

Institute of Cybernetics at TUT

Strategic plan

2008–2012

Approved by the Board of the IoC
March 27th, 2008 decision nr 133

Tallinn
2008

1 Introduction

The Institute of Cybernetics at Tallinn University of Technology (hereinafter Institute of Cybernetics, IoC, institute) is an autonomous research institute associated with the Tallinn University of Technology (hereinafter TUT) that functions under the Organisation of Research and Development Act. The present legal status of IoC was formed in the mid-1990s during the process of Estonian science reform. IoC became an autonomous science and development institution of TUT by the merger agreement signed by the Estonian Ministry of Education and Research and TUT on November 12th, 1997. IoC has its own statute, balance, budget, bank accounts, insignia and stamp. IoC is the legal successor of the Institute of Cybernetics of the Estonian Academy of Sciences, founded on September 1st, 1960.

IoC is the leading research institute for the application of mathematics in Estonia. The research of IoC focuses on the development and application of mathematical structures, methods and models in different research areas, including computer science, automatic control, informatics, phonetics and speech technology, mathematics, mechanics, coastal engineering and system biology.

The **mission** of IoC is to undertake high-level basic and applied research and to offer internationally competitive doctoral studies. The goal of IoC is to achieve international recognition in its own research areas and play a significant role in society by participating in national programmes and by contributing to the promotion of knowledge-based economy and innovation both in Estonia and EU.

The strategic plan is a document that couples the self-definition, mission, long-term strategic objectives and major goals of IoC for the years 2008-2012. The strategic plan originates from the traditions and current state of the institute, the plans of departments and laboratories, and international trends in science. The strategic plan was composed in accordance with the Strategic Plan of TUT for the period 2006–2010.

2. Where are we? Analysis of current situation

2.1 Short overview

The institute has overcome the lows of the 1990s when a large number of employees left IoC and only a few young people joined the institute. Excluding researchers who are funded by EU supported projects; the group of researchers in the best creative age group (35-50 years) is still small. The main hope for the revitalisation of the institute relies on increasing the number of young scientists; a good example being the laboratory of system biology founded in 2007, the personnel of which comprises exclusively young staff. The financing of the institute has improved slightly, since in addition to targeted and basic governmental funding the IoC has been able to use the funds from two Estonian Science Centres of Excellence, national programmes, EU structural funds, etc. Especially important is

basic governmental funding as a new financing instrument that helps assure the financial stability of the institute and the autonomy to shape research areas.

The priority of the institute is basic research, whereby each research team participates actively in non-formal and in contract-based international cooperation, including EU Framework Programme projects. The IoC coordinated the work of 2 Estonian Science Centres of Excellence in the years 2002-2007. Besides basic research, the IoC has also worked on applied research, partly focused on problems in Estonian society. The results of experimental research on Estonian language phonetics are applied in the development of Estonian language speech synthesis and recognition. The IoC has also been actively developing various technologies and technical solutions that consider the conditions of the Baltic Sea, especially bordering Estonia, in the areas of hydrodynamics of the coastal sea and large lakes, marine meteorology, sea state forecasting and coastal engineering.

We participate productively in two doctoral schools: "Doctoral School in Information and Communication Technology", and "Doctoral School in Linguistics and Language Technology". With help from an infrastructure modernisation project, the computing power has been increased, the electricity grid modernised and offices were renovated.

Yet the situation in IoC is complicated, mainly caused by the fact that a large number of researchers work full- or part-time under other employers, which in turn is caused by chronic insufficient financing of science. The former weakens our competitive position in applying for targeted financing and also effectiveness of research. By the end of 2007, 23 researchers out of 57 worked in universities with a total workload of 12 full-time positions, not counting researchers working in the private sector. A serious problem is also the fact that the salaries in the IoC are permanently lower than the minimum salaries of TUT (which unlike the institute, can additionally use teaching funds), which in turn are lower than the remuneration in other economical sectors. All the above cause problems regarding future staffing. There is a risk that young PhD graduates leave the institute and the IoC will be dismantled and spread about in faculties of TUT. The Institute is also not competitive in hiring young PhD graduates from outside the TUT. Unlike the past, the percentage of part-time researchers and top-level seniors (over 60 years of age) has risen.

The number of research staff of some targeted-financed teams (e.g. mathematics) is close to the critical level. Some teams have a risk of falling apart by a (sudden) departure of a team leader and/or a lack of successors. A few research areas have already been closed, for example, statistics.

The research financing politics may, in the future, hinder the launch of capacious (EU) research projects, which require self-financing. There is little administrative capacity of the institute left for handling new EU projects.

2.2 Identity

The identity of the IoC is defined by the level of achievement, the areas of research and by collaborative networking. The unity of the staff is supported by the autonomy of the institute, including independent accounting and the building constructed especially for the IoC.

IoC is characterized by focusing on research. Our goal is to unite the mainly research-oriented people and to create favourable research conditions for them, including PhD students. Our second goal is to bring young people into science as early as possible.

2.2.1 The structure of the institute and research areas

There are 3 departments and 4 laboratories in the IoC: Mechanics and Applied Mathematics Department, Control Systems Department, Software Department; Laboratory of Photoelasticity, Laboratory of Phonetics and Speech Technology, Laboratory of Systems Biology and Laboratory of Wave Engineering. The institute has its own library providing research literature and administrating databases of the publications of the institute.

The IoC has 4 targeted-financed projects:

1. Dependable software and human language technologies (2006–2011)
2. Nonlinear dynamics and complex systems (2008–2013)
3. Synthesis of complex nonlinear control systems (2008–2013)
4. Mathematical models with nonlinearities, incomplete information and structural complexity (2008–2013)

Project staff are connected through close research topics, applied mathematical tools or field of application. The number of publications in top research journals (including the ones listed in Thomson Reuters Web of Science) has increased considerably.

2.2.2 Cooperation

An important part in the identity of the IoC is extensive cooperation network, which includes both national and foreign research institutions. The IoC practises different kinds of cooperation with these institutions.

Firstly, the IoC coordinates **national specialized cooperation networks**, such as the Centre for Nonlinear Studies (CENS) and Centre of Excellence in Computer Science (EXCS). Both centres were attributed the status of Estonian Centre of Excellence in Research for the years 2002-2007. Joint research with the other structural units of the TUT, University of Tartu (hereinafter UT), Tallinn University (hereinafter TLU), KBFI and AS Cybernetica is being undertaken through these networks. Additionally, joint research is also done with the Institute of the Estonian Language in phonetics and speech technology.

The institute organizes national specialized research seminars and series of lectures. Highlights of the latter are the Winter School, Summer School and Theory Days, organized mainly for graduate students jointly by the University of Tartu and the other institutes of TUT. The Winter School has evolved into a regular international event with foreign lecturers. Theory Days give graduate students an opportunity to present their own research results. The IoC also coordinates the organization of Estonian mechanics days.

The scientists of the IoC participate actively in the graduate studies of the faculties of civil engineering, information technology and science, and supervise the MSc and PhD students of TUT.

Secondly, the **institute regularly organizes international research events within each research area of the institute**. These bring top-level foreign scientists to Tallinn and help disseminate the achievements of Estonian scientists. In particular, the Software Department has organized a great number of such events. For example, the IoC has organized large conferences (with several hundred participants) like *10th ACM Sigplan International Conference on Functional Programming (ICFP)*, smaller conferences such as *5th Junior European Meeting on Control and Information Technology (JEM'06)*, and medium-size seminars such as *EUROMECH Colloquium 478*. Regularly the Baltic Databases & IS conference is organized.

In addition to organizing scientific events, the research staff of the IoC has also participated in co-supervision of PhD students, where the other supervisor is at a foreign top-level university.

The scientists of the IoC participate actively in directing bodies, technical and coordinating committees of international speciality unions such as IFAC, IUTAM and IFIP.

Thirdly, **cooperation projects with fixed deadlines**. This includes two doctoral schools and post-doctoral fellowships project financed by structural funds of EU. The IoC has participated in several projects of EU framework programmes and in regional as well as in Pan-European networks (eVikings 2, Appsem, Types, SEAMOCS, Mobius, WIND-CHIME, VISPP and others). Currently, the most remarkable projects are:

- CENS-CMA (*Co-operation of Estonian and Norwegian Scientific Centres within Mathematics and its Applications*) researcher mobility programme under Marie Curie Network, coordinated by IoC;
- Research grant *Analysis of structural and functional aspects of compartmentation of adenine nucleotides in heart muscle cells*, financed by the British charity fund Wellcome Trust.

The Laboratory of Phonetics and Speech Technology has participated in preparation of the *National Programme for Estonian Language Technology (2006-2010)*. The representative of the laboratory is also a vice-chairman of the steering committee of the programme that is financing the projects of the three laboratories.

Fourthly, **personal partnerships**, resulting in joint papers. Within personal partnerships, the IoC hosts regularly foreign visitors (mostly for 1–2 weeks,

sometimes for 3 months) and the scientists of the IoC, including the PhD students, have an opportunity to visit universities abroad. These partnerships, with some exceptions, do not function under signed research cooperation agreements.

2.2.3 Development and knowledge services

In the development activities, the institute has taken the position to participate mainly in high-level innovation projects. The development in the IoC is preferably directed towards the further extension of the results of its own fundamental studies, and the purpose of which is to reach to a working prototype.

For example, one can highlight here the Estonian speech synthesiser, made in cooperation with the Institute of the Estonian Language, which has resulted in a working prototype. Further development may be continued within the specific production of some development company. Applied research in the IoC in the field of stress measurement of glass has led to a birth of spin-off company Glasstress. The institute has developed a prototype for an automatic polariscope for residual stress measurement in glass.

The IoC tries to apply scientific ideas in Estonian enterprises and to provide knowledge services. In the last few years academician Tarmo Soomere and his team have been active in this respect and have explored coastal processes and the impact of economical activities in coastal areas on the environment, requested by local authorities. In particular, suggestions have been formulated for the Tallinn Transport Department on how to regulate fast ferry traffic in Tallinn Bay. This is an example of systematic application of a theory of fast ferries as wavemakers and the experience of different maritime nations.

2.2.4 Financing resources

1. The main resources come from national financing, including direct targeted financing of research teams in 6-year periods, finances allocated to cover infrastructure costs of the institute, Estonian Science Foundation grants, basic financing, national centre of excellence finances and finances from national programme. In 2007 these finances covered 51% of the budget of the IoC.
2. Additional finances were received from projects of EU Structural Funds in Estonia. In 2007 these finances covered 17% of the budget of the IoC.
3. The amount of funds received from EU framework programmes and other international project/grants has increased significantly. In 2007 these finances covered 12% of the budget of the IoC, including 10% from FP programme.
4. The application of research and developmental projects are funded from contracts. In 2007 these finances covered 18% of the budget of the IoC.

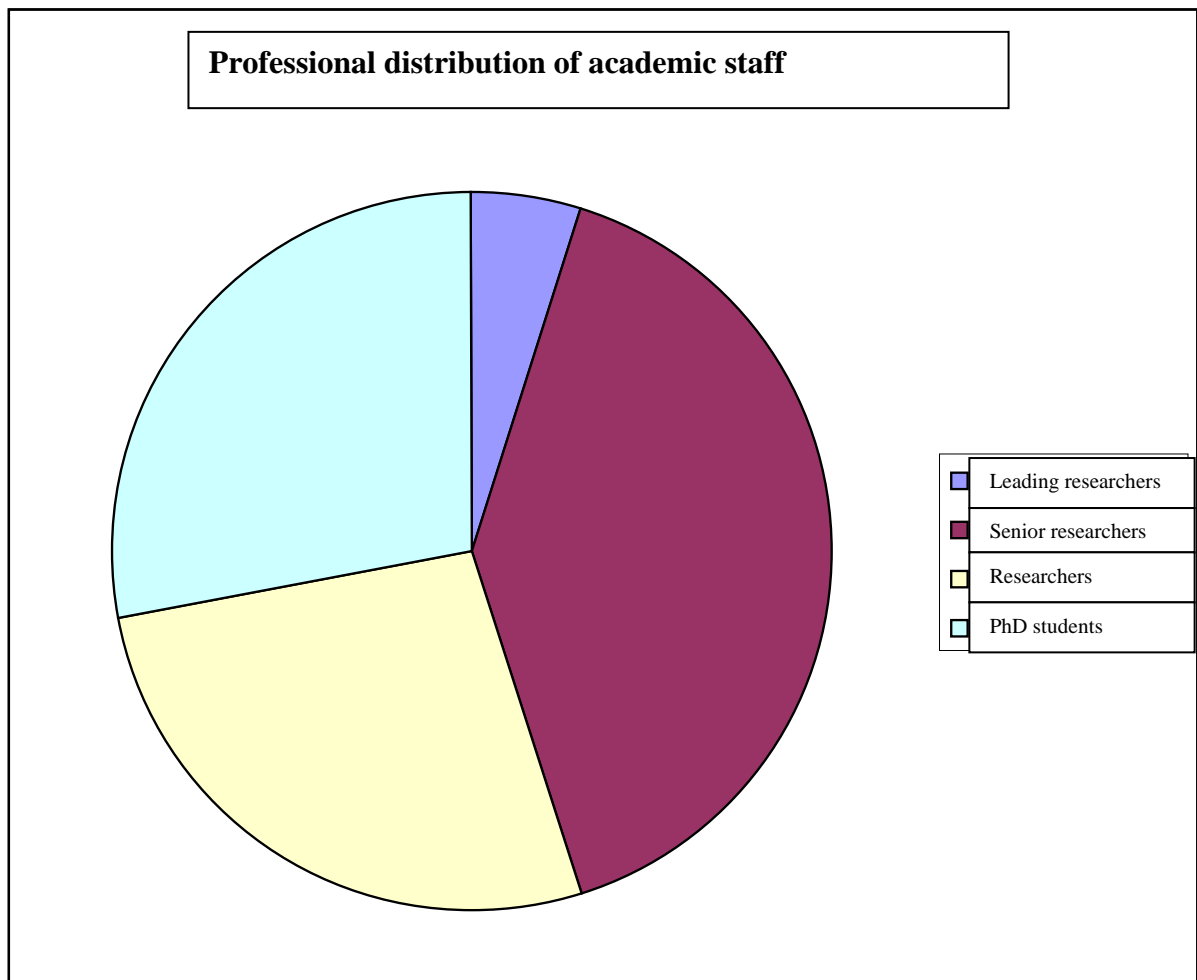
The capacities of targeted financing and Estonian Science Foundation grants have been practically formed and our goal is to keep the existing level of financing. Obviously, it will be not easy to sustain the success achieved in the previous call for the national centres of excellence. The growth of financing is possible only

through international funding. Additional opportunities are offered by actions of structural funds.

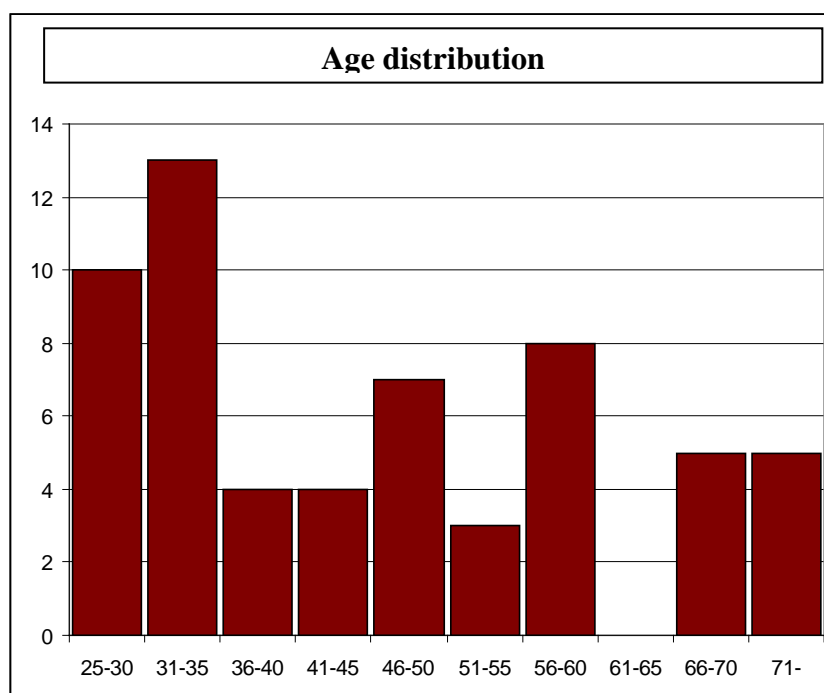
EU cost-based reimbursement may lead to problems due to inadequate monetary reserves of the IoC or due to the requirement of co-financing. Many projects do not allow paying bonuses to compensate the low wages of the researchers and the volume of paperwork exceeds the administrative capacity.

2.2.5 Personnel and working environment

The greatest value that the institute holds is its researchers. By October 2007, there were 4 (3.75) leading research scientists, 33 (28.1) senior research scientists and 22 (17.5) research scientists in the institute. Altogether, there were a total of 23 PhD students in the targeted financed teams by the end of October 2007.



Age distribution of researchers:



Crucial, though hardly measurable, factors in the institute are the research atmosphere, which values and stimulates research and the opportunity to set the goals autonomously and to choose the means to carry them out. The institute is small, mobile and capable reacting quickly to the needs of society.

Due to the chronic overload of the researchers an unfortunate lack of regard of the work of colleagues has developed. This is caused, in particular, by the increasing number of researchers having full-time jobs elsewhere. This decreases togetherness and ability for cooperation, and breeds rivalry between departments. The number of academic staff working predominantly in the IoC is close to the critical level.

Computing infrastructure in the IoC is comparable to that in Western European universities. Remotely accessible computational clusters have been created that offer sufficient amount of computational power to solve large-scale tasks, like modelling and simulation. The institute has built an up-to-date studio for Laboratory of Phonetics and Speech technology and has equipped it with state-of-the-art audio technology.

The institute of Cybernetics has its own library, which is being supplemented regularly with scientific literature related to research areas of the institute. The IoC has unique collection of new books on computer science, that has been supplemented in recent years mostly from the support by centres of excellence and the doctoral schools.

The offices of the IoC are unfortunately below the Estonian average. Although senior research scientists have, in general, private offices, a large number of rooms need renovation and refurnishing. The situation was somewhat improved by

partial renovation and refurbishing of rooms for 13 researchers by the finances of infrastructure projects of centres of excellence.

The institute organizes annual contest of the best publication and the fall seminar.

2.2.6 Implementation of the previous strategic plan

In conclusion, the tasks of the previous strategic plan for years 2003-2007 have been largely carried out. 9 PhD theses and 22 MSc theses have been defended. Non-governmental funding, including finances of the Estonian Science Foundation and structural funds, was 55% in year 2007. Larger research areas of the institute have their own strategic plans, while smaller research areas, like automatic control and mathematics, still miss these.

In the previous period we focused on the growth of high-level scientific publications. By the year 2007, we have achieved relatively stable volume of publication: 1,7–2,5 peer-reviewed papers per researcher per year, including 1 paper per (leading) senior research scientist published in journals, listed in Thomson Reuters Web of Science. The latter has an effect on basic financing and evaluation of the institute.

2.3 Main drawbacks

- Non-competitive salaries even when compared to the salaries of the Tallinn University of Technology which has a devastating effect on sustainability of the institute, because fresh PhDs leave the IoC.
- Researchers working (either on economical reasons and/or pressure from Tallinn University of Technology caused by the lack of personnel) also under another employer diminish researcher's contribution and our competitive ability in applying for targeted financing.
- Relations between the IoC and TUT are inadequately regulated, in particular, the participation of the IoC in graduate studies of TUT.
- Institute does not follow requirements set for senior research scientists, including the requirement to lead a project. There is a great heterogeneity in research productivity and in research-related administrative capability.
- Great differences in salaries of senior research scientists are no longer in positive correlation to their research productivity, but are caused by external reasons.
- The weak involvement in the economy and insufficient development.
- Functionality and proportions of the offices do not meet today's requirements. There is shortage in rooms for teamwork. The building does not have all the necessary facilities, for example it does not have a proper ventilation and the service land.
- Visibility of the institute in the scientific scenery, the promotion and dissemination of the research results among potential developers is insufficient. Institute does not have finances to support either activity.

3 What do we want to achieve?

3.1 Priorities

The most important activity of the IoC is high-level research, expressed by the publications and presentations of the researchers. Up-to-date research topics and the level of research must be attractive for the involvement of young research scientists.

We prefer to publish in internationally recognized journals with strict peer-review or under recognized publishers, and to present research results at top-level conferences.

IoC actively takes part in graduate studies (predominantly in TUT, but in case of necessity also in University of Tartu and Tallinn University), offering students professional supervision and employment, participation in R&D projects and special courses / seminars. In addition, researchers of the institute participate in BSc teaching and adult training. The IoC is capable to supervise significantly more graduate students than it's own needs.

IoC contributes in advancing the knowledge-based economy and innovation in Estonia and EU, including through participation in national programmes.

3.2 Strategic goals

- To ensure continuity of basic research and academic development. To shape the research topics with foresight.
- To support the coming and staying of young researchers in science.
- To sign international co-operation contracts and to participate in international projects.
- To raise the competence and qualification of the researchers.
- The increase of the proportion of applied research.
- To attract experienced academic staff, for example: Estonian origin experienced young researchers and foreign scientists.

4 How to achieve the goals?

4.1 Shaping the research topics

The main instrument to influence the research topics is to actively direct flexible interests of the youth to the research topics with great potential, including short-term foreign studies in case of the lack of competent supervisors in a specific research area in the IoC. Shaping the research topics has to be a continuous process and in **all** research areas of the IoC specific strategic plans have to be developed, which could be associated with national programmes. Public-

addressed Activity Report published once every 3 years should present briefly the perspectives of the research areas.

The renewal of research topics is unavoidable, but it should not be done rashly following every trend. In shaping the research topics the following should be considered:

- Based on the identity of IoC as interdisciplinary research institution, research done in the institute should not be a collection of separate topics, but an integral system, formed by joint publications and development. Effective integration helps to achieve more synergy in research. In addition to the contest of the best publication in the institute, IoC is planning to introduce the annual award for the best inter-departmental publication.
- Research carried out in the institute has to be based on existent competence and on the perspective of the research topics.
- Research topics have to be determined by necessities of the society and by new constructive ideas. Speaking of necessities of the society, one has to focus on the important subjects for Estonia which are uncovered so far.
- Research carried out in the institute needs a solid knowledge of different areas of mathematics. As there are no graduates in mathematics in TUT, young researchers must be sought from UT and TLU. For the latter, the institute improves the relations between IoC and UT.
- The Laboratory of Phonetics and Speech Technology is the only research team in IoC with a topic that meets **directly the national** interests of Estonia. In order to develop this research area in first priority, additional resources must be sought by initiating international programmes.

4.2 Taking care of newcomers in the institute

The mission of the IoC is to offer qualified graduate studies for students from TUT and other universities in Estonia. It is also the main opportunity to employ new researchers and guarantee the continuity of the research. IoC involves BSc, MSc and PhD students on research projects, providing them with opportunities for training and career advancement. The purpose of research projects, doctoral schools and seminars is to offer new knowledge that enables youth to continue research in top foreign universities.

The strategic goal of the IoC is to regulate and enhance the role of the institute in the graduate studies of TUT. For implementation of this strategic goal a specific action plan is needed, because there is tight competition for governmental-funded graduate positions. IoC stands for changing the funding of PhD students from curriculum-based funding to targeted governmental funding. The principal investigator of a research team, supervisor and PhD student could then choose the most suitable curriculum offered by faculties of TUT. In addition, IoC supports doctoral schools to become regular institutions, so they can keep functioning after the end of current financing by structural funds. IoC sets the goal to sign cooperation contracts with faculties of UT and TLU, related to the research areas of the institute.

4.3 Improvement of (inter)national cooperation

International cooperation enables research teams to broaden their research areas, which results in increased productivity through synergy and combining the methods. International cooperation should function both in an informal as well as a formal (through contracts and participation in joint research projects) manner. International partnerships are means to raise the qualification, competence and motivation of researchers and to advance development.

Since long-term informal joint research cooperation functions rather smoothly, we should focus mainly on participation in international projects and attracting more foreign researchers into the institute through international postdoctoral studies as well as creating new job positions for foreign researchers in each research team.

4.4 Increasing the volume of development

Although IoC is oriented mainly towards basic research, the institute should pay more attention to development. The problem of small-scale development lies not in the IoC, but rather in the size and the structure of Estonian economy which does not correspond to the knowledge-based model of society. However, focusing on development may help direct national industry to order developmental research from IoC. The duty of IoC is to enhance development, especially in the directions of applied research carried out in the institute like photoelasticity, speech technology, coastal engineering and cyber defence.

5 Management of the institute

1. Administration applies modern principles of performance-based salary for researchers being paid from finances of governmental funding, valuing the following:

- R&D results, which are expressed in monographs published by recognized publishers, papers in top-level research journals, making presentations at top-level conferences and working prototypes,
- supervision of graduate students,
- additional duties (e. g. participating in writing project applications and in organizing conferences and seminars).

2. Institute ensures good working conditions and up-to-date equipment.

3. Administration of the institute creates the possibilities for researchers to continuously improve themselves professionally, including:

- by supplying the library with the latest specialized literature, by arranging free access to the information services, including ordering the copies of publications,
- by arranging access to scientific and technical information, including commercial electronic resources,

- by favouring the mobility of the researchers, creating also the possibilities to host foreign researchers.

4. Administration increases the visibility of institute by:

- continually disseminating the information on its own research in printed and electronic form via the web, including *Activity Report*,
- organizing international top-level research conferences in Estonia,
- emphasizing PR activities more. IoC should have a PR manager, who takes care of the institute's website, relations with press, *Activity Report*). We are leading specialists in many areas in Estonia and should act accordingly. IoC needs a more positive mood, self-confidence and self-dignity, involvement instead of confrontation,
- arranging the creation of an archive of the publications of the institute.

6. Tasks for years 2008–2012

6.1 Research

- Alongside the current productive research areas of the institute, new areas of systems biology and cyber defence will be developed.
- IoC plans to increase the number of papers published in international top-level journals.
- IoC promotes putting together and/or regular updating of strategic plans in every research field.

6.2 Graduate studies

- IoC applies for annual quota of state-budgetary doctoral students in TUT. Participation in graduate studies needs to be regulated either by contract or directive from the rector.
- IoC plans 15 new PhD-s for years 2008–2012.
- Supervising the graduate students of TUT or other universities, institute claims a fair share of the funds allocated.
- IoC supports doctoral schools to become regular institutions.

6.3 International cooperation

- IoC plans, creates and manages useful strategic scientific networks in order to achieve common important goals. Every network link should be added based upon its skills or strengths. IoC actively seeks different opportunities for cooperation with existing international cooperation networks.

- Institute organizes international research events (conferences, seminars, schools etc) within each research area of the institute regularly, at least once in every 5 years.
- IoC plans to receive 1-2 foreign grants in each research area of the institute in 2008-2012.
- IoC keeps international post-doctoral studies lasting, applying for the additional finances from EU structural funds.
- IoC creates new permanent job positions for foreign researchers in each targeted-financed team for long-term visits (3 months to a year) of qualified researchers. IoC applies for additional finances from EU programmes like Marie Curie mobility programme and structural funds.

6.4 National cooperation

- IoC creates a subunit in Tartu with a size of about 10 people (infrastructure costs could be covered together with AS Cybernetica). This is a possibility to hire good researchers and PhD students from South-Estonia who would not otherwise work in Tallinn.
- To continually develop joint research with other research teams of TUT, for example with Department of Mathematics, having the same goal in their structural plan.

6.5 Development and knowledge services

The capacity of the applied research, development and knowledge services should be approximately 1/3 of basic research. Larger contractual activities and product development should be carried out through *spin-off* companies.

6.6 Financing

- IoC participates in the next contest for the Estonian Science Centres of Excellence.
- IoC participates in the next contest of graduate schools.
- IoC should focus more on applying additional finances from foreign funds and participating in EU framework programme projects.
- IoC applies for participation in national programmes.

6.7 Management of the institute and working environment

- Development of reporting databases in order to unify reporting within different targeted-financed teams and simplify reporting for researchers.
- Improvement of working environment and information systems of the institute. IoC will invest 4.25 million EEK (at today's prices) within next 5 years to modernize the offices and library.

- IoC continues to update the laboratories using finances from the national programme as well as other possibilities.
- According to the strategic plan of TUT, the university will invest 61 million EEK for renovating the building of the IoC in years 2011–2012.

6.8 Human resources

- Unlike earlier years, the current research staff is characterized by large proportion of part-time researchers and top-level seniors. In addition to paying attention to the needs of youth, it is necessary to pay attention to the needs of seniors in order to keep their scientific contribution high. We consider senior researchers who have attained the maximum status (leading research scientist) or who are over 50 years of age. This is a critical group, who have a danger of not being paid enough attention to. They have many responsibilities: supervise newcomers, maintain traditional work-culture. IoC has to create the possibilities of self-development like introducing *sabbatical* for active full-time senior and leading research scientists.
- IoC formulates the principles for acknowledging researchers' work in order to avoid acknowledging on unwritten rules that could be understood in different ways. Evaluation will focus on publication, supervision, administrative work, public activities and teamwork.
- IoC supports young researchers to come and stay in science, that will be carried out through participation of IoC researchers in teaching, supervising in doctoral schools and through creating new job positions for students at research teams. Many opportunities will be given to young researchers for self-improvement through mobility and cooperation projects.

6.9 Other

- To develop such a legal form for the institute which helps IoC to stand out from other subunits of TUT.
- IoC applies for extending the real estate in the westerly direction until building A and merging the area between buildings A and B with the real estate of Akadeemia tee 21B. This solution provides the institute with service land allowing it to solve numerous problems (service land for maintenance of building, ventilation, building up the WC-s and service rooms, bicycle parking lots etc). It would also relieve parking problems.
- By submitting high-level research papers, IoC supports the continuing publication of the Proceedings of Estonian Academy of Sciences and raises the level of series, related to the research carried out in the institute.

6.10 Implementation

- If necessary, detailed plans with realistic deadlines, means and evaluation criteria will be put together in order to carry out the tasks presented in this strategic plan.
- The implementation of this strategic plan will be evaluated annually and, if necessary, supplements and corrections will be made by the Board of the Institute. The Strategic Plan will be taken into account while budgeting.

Evaluation criteria of strategic plan 2008–2012

Evaluation criteria	2007	2010	2012
Number of employees	98	94	90
Number of employees in R&D	70	68	65
<i>inc. researchers</i>	59	58	56
Number of foreign researchers (contractual non-residents)	5	6	7
Number of PhD students under IoC supervision	21	22	24
Number of new PhD-s	2	3	5
Percentage of students, studied at least 1 semester abroad, from fresh PhD-s	40%	50%	60%
Publications (average of last 3 years)	173	180	190
<i>inc. research publications</i>	104	115	125
<i>TR WoS publications</i>	13	25	35
<i>R&D financing (mln kr/year)</i>	34,8	37,0	40,0
<i>inc R&D income from state budget</i>	16,8	18,0	19,5
<i>Non-state financing (contracts with local industry and public sector, participation in international programmes, foreign contracts etc)</i>	18,0	19,0	20,5
Average age of academic personnel	42,1	42,0	42,0
Budget of the institute (mln kr)	37,5	41,0	44,0