HIIT INDICATORS

Patrik Floréen, 13.10.2006

Objectives of the exercise

Indicators can be used as evidence displaying the quantity and quality of the results of the organisation's activities. In the spirit of "management by results" (tulosjohtaminen), the selection of indicators may direct the operation of the organisation; therefore it is important to select indicators that push the activities in the desired direction. It must be stressed that indicators are only what they say to be: indicators. This means that they do not give a full picture of the status, they only give indication. The proper use of indicators includes also their proper interpretation. Both quantitative and qualitative indicators may be used.

In the previous discussion in HIIT, not much attention has been given to different levels of indicators. For instance, a possible measure "number of foreign researchers recruited" tell about "research quality", "internationalisation" and "technology transfer". We address this issue by suggesting indicators on two levels: aggregated indicators and their concrete measures.

In the selection of indicators, the following requirements should be fulfilled:

- The selection of indicators reflect the target outputs outcomes, corresponding to the aims of the organisation,
- the indicators measure the important things and are not too numerous,
- the indicators are practical, i.e. the data is reliable and are easy to collect, preferably already collected for other purposes.

A review of some background information used in this exercise can be found in the appendices.

A suggestion for common HIIT indicators

The following HIIT indicators on two levels are suggested. Note that some measures provide basis for several aggregated indicators, or that some measures added together provides for a measure for another aggregated indicator.

These indicators would be followed on the level of each research programme, and on the overall HIIT level. In addition to these common indicators, the research

programmes may adopt a few own additional indicators, e.g. participation in standardisation activities, number of spin-off companies etc.

The statistical information needed would be gathered in the existing processes of (a) keeping up the list of research projects within HIIT, (b) gathering material for the Annual Report and (c) submitting information to the university databases. The explanatory texts would be written by the Programme Directors. In addition, there is a need to go through the list of publications identifying collaboration and some work is needed to track past PhD students.

The indicators produced would be used, as needed, in HIIT presentations, in meetings with the Rectors and in the Annual Report, as well as internally within HIIT to show the outcome of the different research programmes. The first time these will be used is apparently in the HIIT Annual Report for 2006.

Aggregated Indicator	**Its Measures (each year)**
Research quality	Explanatory text, including research highlights (3-5 most significant results), as well as information about prizes and awards, academy professorships, top-level research units, results from research evaluations, use of software made available etc.
Research quantity (input and output)	€ total external research funding py scientists # refereed publications by HIIT scientists # PhD theses by HIIT scientists #other monographs by HIIT scientists # software produced and maintained
Research education	# PhD students at HIIT py in graduate schools Explanatory text about present placement of PhDs completed 2-5 years ago
Mother-university research collaboration	# projects with non-HIIT partners from UH # projects with non-HIIT partners from TKK # refereed publications with writers from UH outside of HIIT

	# refereed publications with writers from TKK outside of HIIT
Other university collaboration	# projects with other Finnish universities than UH and TKK # projects with foreign universities # refereed publications with writers from other Finnish universities than UH and TKK # refereed publications with writers from foreign universities
Industrial collaboration	€ Finnish industrial funding € foreign industrial funding # projects with Finnish industrial partners # projects with foreign industrial partners # refereed publications with writers from Finnish industry # refereed publications with writes from foreign industry
Internationalisation	€ foreign industrial funding € EU funding list of visits from abroad and their durations list of visits to abroad and their durations pm visits to abroad py foreign researchers employed # projects with partners from abroad # refereed publications with writers from abroad
Multidisciplinarity	# projects with partners from other scientific disciplines # refereed publications with writers from other scientific disciplines
Teaching collaboration	# MSc theses supervised list of courses and seminars given at UH list of courses and seminars given at TKK list of courses and seminars given elsewhere
IT society development / Societal impact	Explanatory text, including public talks, collaboration efforts à la Forum Virium Helsinki, expert duties outside scientific organizations etc.

Appendix 1: HIIT objectives

Indicators in an academic environment necessarily reflect the mission of the universities: research, teaching and social interaction ("yhteiskunnallinen vuorovaikutus"). They can also reflect general objectives of the research and innovation system, such as multidisciplinarity, internationalisation and promotion of researcher careers.

The statutes of HIIT say in §2: "It is the duty of HIIT to carry out cutting-edge basic and strategic research in information technology internationally, in close cooperation with the IT industry and research that applies information technology, and to offer research education at the highest level.

The goals of HIIT are to raise the research, visibility and impact of information technology in Finland to the highest level internationally, and thus make the interaction more efficient between the universities and the IT industry on the one hand, and the main international research institutes and universities in the ITC field on the other.

HIIT attempts to improve the long-term competitive edge of the Finnish IT industry and the IT society, so that the scientific research carried out at the universities can be connected with the far-reaching and risky strategic R&D of the IT industry, and with the development of the IT society."

The HIIT Mission agreed on is as follows: "Recognised as an internationally leading research institution, HIIT conducts basic and multidisciplinary research of modern information and communication technology which includes theoretical and technological aspects, as well as applications, and has high scientific, industrial and societal impact."

Appendix 2: A report from the Academy of Finland

The Academy of Finland report 9/06 "Methods for Evaluating the Impact of Basic Research Funding" includes a number of observations about indicators, however with a view of discussing the impact of Academy of Finland funding.

It is noted that techno-economic impacts are usually stressed with less attention to cultural, social or political influences. Challenges to impact assessment are time lag issues, attribution (what are really the causal dependencies), appropriability (who is really affected), complexities (how is the impact generated). Different methods of performing measurements are listed: peer-review, bibliometrics, high-level S&T indicators, surveys, cost-benefit analyses, case studies etc. A distinction is made between inputs (e.g. expenditure on research), outputs (e.g. publications), outcomes (e.g. citations) and productivity (outputs and outcomes related to inputs).

Appendix 3: Recent University of Helsinki working group on indicators

A working group at the University of Helsinki led by Vice Rector Thomas Wilhelmsson presented on 30.1.2006 a report "Ehdotus erillisten laitosten tuloksellisuuskriteereiksi," according to which the indicators for distributing success-based funding to HIIT (BRU) could be

- research quality evaluated by advisory boards or peer-review (weight 40%),
- number of directed PhDs (weigh 30%), and
- share of external research funding, including stipends (weight 30%).

For results regarding teaching, EATCS points awarded was suggested as indicator. This does not concern HIIT (BRU), which in the report is seen as a pure research institution.

However, as HIIT (BRU) was evaluated as part of the research evaluation at the university, and was awarded funding on basis of these results, the suggestions of the group have not been implemented.

Appendix 4: University of Helsinki databases

The following information is collected in addition to publication information into the so called MUTI (1-8) and YHTI (9-12) databases:

1. teaching and research visits abroad
2. visits of foreign teachers and researchers (not recruitments, i.e., not including foreigners performing their PhD studies at UH)
3. presentations
4. tasks as expert for scientific journals and proceedings (e.g. editor-in-chief, editor, referee)
5. tasks in scientific organisations (e.g. Academy of Finland, evaluation panels)
6. statements regarding positions (e.g. for professorships, docentships)
7. opponentships and pre-examinations for PhDs
8. supervision of other PhD studies than those for UH
9. tasks as experts
10. public and popularised presentations related to own scientific area
11. organisational tasks
12. other social interaction

Appendix 5: Helsinki University of Technology databases

The following information is provided in the UNEL system for the results discussions at TKK:

- number of MSc(Tech) , LicTech and DrTech theses and person-years in graduate schools
- number of refereed articles, monographs, conference papers and granted patents
- number of national top-research units, internal top-research units and academy professors
- person-months of work abroad (stays over 1 month stays), person-weeks of work abroad (stays 2 weeks – 1 month), person-months of visits from abroad (stays over 1 month stays), person-weeks of visits from abroad (stays 2 weeks – 1 month)
- person-years of personnel on budget posts and on external funding
- square metres of the work space
- budget: costs from budget funds, costs from external funding, amount of external funding

The following information is collected in addition to publication information into the so called TKK TOIMII database:

A. teaching and research work abroad
B. postgraduate studies abroad
C. foreign visitors
D. international meetings (presentations)
E1. prizes and awards
E2. leading positions in scientific societies
E3. professional positions (luottamustehtävä) in international organisations
E4. editor-in-chief of scientific journals
E5. editor of scientific journals
E6. editor of scientific monographs
E7. pre-examiner of PhD thesis at another university
E8. PhD opponent at another university
E9. statements for filling of professor and associate professor positions

Appendix 6: Previous discussion within HIIT about indicators

In the HIIT Senior Scientists meeting of 18.4.2006 Patrik Floréen presented the following list of potential indicators (the most important bold-faced). Research impact was here divided into scientific impact (called research indicators) and industrial impact (called innovation indicators). Indicator data related to multidisciplinarity and internationalisation are underlined.

List of potential research indicators:

- **Scientific publications**; different quality (citations, reputation)
- Invited talks and papers; forums of different quality
- **(Public) software**: made available and used
- **PhDs supervised in HIIT**; also partially
- **External funding received**: amount and success rate
- Personnel: recruitment of foreign scientific personnel, visits between HIIT and other academic institutions (both ways, both national and international)
- **Academic collaboration**: publications, projects and exchange of personnel with other academic research groups (both within IT and with other disciplines, both national and international collaboration)
- Committees: editorial board of scientific publications, programme committees and organising committees of conferences, positions in scientific societies
- Activity as evaluator: project proposal evaluation, scientific evaluations, reviewer of professor applications, PhD opponentships, reviewer of PhD and PhLic theses
- Evaluation: awards based on scientific merits and impact, scientific evaluations by SAB, university and Academy of Finland, feedback from peers

List of potential innovation indicators:

- **Company funding**: amount and success rate
- Industrial collaboration: projects where companies participate in the research and/or funding (both IT companies and companies in other areas, both national and international collaboration)
- Intellectual property: copyright, patents etc.
- Standardisation activity
- Products resulting from the research: prototypes of products for the market
- Spin-off companies
- Personnel: recruitment of personnel from industry, visits between HIIT and industry (both ways; here again the disciplinary and international dimensions)
- Software and facilities (open lab etc.) available for industrial collaboration
- Participation in industrial collaboration efforts (Forum Virium Helsinki etc.)

- Evaluation: awards based on industrial impact, feedback from IAB and companies participating in projects

List of potential teaching indicators:
- Participation in teaching (courses, seminars etc.)
- MSc theses supervised
- Evaluation: awards for teaching, feedback from students

List of potential social interaction indicators:
- **Exposure**: talks, writings, media and Internet appearances both by HIIT staff and by others about HIIT activities
- **Activity as expert**: consultation to companies and other organisations, advice to politics and lawmaking
- Professional positions ("luottamustehtävät"): positions in non-scientific boards, societies and associations with professional relevance
- Participation in local initiatives ("alueellinen vaikuttaminen")
- Evaluation: awards based on social impact

The discussion has put forward the need to identify HIIT activities that bring added value to the related university departments, i.e., that distinguish HIIT from the normal departments.

In the Steering Group meeting of 28.8.2006 it was agreed that the approach is to have common indicators for all the four research programmes, with only minimal research-programme related add-ons.

It needs also be noted that information about the placement of completed PhDs was asked in the latest call for graduate school applications due 15.12.2005. The information concerned students in existing graduate schools for 2002-2005.