment of the Finnish Strategic Centres for Science, Technology and Innovation (SHOKs), and particularly the TIMT (Tieto- ja viestintäteollisuuden tutkimus Oy), which is committed to ensuring the development of Finnish ICT know-how, has been somewhat controversial among the different actors. Some of the research organisations and companies in the telecom sector have high expectations about the outcomes of the TIMT. Many actors noted that the way of conducting Tekes programmes has been very much the same for so many years that it is definitely time for some new initiatives. However, many actors also had the opposite opinion, with one key point focusing on the future of the funding.

The need for research is widely accepted, by this is meant both basic research and applied research. The grounds for innovative activities are created by basic research, which is now basically conducted by the universities. Also, some of the projects included in the Tekes programmes could be described as basic research; at least, the Nordic programmes included some projects that the responsible research organisations regarded as basic. In light of the results of the evaluation of the Nordic programmes, it can be pointed out that

if the role of the companies remains weak, the connection of the results to the actual product development is rather poor and also quite demotivating for the researchers.

Digital agenda for Europe that is one of the Europe 2020 - the EU's growth strategy's flagship initiatives is one of the topical initiatives that is supposed to answer to the need for research conducted in the programme model. From Finland's point of view, the initiative would be interesting but that would of course not cover all the national needs. In particular, integrating SMEs to the innovation activities should require new initiatives on the national level. The EU programme level mainly concerns the large companies. The question is more on the subject of how much and what kind of research should be done on the national level and what should be the role of EU and other international programmes with regard to the work of national research organisations and SMEs. It can be concluded, therefore, what the role of the main national actors should be defined clearly.

### Development suggestions for the national innovation policy

- 7.** *The interaction between national actors should be ensured.*  
The tight network of SMEs, large companies and research organisations creates a value chain and enhances the national competitiveness in a way that should be ensured in the future as well.
- 8.** *The role of Tekes and other funders in the funding of the basic and applied research as well as what is the emphasis of those should be defined.*



One important role of the Tekes' public funding is to provide funding in the areas where the normal financial market fails. Neither should the role of Tekes be the funding of basic research. Therefore the responsibilities concerning basic, applied and market-end research should be clarified, especially in the telecommunications industry.

**9.** *In the projects of applied research, the role of the companies should be prominent enough to integrate them to the projects.*

If the companies do not have any role as a funder, their role has to be emphasised some other ways to keep the companies motivated.

**10.** *Tekes should take a stronger role on the EU-level programmes.*

Tekes could be more active in supporting the national activities by networking actors as well as promoting the role of Finnish research and innovation policy on the EU-level. Working in a EU-programme is usually very familiar to the research organisations and large companies but SMEs find even writing the application very challenging.

## Appendix 1. Interviewed experts by organisations and countries.

Name	Country	Programme	Organisation
Anssi Kujala	Finland	NETS	
Heikki Hämmäinen	Finland	GIGA, NETS	Aalto-yliopisto
Matti Latva-aho	Finland	GIGA, NETS	CWC
Kristiina Pietikäinen	Finland		Euroopan Komissio
Jyrki Ali-Yrkkö	Finland		ETLA
Olli Martikainen	Finland	NETS	ETLA / University of Oulu
Kari Leppänen	Finland	GIGA, NETS	Nokia
Eero Silvennoinen	Finland	NORDITE	Tekes
Erkki Hietanen	Finland	GIGA, NETS	Tekes
Juha Tanskanen	Finland	NORDITE, EXSITE	Tekes
Kari Markus*	Finland	GIGA, NETS	Tekes
Kari Tilli*	Finland	GIGA, NETS	Tekes
Katja Ahola	Finland	INWITE	Tekes
Marko Heikkinen*	Finland	NORDITE, EXSITE	Tekes
Pekka Pesonen*	Finland		Tekes
Tiina Nurmi	Finland	GIGA	Tekes
Heikki Hänninen*	Finland	GIGA	Netcare Oy
Timo Simula*	Finland	GIGA	Netcare Oy
Seppo Borenus	Finland	GIGA, NETS	Tellabs Oy
Mikko Valtakari	Finland	GIGA	Tempo Economics
Pauli Kuosmanen	Finland		Tivit Oy
Reijo Paajanen	Finland		Tivit Oy
Mikko Valkama	Finland	GIGA	TTY
Hilde Erlandsen	Norway	NORDITE	Research Council of Norway (RCN)
Morten Ween	Norway	NORDITE	Research Council of Norway (RCN)
Gunnar Edwall	Sweden	NORDITE	Telia
Ciro Vaquez	Sweden	NORDITE	VINNOVA
Eva Westberg	Sweden	NORDITE	VINNOVA
Herbert Sander	Sweden	NORDITE	VINNOVA

\* The person was part of the evaluation's steering group.

# Appendix 2. Case interviews question sheet

<b>Name of interviewee</b>	
<b>Name of organisation</b>	
<b>Interviewer</b>	
<b>Date</b>	

Thank you for participating in the interview. This interview is part of the evaluation of five telecom programmes.

Your organisation participated in the following programmes:

- Programme x (interviewer fills)
- Programme y (interviewer fills)

Your organisation's project/s in the programmes:

- Project X (interviewer fills short description)
- Project y (interviewer fills short description)
- Other

This interview focuses on analysing this project/s and Tekes programme's impacts on your organisation and the ITC sector in general. We would also like to know your opinion of Tekes funding and the programmes' service practices in general.

**Background questions**

How actively have you participated in Tekes programmes and their programme services?

- How did the project get started?
- What kind of impacts did the project have on your organisation's operations and/or strategy?

**Project impacts and results**

- What were the main results of the project?

The expected impacts of the programme are listed in the matrix below. Kindly evaluate the possible impacts on your organi-

sation and, if possible, more widely on the cooperating organisations.

Expected programme operation impacts	Additional question
Increase of R&D&I-investments	- Did the project increase your organisation research operations?
Increased knowhow	- Did your organisation gain any new knowhow due to the project? - Have there been any changes in the professional labour force between companies and research organisations due to the project?
Domestic and international networking	- Has the programme or project affected your organisation's international networking? - Has the programme operation created any new cooperation partnerships?
Changes in organisation's procedures	- Have the project's results had any impacts on your programme partners' operations'?
Significant innovations	- Have you been able to utilise or spread the results of the project/s more widely?
Productivity	- Did you develop something that increased your productivity? - Have the results of your project been in wider use?
Business opportunities	- Have the new products increased your markets, export or other business?

Other; if so, what?

### Programme's operation impacts and future

- If you have participated in the programme's operations and events, what kind of impacts did these programme operations have on your organisation?
- Have you participated in international cooperation or research programmes?
- How would you describe its impacts on your organisation's operations compared to the Tekes' programmes?
- What kind of programmes or other cooperation opportunities would you like to see in the future?
  - a. Programme operations (for example, networking, seminars, benchmarking trips)
  - b. Other funding instruments
  - c. TIVIT oy
  - d. Other operations (if so, what?)
- How would you describe Nordic cooperation (Tekes, VINNOVA, Norwegian Research Council) programmes and services?
- Best practices?
- Proposals for further development?
- Other comments

### The following additional questions were asked only of the organisations that did not have project in the programmes

- Have you participated in Tekes programmes and their programme services?
- Has your organisation applied for any Tekes funding
- Has your organisation participated in Tekes programmes (if so, which one?)
- Has your organisation participated in Tekes programme service or other events?
- Were these other events part of some Tekes programme?
- Otherwise (if so, how?)
- Has your organisation considered participating in some of the Tekes programmes (if so, which ones?)

### Business environment and changes in the business operations

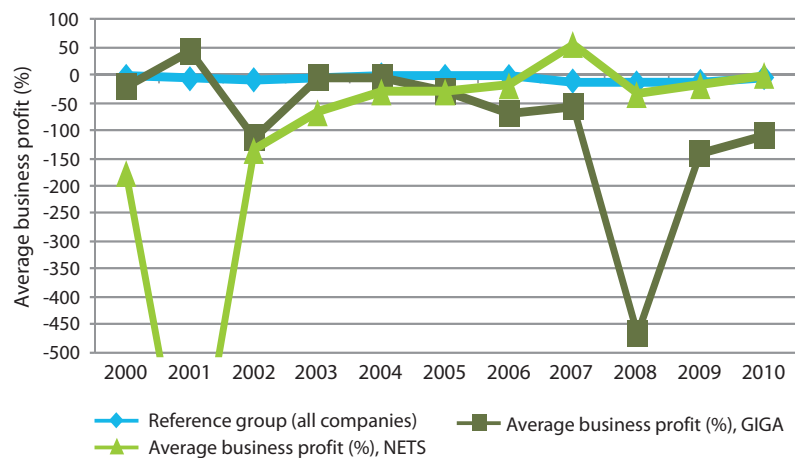
- Please evaluate how the business environment and business activities have changed in the last six years?
- Have your organisation increased R&D&I activity? In which product/service sector?
- What factors have affected the development?
- Changes in the knowhow of ICT technology in your organisation
- What factors have affected the development?
- Development of cooperation between research organisations and companies
- What kind of cooperation?
- What factors have affected the cooperation?
- Significant service/product innovations?
- What factors have led to these innovations?
- Your companies' economic performance
- Volume of business
- New market areas
- Productivity
- What factors have affected this development?

Thank you for your time and valuable insights!

## Appendix 3. Survey results of GIGA and NETS

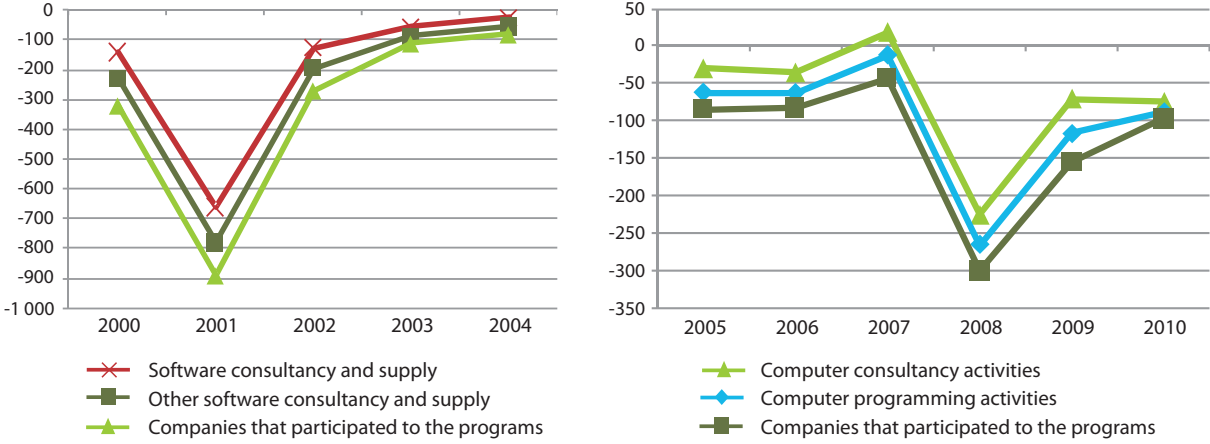
Average	GIGA	NETS
<i>How did the programme match your organisation's needs? (1=not at all, 5=very much)</i>		
Our organisation received valuable information from other participating organisations.	3.9	4.3
The programme strengthened our organisation's technological knowledge/knowledge of the branch.	4.6	4.8
Networking between companies, research organisations and public sector improved due to the programme.	4.1	4.3
<i>Please evaluate the following statements concerning international cooperation from your organisations point of view (1=not at all, 5=very much)</i>		
International cooperation strengthened our organisation's connections to our partners	4.0	3.9
International cooperation improved our organisation's ability to create new cooperation connections	3.8	3.7
<i>Other impacts (only companies) (1=not at all, 5=very much)</i>		
Role of research strengthen in our organisation due the programme	3.7	4.2
Our organisation developed something that would not have been developed without the programme	4.5	4.7
Economic competitiveness improved in our company	4.2	4.3
The programme supported our business	4.3	3.4
The programme created new business opportunities	4.0	3.8
Our business knowledge improved due to the programme	3.8	3.8
We created new innovative products and services due to the programme	4.1	4.2
Our company increased its R&D activity due the programme	3.9	3.5
<i>How important have the following programme services been from your organisation's point of view? (1=not at all important, 5=very important)</i>		
Financing	4.9	5.0
Seminars and workshops	3.9	4.3
Domestic and international surveys	3.5	3.6
Benchmarking and networking trips	3.3	3.4
<i>How useful have the following programme services been from your organisation's point of view? (1=not at all useful, 5=very useful)</i>		
Financing	4.9	5.0
Seminars and workshops	3.9	4.0
Domestic and international surveys	3.6	3.5
Benchmarking and networking trips	3.3	3.4
<i>How did the following factors affect your organisation's abilities to achieve the goals you had set for your participation in the programme? (1=weakened significantly, 5=strengthened significantly)</i>		
Timing of the programme and its relation to the market development	4.1	4.0
Global economic development	2.9	3.2
Availability of skilful labour	3.3	3.5
Building cooperation networks in the branch	4.1	4.3
<i>How would you evaluate the achievement of the objectives your organisation had set for the participation in the programme? (1=only some of the objectives were met, 4=objectives were exceeded)</i>		
Economic and commercial objectives	2.1	2.1
Technological objectives	2.6	2.5

## Appendix 4. Average business profit (%) in the participating companies who participated in the GIGA and NETS programmes



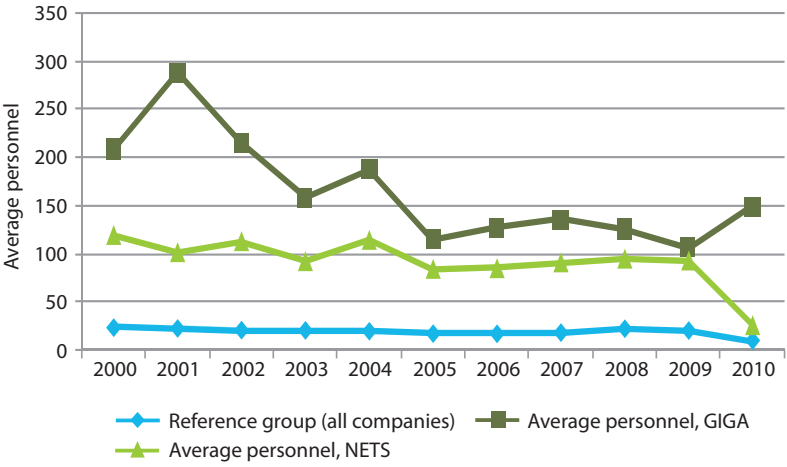
Source: Suomen Asiakastieto Oy

### Appendix 5. Average business profit (%) in the selected ICT line of business



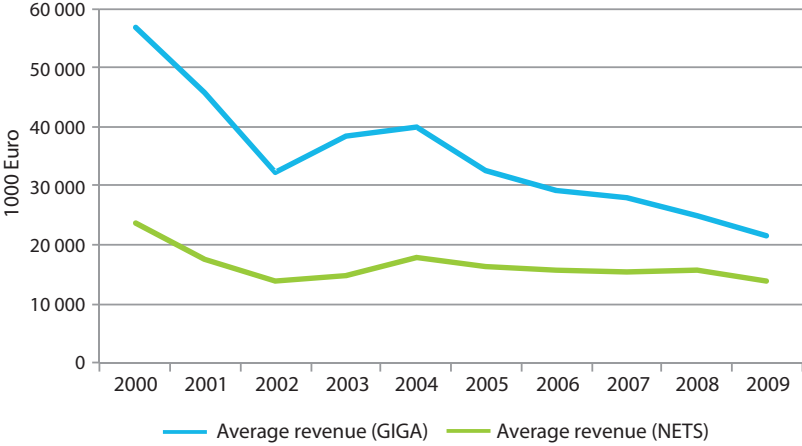
Note: Different industrial classifications in the pictures. Source: Suomen Asiakastieto Oy

### Appendix 6. Average number of personnel in the participating companies who participated in the GIGA and NETS programmes



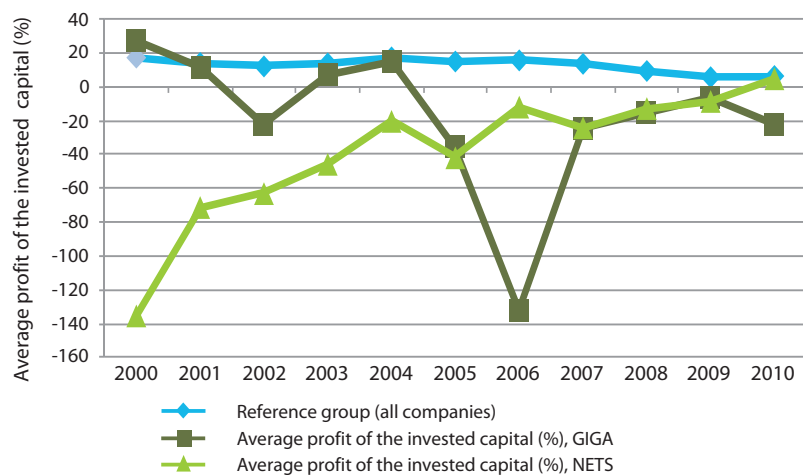
Source: Suomen Asiakastieto Oy

### Appendix 7. Average revenue in the participating companies who participated in the GIGA and NETS programmes



Source: Suomen Asiakastieto Oy

## Appendix 8. Average profit of invested capital (%) in the participating companies who participated in the GIGA and NETS programmes

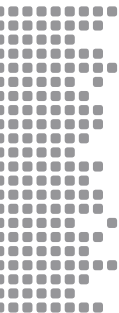


Source: Suomen Asiakastieto Oy

## Tekes' Programme Reports in English

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