

Aalto University School of Chemical Technology

Report Scientific Advisory Board

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Key Recommendations

- Organize the industrial research funding to facilitate development of a high level fundamental research program, as it is virtually impossible to establish international excellence on the short term research needs of local industry.
- Spread the mission and vision of Aalto University and the School of Chemical Technology at all levels.
- Reorganize underperforming units; consider the strategic merger of units.

Introduction

The scientific advisory board (SAB) visited the School of Chemical Technology for the first time, from Monday January 30 till Wednesday February 1, 2012. The meeting was well prepared, with flawlessly organized logistics, excellent documentation and secretarial support. Owing to this, the meeting was efficient, informative and pleasant. We appreciated the open atmosphere in which the discussions were held. We thank the Dean and her team for the excellent arrangements.

Research

The research program at the School of Chemical Technology is traditionally strongly determined by collaborations with industry, performed in an excellent way. While this provides ample funding and high societal impact, the dominance of industrial funding stands in the way of the development of long-term fundamental research programs and the ambition to be an international top university. It is therefore imperative to implement a funding structure that sufficiently supports Aalto's mission to be in the international elite of academic institutions. This will also be beneficial for the applied research activities. A strong presence in fundamental research will form the basis for international collaboration, and will offer the Finnish industry access to international research centers (a window to the world of frontier research). This brings the perspective of breakthroughs for building the next generation of technology in Finland.

A good model for spending industrial research funds is:

- 65% of the funding for the project, to be spent as agreed with the client, and according to the client's wishes
- 25% of the funding spent on the project, but according to the principal investigator's insight (and to be reported to the client)
- 10% to be spent on general fundamental research (without any obligation to report to the client)

The advantages are on both sides: the agreed part of the research (65%) will benefit from the alternative approaches (the 25%) and possibly also from the generic capabilities developed in the unrestricted part (10%)

The research infrastructure of the School needs attention.

- A special fund should be made available for an upgrade of the basic infrastructure of the laboratories, which appears to be on the weak side. Recommended budget: at least 1-2 M€ per department in the next 2-3 years.

- Another 2-3 M€ budget is needed for truly unique equipment which will enable a step-up in scientific performance. This investment will help to build the research infrastructure characteristic of an international top university. Recommended budget. 2-3 M€ for each department applied over a period of 4 years.

We noticed that collaboration amongst faculty is just emerging. As scientific breakthrough often occur at interfaces, collaboration between staff should be strongly encouraged, also between different departments, and it should include joint supervision of doctoral students.

Mission, vision, strategy

Aalto University is a new university with a new and well-conceived philosophy of science and technology meeting art, design and economics. The executive level presents Aalto in a professional style supported by attractive documentation, but this is missed at lower levels in the organization. It is imperative that the mission of Aalto be known and supported by all faculty and students. During the meetings the SAB felt too often that they were listening to TKK employees (with the notable exception of the Department of Forest Product Technology). The Deans should be empowered (= be given the resources) to implement the vision of the university as much as possible and to institute an atmosphere of accountability at all levels.

The School of Chemical Technology needs a concise Strategic Plan in the style of the Aalto Strategy Document. The draft Roadmap available now is too long and insufficiently specific at this point, and reads like a collection of all inputs from the separate departments. Value chain analysis (presented several times!) may be a useful template for teaching purposes¹, but should not be the basis for a comprehensive research strategy. Emphasis on covering the entire value chain will change the university into a consultancy company that covers all aspects to a limited extent. Instead Aalto University should concentrate on some focus areas of scientific excellence with strong international impact.

Departments must prepare clear and well-organized strategic plans that are well- coordinated with other departments in the School of Chemical Technology. Also, Departments must prepare clear *management and financial* plans, which support their strategic plans.

¹ The Value Chain Analysis could be a valuable basis for a Special International Master Program on the Bioeconomy

It is recommended that an external advisory board (not necessarily ours) monitors and guides the School closely on a regular basis (i.e. 1-2 times per year).

We are concerned that Key Performance Indicators play a too dominant role at Aalto University. The Leadership should not lose itself in metrics². Setting overall targets that are too ambitious (i.e. 1.7 for overall research impact), or not ambitious enough (e.g. 1.7 for the area of chemistry) may be counterproductive. We recommend that Departments identify international laboratories as role models against which they benchmark themselves regularly.

The presentations to the Scientific Advisory Board were of mixed quality, some excellent, and some clearly below standard and lacking strategic vision. It is important that missions, visions and strategies of the individual departments be articulated much better, and that they be aligned with the strategy of Aalto as a whole.

The reform of the Department of Forest Product Technology, who successfully rejuvenated its program and staff is an outstanding example for the other departments, also in the professional way it presents itself.

Staff, Students, Postdocs, and Underperformers

From the managerial information we obtained it becomes evident that the School of Chemical Technology has many productive professors who supervise PhD students, guide them successfully to the doctor's degree, and who produce scientific papers and/or patents. However, it is also evident that staff exist whose publication record and turn out of PhD students is far below acceptable standards. We strongly recommend that the instruments of early retirement or outplacement (facilitated by attractive financial conditions) should be applied for the reorganization of underperforming units without reasonable perspective for improvement. This will have an overall positive effect on the morale of the entire university.

PhD students should be strongly stimulated to finish their projects in 4 ± 0.5 year. We have the impression that delays are caused by

- the industrial and applied nature of the projects, funded by industry

² Can one express the Mona Lisa in KPIs?

- the requirement that admission to the defense is only possible with four papers published
- lack of career awareness among the students.

We strongly support the recent introduction of career planning for PhD students. We furthermore recommend that the requirement of published papers be abandoned. PhD students deserve the title if they present an adequate thesis based on independently carried out research and they defend it successfully against experts. A thesis may of course contain published papers, but we do not believe that a formal requirement of having published papers is necessarily in the interests of the student, the university or even the scientific community.

Postdoc positions should preferably be filled by candidates from outside Aalto, and should not exceed a period of 2-3 years³. The risk of overloading postdocs on a combination of (applied) research and too many teaching duties will hinder their ability to do quality research and in the end hinder them to apply successfully for academic positions.

Teaching should be the responsibility of the academic staff, and be carried out by the professors. Minimize the system of Lecturers, and they should NOT be supposed to do research⁴. We recommend balancing the teaching load across the departments in the School of Chemical Technology, to spread the burden in a fair way. Postdocs can assist with teaching, but should not be responsible for entire courses.

The departments should establish a system to keep track of editorial activity of faculty (for example, membership in editorial boards and other reviewer activities), and encourage them to engage in international conferences, and in participation of professional committees. We suggest the School to take initiative for high-level conferences (“The Aalto Conference of Biorefining”).

Reform of the BSc Education

We strongly recommend that the BSc education will remain strong in the fundamental disciplines, particularly in chemistry. Applied areas, even those such as bio refinery and new materials may turn out to be fashionable, but the value of a solid foundation in the principles of thermodynamics,

³ We suggest that Aalto University introduces the (unwritten?) rule that one cannot apply for a position before 3 (?) years after one has graduated from the Aalto University.

⁴ In general we have the impression that Aalto University has too many postdocs and lecturers without ambitious career plans.

physical/inorganic/organic chemistry is invaluable.⁵ Graduate students that are well grounded in the fundamentals are the cornerstones of a successful research university⁶.

We suggest exploring the introduction of metrics for teaching quality, based on student surveys. We also recommend opening communication channels between the management and the students, as the awareness of strategies at the level of the Departments, the School and the University is low.

Miscellaneous

Although Aalto University presents itself in a professional, modern and attractive way, with informative documentation, we sensed a tendency to produce too much written text.⁷

The TOUR of the facilities could and should have been done much better. This is an ideal opportunity to showcase unique infrastructure and expose visitors to young talent. The laboratories were essentially empty at the time of the visit (5-6 pm), which we found surprising.

On the three Aalto research themes of biorefining, energy and water, the University may consider to hold a student/faculty seminar program with invited external guests on a quarterly basis. To help facilitate exchange of ideas and greater internal and external partnerships, it is recommended to bring art/design aspects or economic analysis into these research efforts to make Aalto a truly integrated university. There may be opportunities for joint appointments of the occasional professor between the schools to strengthen the coherence.

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⁵ *Deep-rooted trees can cope with any change in wind*

⁶ *Such students also possess the flexibility of being valuable employees in the industries in a changing world.*

⁷ *Who will read all this? Don't overdo it!*