Yrjö Neuvo Jubilee Seminar

Education, research and innovations – Predicting the unpredictable

Aalto University

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Yrjö Neuvo et al

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Yrjö Neuvo Jubilee Seminar
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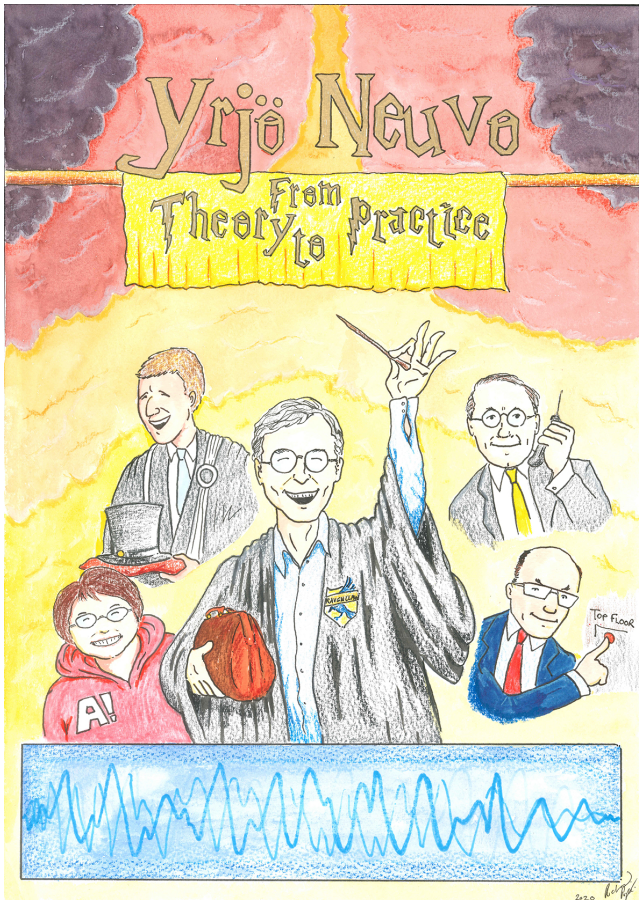
Education, research and innovations – Predicting the unpredictable

This special seminar covered various topics in digitalization, mobile phone development, multidisciplinary research programs, education, and national and international science policy.

Links to the transcripts and slides can be found here:
https://www.aalto.fi/en/events/yrjo-neuvo-jubilee-seminar

Watch the complete video here:
https://www.youtube.com/watch?v=si2AARtG6vw



A gift for Yrjö. Artwork by Richard JL Pope

Yrjö Neuvo

In Yrjö Neuvo's career, theory and practice have been intertwined. He has been a lifelong evangelist of the digital revolution. He received his PhD degree from Cornell University in 1974 and had a 19-year academic career as a professor of signal processing at Tampere University of Technology, as a National Research Professor at the Academy of Finland, and as a visiting professor at University of California, Santa Barbara in the United States. His most cited paper, "Vector Median Filters", has received 1,577 citations.

From 1993 to 2005, he was Chief Technology Officer and a member of the Group Executive Board of Nokia, during the phenomenal growth of the mobile phone market. After retiring from Nokia, Yrjö had a pivotal role in the formation of Aalto University as a member of the preparation committee established by the Finnish Government. Starting in 2006, as a Professor and Research Director at Aalto, he led Aalto-wide major research programmes.

He was chairperson and member of numerous international and Finnish working groups and committees on research and technology policies. He served as chairperson of major international scientific conferences. He has advanced conditions for basic and applied research, graduate education as well as industry-academia cooperation. Throughout, he has shown an exceptional interest and devotion to popularize science and technology. He has given numerous invited talks for widely varying audiences both in Finland and abroad.

Yrjö is a Life Fellow of IEEE, Member of Academia Europeae, the Swedish Academy of Technical Sciences, two Finnish academies, and holds four honorary doctorates. Asteroid 1938 DN carries his name, Neuvo.

His own experience working both in industry and academia triggered his interest to find novel ways to increase doctors' employment in industry. This resulted in starting the full academic-year-long Bit Bang courses for doctoral students and the creation of the national Post Docs in Companies — PoDoCo — programme, matchmaking young doctors and companies in Finland.

Guest Speakers

Carbon nanotubes towards industrial applications

Esko Kauppinen
Professor at Aalto University

30 Years of Signal Processing

Moncef Gabbouj
Professor at Tampere University of Technology

On the development of the digital world

Olli Simula
Emeritus Professor at Aalto University

On research and innovation policy at the national and European levels

Marja Makarow
Chair of Technology Academy Finland

Memories from Bit Bang and how it shaped my personal career

Vincent Kuo
Bit Bang course alumni, startup founder

How studies in signal processing shaped my personal career *page 23*

Kai Öistämö
CEO Vaisala

PoDoCo concept, Post Docs in Companies

Outi Krause
Emeritus Professor at Aalto University

Miten Osaamiskeskusohjelma muutti Suomea *page 26*

Pirjo Kutinlahti
Ministerial Adviser for the Finnish Ministry of Economic Affairs and Employment

Bit Bang: Yrjö Neuvo ja digitaalinen kumous

Martti Häikiö
Professor at the University of Helsinki

Kaikki alkoi syyskuussa 1948, Vuokkolasta *page 29*

Matti Kuusimäki
professor, former Prosecutor General of Finland

Selected speeches

Greetings from Aalto University

Ilkka Niemelä
President of Aalto University

Dear audience, colleagues and friends,

You are all warmly welcome to this special occasion, the Yrjö Neuvo Jubilee Seminar. A special occasion in honor of a very special person, Professor Yrjö Neuvo. A person who is very difficult to define by definitions, delimitations or generalisations. A person known for breaking boundaries, overcoming obstacles and inspiring towards the new and unknown – predicting the unpredictable in education, research and innovations. A real game changer.

This event serves to show our gratitude to him.

Yrjö has done a tremendous job for Aalto in various roles, always in the very core of the university. Yrjö's role has been pivotal already in the formation of Aalto University as a member of the national preparation committee chaired by Raimo Sailas. The committee was set up to build a new kind of university focusing on innovations and excellence. From the very beginning, Aalto has been home to multidisciplinarity, and Yrjö helped to create Aalto's multidisciplinary research platforms as an instrument of cross-school and cross-discipline collaboration.

And, as well known, Yrjö's strong contribution at Aalto University has continued in various forms and roles during Aalto University's first decade. As Professor and Research Director, he has led Aalto-wide major research programmes.

For example, Yrjö was Director of Aalto's MIDE programme, the Multidisciplinary Institute of Digitalisation and Energy. The research programme focused on long-term basic research in the fields of digitalisation and energy technology, and it created top-level expertise, strengthened education and increased the competitiveness of Finnish trade and industry. The MIDE programme, which ran from 2008 to 2013, kick started the Aalto-1 satellite and supported research in biofuel cell systems for portable electronics, energy efficient wood processing and many more. One of the talks in today's seminar sheds light on how MIDE supported carbon nanotubes research.

In addition to research projects, the MIDE programme also included a postgraduate course called Bit Bang, promoting wide knowledge and understanding of digitalisa-

tion of the future. Bit Bang was based on Yrjö's own experience of working both in industry and academia, which triggered his interest to find ways to increase doctors' employment in the industry. One of Bit Bang course alumnus will today share his memories on the course.

The journey continues. Yrjö is still doing valuable work for Aalto fundraising, together with Matti Pursula.

Dear friends,

During these years, Yrjö has left an indelible mark not only on the whole world, technology, business and Aalto University but also on the numerous colleagues and students he has met here. In this context, I would like to share a few of these memories, as they are a good illustration of Yrjö's incredible diversity and his richness of ideas:

> "Designing Aalto University in the working group led by the late Permanent Secretary of the Ministry of Finance, Mr. Raimo Sailas. Great memories of innovative collaboration that served the purpose of reforming Finnish higher education and research. And now we can admire the results."

> "Congratulations for your amazing career! You have been a mentor, advisor and role model to a whole generation of Finnish signal processing researchers and professionals as well as played an important role in the success story of the Finnish wireless industry. Best of luck with your ongoing and future endeavors in technology, science and science policies."

> "I have worked with Yrjö in several of his many roles for more than 20 years. I cannot stop wondering at his everlasting energy, inventiveness, and this wide scope of interests that does not seem to have any boundaries. In particular, I admire (and envy) his capability to be excited about technology and the opportunities it offers for mankind and business."

> "Yrjö has an exceptional ability to inspire people's curiosity and keep discussions open for new ideas. He never insists and never gives up! That's a rare combination."

> "Testing of the first carbon nanotube thin film based capacitive touch sensor, which could not quite take the touch of Yrjö's 'tiny' finger, but rather broke. But the later similar touch devices worked much better."

> "Since the Bit Bang course I have always been pushing the boundaries of my knowledge outside my expertise. This is one of my biggest learnings from Yrjö during my PhD studies. I feel truly privileged that I was able to be one of Yrjö's students. All the best and warm wishes."

> "I always remember you as a very warm person. You have faced younger people with the same dignity as more experienced scientists. It has always been a pleasure to listen to your thoughts and presentations and to learn! Thank you for these experiences!"

Greetings from Aalto University

Mikko Kosonen
Chair of the Aalto University Foundation Board

Dear colleagues and friends,

How can we celebrate the illustrious career of a remarkable individual whose contribution to so many fields is beyond what one can say in a few words? Someone who, after a professional journey of more than 50 years, retains boundless enthusiasm?

Let me begin with some personal notes. I have known Yrjö across three spheres: as an executive at Nokia, as an academic at Aalto, and of course also as a personal friend. Across all these spheres, Yrjö's infectious enthusiasm, wonder at new technologies and future orientation have been apparent. Yrjö is, to me, a role model of continuous renewal capacity, always learning, always interested in new things and always imparting that orientation to all the people around him. A person who has realized great things himself, but also inspired countless others. If there is a Moore's Law, there is definitely also an Yrjö's Law. Those gaining his contagious enthusiasm have gone on to impart that to many others, and so on, and so on. One just wonders how many people have been touched by Yrjö in this way? The branches of this tree of inspiration must be doubling at least every 2 years!

Dear friends,

Our title for today is "Predicting the Unpredictable," which certainly has a strong link to Aalto University and Yrjö. In fact, many aspects of Aalto's strategy appear to parallel Yrjö's character. Our previous strategy until this year was labelled Shaping the Future — and this, if anything, is Yrjö, predicting what comes next. Another key quality of Aalto from the very beginning has been, as Ilkka mentioned, multidisciplinarity. Who knows exactly how many disciplines Yrjö has been involved in, and how many bridges he has built between those? We also highlight innovation — and, again, Yrjö has carried forward innumerable innovations, taking theory into practice, crossing between academia and industry. And now, in our fresh strategy for 2021-2024, we highlight three new qualities. First, sustainability – where Yrjö is certainly a pioneer, connecting digitalisation and energy, and an evangelist for electromobility. Second, radical creativity; Yrjö has continually brought forward new ideas — many of which we take for granted today. An anecdote from our audience guestbook for today, when at Nokia, Yrjö "radically" proposed color screens for phones — others wondered why

those would be needed for a device that we use only for phone calls? And last but not least, the third theme of our strategy, entrepreneurship. Not only has Yrjö directly commercialised many technologies in his own career, he has also acted as a mentor to countless others, giving them the education, inspiration and confidence to go forward.

So how is it that Yrjö "happens" to embody all these elements of Aalto strategy? Is it a coincidence? Clearly not. These elements of Aalto strategy exist significantly because of Yrjö, his role in the very foundation of this institution, his continuous contribution through the means mentioned by Ilkka and others. Yrjö is fundamental to what surrounds us at Aalto today. In fact, the key characteristics of Yrjö predicted this outcome!

So, dear friends, how do we predict the unpredictable? How do we understand what to build for the society of the future? I think it is obvious. Look at Yrjö's character and orientation, his wizardry of new technologies and his approach to continuous learning. Take forward Yrjö's spirit that has brought all of us here today: enthusiasm, wisdom and, not to forget, a great sense of humour.

Let us keep these important qualities in mind throughout the day and celebrate Yrjö by looking to the future together. And knowing Yrjö Neuvo, he just might have some new advice for us....

Thank you.

Reflections on Nokia development

Jorma Ollila
Nokia CEO 1992-2006

Dear Yrjö, ladies and gentlemen,

In Autumn of 1993, I made a phone call to Yrjö Neuvo and asked him to come and see me as soon as possible. And he certainly did come over to my office. I had been Nokia CEO for 18 months, and I had a feeling that we needed some strengthening in the core management team. We had a discussion with Yrjö, which was very much the first time I had this opportunity, even though Finland is a small country and Yrjö and myself are both alumni of what now is Aalto University, as well as the particular high school in Vaasa in the western part of Finland. But we only had met each other in passing. And without too much hesitation, I was in a position to invite him to join the Nokia team, the executive team, as the Chief Technology Officer, CTO, and member of the executive board.

We had a feeling in the Nokia top team at that time, that if we do certain things right, the company is on the road to becoming a real world leader in mobile telecom. But we felt that there were some areas where we really needed some top, world-class leaders to complement the know-how that the young management team was able to demonstrate. The technology area and the position of CTO was one of those positions, particularly when the Global System for Mobile Communications was in its first years of development. The standard had been specified, but nobody really knew how it would be made into working products in either networks or in the phones. Yrjö played a key role in Nokia's mobile success, in Nokia becoming the number one in mobile phones and a leader in network equipment. And Yrjö's contribution came from a number of abilities that he could bring into the team. First of all, he had this world leading know-how in digital signal processing.

My research sources told me that he was one of the top three people in the world understanding digital signal processing, having published academic papers on it and having a broad understanding of what it was all about. So this was obviously a key reason. But Yrjö's contribution to Nokia was particularly strong for two other reasons. First of all, Yrjö's approach has always been multidisciplinary. So he always had the ability to see other technologies and how they affected the issue in hand, and he had a very deep and broad at the same time knowledge of those technologies, which could be employed to solve a problem or which affected these issues in hand. And equally

importantly, Yrjö was was a researcher of basic research in his well-known discipline. But he also knew the applied research, and he had an understanding how all of that could be made into products. And this was really eye-opening because I had not always seen — to me anyway — got used to that. You often have three different people which you need. You need some fundamental basic research know-how. You also need applied research, and that might be a different person, and then you need to have a product guy, so to speak, to understand how you bring all that to products.

So it is not common in top companies to have these three abilities in one person, and Yrjö's contribution at Nokia very much emanates from the fact that he had this this exceptional grasp. At the same time, obviously, as already mentioned by my colleagues here, the wonderful personality that Yrjö could bring into the team. His humble working style, listening to two different viewpoints, being a team player, so that he inspires people to get the things done with his friendly approach. This is something unique! I think the way in which Yrjö was one of the key outside people that we could bring into Nokia in the 1990s. To compliment the internal know-how and the young entrepreneurial thrust, which was the early 90s team that I started with. We could then complement with a number of other similar players from outside. Juhani Kuusi came about 18 months after Yrjö to run the research center, and the partnership the the two of you played was instrumental in Nokia having today the patent portfolio, and the understanding of the role of research in technology companies. We also had Frank McGovern to join in to run the manufacturing, and to create a culture that was world class! And Yrjö Neuvo coming to run the design on the phone side. So there was Yrjö really being an example also to many of those complementary additions that we brought into the team at the top level.

So there's a bit of a management lesson: that you have to be able to combine both the newcomers, pick the new ones and then combine that with a team which has been in the company for a little bit longer. Yrjö, your contribution to Nokia was exceptional! We all feel a lot of gratitude today from what we learned from you! What we learned together and what we were able to bring as an example to many of our colleague in different parts of the organisation.

So many, many thanks Yrjö, for all the years.

Twelve years you spent with Nokia.

Unforgettable years!

Thank you very much.

Reflections on Yrjö's role at Nokia

Matti Alahuhta
Member of Nokia's Executive Board 1993-2004

Dear Yrjö, ladies and gentlemen,

I first met Yrjö in 1976. Significant progress in digital signal processing had just started. I was doing my Master of Science thesis in this area, "The use of delta modulation in PCM-coding".

I was happy to get guidance in my study from Yrjö, who was one of the leading researchers in digital signal processing, and who had just returned from the USA. Yrjö made a strong impression as a person who is always curious to learn new things and help others.

Yrjö started at Nokia in 1993. I will now tell you about a couple of our shared experiences during our time at Nokia Mobile Phones. The first one is the way we successfully dealt with the collapse of the mobile phone market in 2001. This market had experienced exceptional growth rates: close to 70% both in 1998 and 1999, and 45% still in 2000. Then growth suddenly dropped below zero in 2001.

Due to our strong market position and our extensive distribution network, we were able to predict this happening. Through rapid actions, such as focusing on R&D investments - with Yrjö's leadership - to the completion of the most attractive new products which had faster data speeds, we succeeded in further strengthening our leadership in this demanding situation.

The next question was: how would the market volume develop from now onwards? We tried to "Predict the Unpredictable" in various ways. Yrjö again did a great job by making forecasts based on Moore's Law and on assumptions about the speed of the expansion of new technologies and features in mobile phones. In comparison, he also used historical market watch data. Market growth returned to positive already in 2002, and grew by about 15% in 2003, followed by increasingly faster growth.

But mobile communication is more than handsets. One of the key elements are international standards. The turn of the century was an active phase in new technologies. When 3G standardisation was completed, Nokia brought its first 3G phone, the Nokia 6650, to the market in 2002. 3G standardisation was an intensive competition

between two alternatives. With Yrjö's leadership Wideband Code Division Multiple Access or WCDMA, which was supported by Nokia and Ericsson, won this very important battle. The beginning of the era of smart phones was symbolised by the Nokia 7650 featured on the front page of *The Economist* in November 2002. Nokia continued to actively develop both Symbian- and Linux-based smart phone platforms, to bring new technologies and products to the market, and to strengthen Nokia's IPR-portfolio. Yrjö's contribution at Nokia was significant!

Yrjö and I became good friends during our Nokia years. Later, we became family friends. Our summer places are close to each other in Raasepori. Our common hobby is boating, which we have enjoyed with various success. Yrjö and Tuula have taken good care of Leena and me by bringing us firewood for sauna and fireplace — Yrjö driving his Avant and Tuula following him in her own Avant. Whenever we have had problems with whatever technology, Yrjö has always been there to help.

All in all, Yrjö has exceptional visions of the innovations and trends in telecom technology, from basic science to consumer products. It has been great to work with you Yrjö!

How Aalto University was born – Memories from the preparation committee

Matti Pursula
Rector Emeritus of Helsinki University of Technology, TKK

Good afternoon Yrjö and all Yrjö's friends and colleaques! It is a pleasure to be part of his Jubilee Seminar.

The subject given to me is to discuss is how Aalto was born, especially the work of the preparation committee known as the Sailas Working Group.

I will start with some background information.

Rector Yrjö Sotamaa, TaiK, University of Art and Design, Helsinki, proposed in his opening speech of the academic year 2005 a merger between Helsinki University of Technology, TKK, Helsinki School of Economics, HSE, and TaiK. According to Sotamaa, this kind of merger creating a new kind of university, an Innovation University, would be much more beneficial to Finland than the then-timely proposal about a merger between the Helsinki region art universities, including TaiK.

The Innovation University proposal attracted much attention, and the Rectors of the other two universities kept it worth further discussion. During the fall semester 2005, the Rectors created a very short preliminary draft about the basic ideas of the possible new university. We, the Rectors, even made a short trip to the USA to get to know Harvard and MIT as examples of top universities. We discussed, among others, with Professor Bengt Holmström at MIT.

At TKK, the University Board discussed the Innovation University proposal on 12 December 2005. The Board was very critical, and the discussion resulted in a conclusion: this is not the way TKK should go. The only ones for the proposal, as far as I can remember, were the Student Union representatives. The industry members of the Board, Timo Poranen and Yrjö Neuvo, shared the Board's negative feeling about the possible merger. It is, however, important to note, that the Innovation University was only a discussion point in the agenda of TKK Board. So, no official decision to reject the merger was never made.

Because of the TKK Board's opinion, the Rectors of the three universities, in early 2006, created a proposal for a common Innovation Institute, instead. The proposal did not satisfy the Ministry of Education, which at that time very strongly pushed the universities of Finland for renewal and cooperation. The Ministry, at the end of October 2006, founded three separate working groups to promote university cooperation. One of the groups had to make a proposal for as deep a cooperation as possible between HSE, TaiK and TKK.

The Sailas Working Group

The Minister of Education nominated Secretary of State Raimo Sailas, from the Ministry of the Treasury, to chair the working group. The other members of the group were the Rectors: Eero Kasanen (HSE), Yrjö Sotamaa (TaiK) and Matti Pursula (TKK), plus the industry representatives Yrjö Neuvo and Matti Lehti. The Secretary General of the group was Professor Turo Virtanen from the University of Helsinki. In addition to that, the three universities gave secretarial help to the group.

Yrjö Neuvo had experience as a professor, and as industry leader and had chaired a Ministry of Education working group on the development of engineering education in Finland. Matti Lehti was at that time also the Chancellor of HSE. So, both industry representatives had knowledge and inside experience of university administration and culture in general, which was very important to the success of the working group.

In the first meeting of the working group, I stated the points, which in my opinion, were the boundary conditions of TKK for a possible merger. In a nutshell, TKK is and will be a strong research university. Therefore, we should not aim for and discuss about something called the "Innovation University". So, the group, in its work, used the term "top university". Yrjö Neuvo very much supported my views.

The basic discussions in the working group were in general positive. All the members tried to find solutions in the critical questions of the idea and principles of the possible new university. In my opinion, one very important additional point was the statement that the new university is a national project, which benefits Finnish society as a whole. Of course, some disagreements and delicate points existed, too. But they could be solved, like the question of the future campus structure, which was stated in a tentative form: the possibilities of Otaniemi Campus should be investigated.

Sailas chaired the working group with a neutral position and supported the goals of the merger. He took a positive view of the idea of the foundation-based university, to the state share of the endowment capital, and to doubling the yearly state financing. He also understood the importance of the transfer of the facilities to the new university. I remember him stating that he supported all these proposals, even though he knew that his colleagues in the Ministry of the Treasury will oppose them.

Yrjö Neuvo and Matti Lehti were active and constructive members of the working group. One important part of their work was to cooperate with the background group

from industry and to promote the idea of the industry share of the university capital, and to estimate the possible amount of the industry donation. Their work was successful, as we know.

When the merger proposal in details were known, the Boards of all the three universities supported it unanimously, at TKK on 12 March 2007.

Conclusion

From the above mentioned, we can see that Yrjö was both an active and important member of the Sailas Group. From the TKK point of view, he was a strong supporter for the most important goals of TKK, the creation of a strong research university with new kind of teaching and learning culture with students in the center. And his work in the background discussions with industry, and later on with TKK professors, have certainly been important in the process of the creation of the new university.

The Sailas Group work did, from the point of view of TKK and Aalto, result in another important action. Yrjö lived at that time in Tapiola, and very often we did travel to and from the Sailas Group meetings together in a TKK car. So, we could, among other things, discuss the meeting agenda in advance and afterwards. At that time, Yrjö was retiring from Nokia. Therefore, in one of those common trips from the meeting, I made Yrjö a proposal to join the TKK staff as a research director with special tasks to be defined later. This way Yrjö became again a member of TKK staff, and among other things, the director of the MIDE research programme. In MIDE, he again demonstrated his ability to create something new, like the successful Bit Bang doctoral course and a flexible research programme with minimum bureaucracy.

To sum up, as I stated, Yrjö's immediate reaction to the Innovation University proposal as a TKK Board member was negative, but changed later when the goals and boundaries of the top university project, with his cooperation, were properly defined. Well, Yrjö was not the only one to hesitate. To your comfort Yrjö, I can state, that among others, Professor Bengt Holmström at MIT did not see any real benefits in the proposal when the rectors discussed with him in December 2005. And after all, he became a member of the first Board of the Aalto University Foundation. So, Yrjö, you were in good company!

Thank you Yrjö, and all the best for the future!

How studies in signal processing shaped my personal career

Kai Öistämö
CEO Vaisala

Thank you for the opportunity to speak to you on a very exciting topic. The topic of this speech is how studies in signal processing has shaped my career. And when I think about it, I thought about what to speak of, as I've studied engineering, I took it literally, so it is really about what my career is, and how has it been shaped by studies. So just what did I study?

So first of all, I met Yrjö when I was at the end of the third year, and I was looking for Master of Science thesis work. And I had heard about this excellent research laboratory of signal processing in Tampere University, and I sought a short introduction to Yrjö, met him and asked if I could join and do a Master's thesis. So I ended up doing it, and it was then a completely new topic, which is nonlinear signal processing.

First, on median processing on still images as a Master's thesis. And then once I did that, then I was thinking about whether I should actually go to a real job or whether I should continue my studies at Yrjö's lab. I decided it was not that hard of a decision, so I decided to continue as a PhD, studies were a little bit more complex. So it got three dimensional. So it's vector median processing of video images. So there was a kind of two dimensions: one dimension on the vector, the median side, and one dimension more on moving images instead of still images.

And then, post that, at the very end of the studies, I already decided to join Nokia. At that time, there was a consumer electronics side, which was then actually doing television for those of you who are younger and do not necessarily remember but that was then the biggest division in Nokia, and supposedly the growth area of the future. So there I went, and the first job really was actually taking the algorithms that we had developed during my PhD thesis and actually turn them into an actual real product. So taking that algorithm simulated in a such a way that it actually would fit into a TV context, and then taking it actually on a signal processing chip on silicon to be introduced in upcoming HDTV products. Long story short: the HDTV didn't happen, and the chip itself did happen, but it really didn't have much of a success.

Then I joined the mobile phone side of Nokia, actually after consulting, Yrjö who had already by then joined Nokia. He was one of the very few people I called. I was

abroad and made a call back to Finland, I had decided to come back. And it was time of the recession in Finland, and it was not the easiest thing to find a job in Finland, and I was wondering about any leads, any kind of good ideas where somebody like myself could find a good job.

And I guess I hadn't made a completely bad impression during my study. So I think I got a little bit of an introduction through Yrjö, and so I got a job. This time as a product marketer, and this actually is kind of a first reference back to the studies, how they actually shape my career. So obviously, the first step was pretty much of a linear step, many people have done this.

This was a side step, and actually during my studies, I had all along studied not just the signal processing but also industrial economics. And I remember having a discussion with Yrjö after the Master's thesis was done. And we were considering whether I should continue on the PhD side, and the discussion went something like that, that he was challenging me: "Are you really serious about this, since you are studying all this economics side as well?", and I convinced him that it's a good idea. And so I did, and then that actually came to play on the next big part of my career at Nokia, and then post that, actually as I was going I was going to work for a private equity company post Nokia as well, so a big part of that was there.

Then the next side of the signal processing complex thinking was when I joined a company called Interdigital, which is actually doing basic research. It was like going back to the roots and very much of a signal processing side, kind of mobile algorithms and so on. I still was more on the management and kind of commercial side, but I very much needed to understand, and there, certainly having the three-dimensional vector median and moving images capability helped me a quite a bit. Another thing, which is actually kind of an interesting coincidence and, I'll come back to this a little bit later, touch upon this a little bit later as well; during my studies where we were a very international group as we've heard already today and it was lots of cooperation around the world, one of the places where we actually visited and had cooperation with, was the University of Rennes, which happens to be a cousin city for Tampere, and we actually, at Interdigital, we've actually bought the the video research at Rennes.

So I had at least a lots of street credibility of actually having been there more than 20 years before visiting the laboratory, having done a PhD in video processing, and it worked out actually great. And now, as you heard, the latest job is at Vaisala. Now, going back to the topic. So how did my studies in digital signal processing impact my career? I think more, even more when I reflect back. It's more than the digital signal processing side. It was actually the studies side that impacted my career, and then I go back on: how was the research group that Yrjö had in Tampere?

The first thing I would bring up is it was international The ambition level was to be the best in the world. It was not "local". It was not "best in Finland". But it was "global". All the collaboration was around the world and for a 20-something-year-old, it was kind of eye-opening on raising the bar and thinking about the world completely

differently than what one would have thought otherwise. The other thing is the international team, the nature of the team and, at that time living in Tampere, that was not the norm. I tell you that having an environment with top-of-the-class people from around the world, working language English, it set the tone on how I perceived the world. A second thing I would bring up is selecting the team, building the team and creating a team. A team is much stronger than an individual. I don't think I would have made the PhD ever without the research team. And that kind of a second learning is, a team is much stronger than an individual. Third thing would be leadership. Lead by example, lead by questions.

So Yrjö was genius, actually, whenever I had technical trouble. He never gave me answers, but he always knew what were the right questions, and I think that was much better than giving the answers and not everybody can do that. Then, creating the right environment to succeed. It's bringing the right people, setting the right bar. It's about the leadership. But it's also about the atmosphere. It's about creating the enthusiasm and the curiosity that many people have talked about today. It's also about creating fun and a place where you want to be. And when I reflect back on my career, these are actually the things that have shaped my career probably even more than the topic that I studied. And these are the things that I have tried to carry with me and and it's like having a management training program in the laboratory when I worked there, and it has been a privilege.

I really thank you, Yrjö, for all that and I continue to be very, very thankful!

Miten osaamiskeskusohjelma muutti Suomea?

Dr. Pirjo Kutinlahti
Ministerial Adviser of the Ministry of Economic Affairs and Employment

Arvoisa professori Yrjö Neuvo, hyvät kuulijat

Alueellisen innovaatiopolitiikan lippulaiva osaamiskeskusohjelma eli OSKE on ollut merkittävä osa suomalaista innovaatiopolitiikan historiaa.

Osaamiskeskusohjelman ensimmäinen toimintakausi käynnistyi vuonna 1993, jolloin Suomen talouden tilanne oli vähintäänkin yhtä haasteellinen kuin tänään. Tuon ajan päättäjillä oli vahva uskomus tiedon, osaamisen ja innovaatioiden merkitykseen kilpailukyvyn ja talouskasvun turvaamisessa. Osaamiskeskusohjelman käynnistäminen oli osa laajempaa hallituksen talouspakettia, jonka pohjalta Suomi nousi 2000-luvulla yhdeksi maailman seuratuimmaksi innovaatiomaaksi.

Ohjelman ensimmäiselle kaudelle valittiin kahdeksan osaamiskeskusta; Vain suuret kaupungit pääsivät mukaan. Viimeisellä, kolmannella toimintakaudella jo mukana jo 22 alueellista osaamiskeskusta. Ohjelmaa johti laajapohjainen eri ministeriöiden, korkeakoulujen, yritysten ja alueiden edustajien muodostama työryhmä, jonka puheenjohtajaksi kutsuttiin professori Yrjö Neuvo.

Toisin kuin kansalliset t&k-rahoituksen välineet, OSKE asemoitui alueellisen innovaatiotoiminnan kehittämisvälineeksi. Siihen valikoituvat kilpailun kautta motivoituneimmat ja kehityskelpoisimmat kaupunkiseudut. Edistyneimmät alueet kirittivät kehittymässä olevia ja päinvastoin. Käytännön toiminnasta vastasi useimmiten paikallinen teknologiakeskus, joskus myös alueen korkeakoulu.

Osaamiskeskusohjelman vahvuutena oli ennen kaikkea sen vipuvaikutus alueen tutkimus- ja innovaatiotoimintaan. Varsin pienellä julkisella rahoituspanostuksella saatiin käynnistettyä mittavia kehittämishankkeita alueen yritysten, korkeakoulujen ja tutkimuslaitosten välillä. Nämä puolestaan lisäsivät alueen elinvoimaisuutta ja kilpailukykyä sekä loivat osaamispohjaisia yrityksiä ja työpaikkoja.

OSKE auttoi alueita erikoistumaan omille vahvuusalueilleen ja työnjako eri alueiden välillä parani. Suomeen alkoi syntyä kansainvälisesti merkittäviä kasvukeskittymiä. Ohjelmasta hyötyivät isot kaupungit mutta etenkin keskikokoiset ja pienet kau-

punkiseudut. Seuraavassa kerron kolme menestystarinaa, joiden osaamispääoma on kehitetty osaamiskeskusohjelman ajoilta.

Ensiksi katse kohti Suomen länsirannikkoa Vaasaan. Vaasan seudulle on kehittynyt Pohjoismaiden suurin energiateknologian keskittymä, jossa kehitetään älykkäiden sähköisten ratkaisujen, kestävän energian, joustavan sähköntuotannon ja digitalisaation ratkaisuja. Vaasan energiakeskittymä viime vuosina ollut Suomen kiinnostavin työ- ja harjoittelupaikka tekniikan opiskelijoille sekä alan insinööreille.

Seuraavaksi siirrymme Suomen metsä- ja biotalouden keskittymään Joensuuhun. Pohjois-Karjalaan ja sen keskuskaupunkiin Joensuuhun on viimeisten vuosikymmenien aikana syntynyt ainutlaatuinen biotalouden osaamiskeskittymä. Alueen profiloitumista tukevat vihreän kasvun osaamiskärjet, kuten ict, fotoniikka ja kemian materiaaliosaaminen. Joensuussa sijaitsee jo nyt useita fotoniikka-alan yrityksiä ja alueen koulutus- ja kehitysorganisaatiot muodostavat yhdessä yritysten ja tutkimuksen kansainvälisen keskittymän.

Lopuksi vielä kurkistus kohti kehittyvää kasvukeskusta Kajaania. Mittaustekniikkaa on kehitetty pitkäjänteisesti 90-luvun lopulta alkaen alueen osaamisperusteisen elinkeinopolitiikan kärkenä. Tekoälyn aikakaudelle siirtymistä vauhdittaa myös Kajaaniin rakennettava maailman kärkeä oleva LUMI-supertietokone. Sen ympärille on rakentumassa suurteholaskennan innovaatioekosysteemi, jonka hyödyt voivat olla Suomelle ja Euroopalle vähintäänkin yhtä merkittävät kuin elektroniikan kehitys aikanaan Nokian ICT-klusterille.

Hyvät kuulijat,

Osaamiskeskusohjelma on kiistatta kansallinen menestystarina, jonka vaikutukset näkyvät tänä päivänä innovaatiotoiminnassamme ja alueiden osaamispohjaisessa kehittämisessä. Nykyinen osaamispohjainen talous ei olisi syntynyt ilman pitkäjänteisiä investointeja tutkimukseen ja innovaatioihin.

OSKEssa omaksuttu ja kehitetty aluekehittämisen malli herätti aikanaan suurta kiinnostusta ympäri maailmaa. Tuskin liioittelen, jos väitän, että nykyinen EU:n älykkään erikoistumisen strategia olisi perua suomalaisesta osaamiskeskusohjelmasta ja sen luomasta aluekehittämismallista.

Menestystarinoiden rinnalla alueet kohdanneet aika ajoin myös talouden äkillisiä rakennemuutoksia, joissa työpaikkojen menetys on tullut yllättävänä iskuna. 2010-luvun alussa koettu IT-alan rakennemuutos koetteli erityisesti Tampereen, Jyväskylän ja Oulun seutukuntia. Huomattavaa on, että jo muutamassa vuodessa nämä kaupungit selvisivät iskusta ja uutta yritystoimintaa on pystytty luomaan aiempaa osaamista hyödyntämällä.

Kolmannella ja samalla viimeisellä toimintakaudella (2007-2013) ohjelman toimintamallia uudistettiin. Aluekehittämisen rinnalle nostettiin klusteri- ja toimi-

alapohjainen yhteistyö, joka vahvisti erityisesti alueiden keskinäistä yhteistyötä. Osaamisklustereita ja voisi pitää esiasteena nykyiselle ekosysteemitoiminnalle, joiden tavoitteena on kannustaa eri kokoisia yrityksiä ja tutkijoita yhteistyöhön paikasta ja toimialasta riippumatta.

Hyvä Yrjö,

Osaamiskeskusohjelma muutti ratkaisevasti Suomea. Alueet ja sen yritykset investoivat osaamiseen ja innovaatioihin. Hajallaan olevaan osaamisen kokoaminen osaamiskeskukseen auttoi isot ja pk-yrityksiä tekemään yhteistyötä alueen yliopistojen ja tutkimuslaitosten kanssa. Opittiin tekemään yhteistyötä kaupunkien ja maakuntien kesken.

Ratkaisevaa ohjelman menestymiselle oli se, että sitä johdettiin alueiden omia valintoja kunnioittaen. Professori Yrjö Neuvon henkilökohtainen sitoutuminen ja visio osaamispohjaisesta Suomesta ja sen alueista on tunnistettavissa ohjelman strategisissa periaatteissa. Näitä olivat: toiminnan laadusta ei tingitä, kehittämiseen sitoudutaan pitkäjänteisesti ja tuetaan motivoituneita ja yhteistyöhön kykeneviä kehittäjäyhteisöjä.

Uskon vahvasti, että OSKEn kaltaiselle ohjelmalle olisi tarvetta myös nykyisessä toimintaympäristössä. Kansainvälinen kilpailu tki-toiminnan sijoittumispaikoista ja osaajista on kiristynyt entisestään. Suomi tarvitsee lisää kansainvälisiä osaajia ja tämä voi onnistua vain sillä, että meillä riittävän innostava ja houkutteleva toimintaympäristö innovatiivisille ja uudistushaluisille yrityksille.

Kaikki alkoi syyskuussa 1948 Vuokkolasta

Matti Kuusimäki
Professor

Hyvä ystäväni Yrjö, arvoisat kuulijat!

Näiden pikku muisteloideni otsikko on näpsäkästi seuraava:

KAIKKI ALKOI SYYSKUUSSA 1948 VUOKKOLASTA

Minulle on suotu ilo pitää tämän seminaarin viimeinen puheenvuoro. Se sopii hyvin. Jo siitä selvästä syystä, että olen kuulijoista ainoa, joka on voinut seurata Yrjön oppisarkaa sen ensi päivästä lähtien. Niinpä olisikin ollut hävytön temppu, ellei Yrjö olisi tohtinut ottaa riskiä ja sallia minunkin täällä esiintyä. Sitäpaitsi enhän minä, pohjalainen professorismies, näinkään fiinissä seurassa ”päätäni alaha paina”.

Yrjön elinikäiset opinnot alkoivat virallisesti silloin, kun hän asteli ensi kertaa sisään Vaasan kaupungin Hietalahden lastentarhan 5-vuotiaiden Vuokkola-osastoon. Henkilökemioista lie johtunut se, että ystävystyimme siellä Yrjön kanssa heti. Tämä ystävyys siirtyi tarhassa 6-vuotiaiden Sinikelloihin, jatkui luokkatoveruuteen sekä kansakoulussa että Vaasan maineikkaassa lyseossa, ulottuen edelleen opiskeluaikojemme kämppäkaveruuteen. - Maininnan arvoista on muuten, että olen Jorma Ollilan, Matti Alahuhdan ja Yrjö Neuvon jälkeen jo neljäs puhuja, joka on saanut oppinsa Vaasan lyseossa! - Ystävyys Yrjöb kanssa on kantanut yhtä rikkumattomana, maantieteestä ja elämän käänteistä riippumatta, näihin päiviin asti.

Varhaiskasvatuksen merkitys lapsen menestykselle elämässä on tutkijoillekin valjennut vasta viime aikoina. Mutta me olemme Yrjön kanssa aina osanneet ilman kasvatustieteilijöitäkin arvostaa lastentarhamme Maiju-tädin esikoulua. Syvästä arvonannosta on todisteena se, että pari vuotta sitten, vanhoja taas kerran muistellessamme, päätimme ottaa selvää, vieläkö iki-ihana Maiju-täti, tuolloin aivan nuori lastentarhanopettaja Maiju Vuola, vaikuttaisi keskuudessamme.

Ja kuinka ollakaan, turkulaisesta palvelutalosta löysimme yli yhdeksänkymppisen pirteän leskirouvan, josta emme olleet 70 vuoteen mitään kuulleet. Rouva Vuola tarjosi hieman jo varttuneille tarhapojilleen lounaan, ja vietimme hänen kanssaan unohtumattoman iltapäivän. Kyyneliltäkään ei vältytty, kun keskusteluissa ilmeni, että

aikaansa tarkoin seuraava, uskomattoman muistin omannut rouva oli vuosikymmenten saatossa tarkkaillut kasvattiensa — ja siinä joukossa meidänkin — joskus julkisuuteen päätyneitä vaiheita.

Olisi runsaasti kerrottavaa yhteisten lapsuus- ja nuoruusvuosien ajalta. Kuvauksia uskollisista pyhäkoululaisista, poikakerhojen lennokinrakentajista, vaativien partiotaitokilpailujen taistelijoista, esiintymisten suhteen uhkarohkeista nokkahuilutaiteilijoista ja ylipäänsä puuhakkaista nuorukaisista. Nyt on kuitenkin pitäydyttävä vain hajahavaintoihin siitä, millaisia signaaleja Yrjön ensiaskeleet 1950-luvun heikkovirtatekniikan saralla jo antoivat vuosikymmenten päässä siinnelleestä signaalinkäsittelyn professuurista!

Havainnot on helppo fokusoida yhteen sanaan — ja se on transistori, tuo puolijohdetekniikan mullistanut kolminapainen tulokas. Yrjön johdolla oltiin toki jo paljon aikaisemmin värkätty kidekoneet, ensin sellaiset, joissa kuuluvuuden aikaansaamiseksi piti metallipuikon kärjellä rapsutella kiteen pintaa, ja myöhemmin kätevämmät, kiinteällä kiteellä varustetut.

Mutta sitten, vuonna 1957, Yrjö kertoi uutisia keksinnöstä, josta oli lukenut juttua Tekniikan Maailmassa. Bellin laboratorioissa Amerikoissa tehdyn keksinnön avulla pystyisi kuulema rakentamaan taskulampun pariston virralla toimivan, kovaäänisellä varustetun radion. Ja mikä tärkeintä tietää; näitä ihmeitä olisi kuulema jo Helsingistä saatavissa, tosin kovalla hinnalla.

Ennakkoluulottomasti päätettiin TM::n kytkentäkaavion pohjalta rakentaa molemmille 3-transistoriset radiot. Oma lukunsa on se, miten vanhemmat saatiin taivuteltua kustantamaan tarvittavat osat, transistoreiden lisäksi vastukset, kondensaattorit, kiteet, pertinax-levyt, juotoskorvat, ferriittisauvat, antennijohdot ym. (aika hyvin lueteltu 60 v takaa näin juristin muistilla, eikös!). Insinöörin pojalle tehtävä oli helppo, minun historianlehtori-isälleni hankkeen perusteleminen oli työläämpää. Äitiäkin vielä tarvittiin. Kun pohdimme sitä, että mistä saadaan sopivat kuoret levällään olevien osien kokoamiseksi, opettajaäitini keksi tuoda koululta vaneriset liitulaatikot. Siinäpä oiva ratkaisu aikana, jolloin muovituotteista ei vielä ollut tietoa.

Radiot toimivat hyvin. Näiden teknisten hankkeiden toteuttajina rinnastuimme keskenämme tunnettuihin kirjallisuushahmoihin Sherlock Holmesiin ja tri Watsoniin — eikä tarvinne arvuutella kumpi oli kumpi! Vaasan Holmes & Watson - elektronikkapaja ei toki välttynyt vastoinkäymisiltäkään. Partiolippukuntamme riskisijoitus, mahtavaksi innovaatioksi ajateltu 6-transistorinen leiri- ja retkiradio, ei syystä tai toisesta suostunut koskaan kunnolla toimimaan. Harmillista tilannetta lippukunnanjohtajalle selviteltäessä minä olin mieluusti vain tuo firman Watson!

Kaikki kunnon tuotteet jalostuvat tuotekehittelyn myötä. Kun tapanamme oli tehdä pyöräretkiä Vaasan ympäristöön, ryhdyttiin pohtimaan matkaradioversion kehittämistä. Tuumasta toimeen. Peltiset telineet ohjaustankoihin, toisiinsa yhdistetyistä polkupyörän pinnoista antennit, kuulokkeet korviin — ja syntyivät valtakunnan en-

simmäiset polkupyöräradiot!

Pari vuotta myöhemmin oltiin vartuttu niin, etteivät transistorit enää riittäneet vapaa-ajan elämänsisällöksi. Bill Haleyn rokkarit olivat vallannut Suomenkin. Tarvittiin levysoitin markkinoille tulleiden EP- ja LP-levyjen soittamiseen. Kotona ei asialle lämmetty, koska vallitsi epäily, ettei soittimella muuta soitettaisi kuin rokkia.

Silloin Sherlock esitti, että, okei, valmistetaan levysoitin sitten itse. Et voi olla tosissasi, epäili Watson. Mutta, hankittiin sopiva puulaatikko, isä-Olavin avulla Strömbergiltä valurautainen sähkölieden levy, johon oli porattu keskelle reikä akselia varten, tarpeet muuntajan käämimistä varten, polkupyörän dynamo moottoriksi, erinäisiä hihnoja voimansiirtoa varten ja vähän muutakin tilpehööriä till. Vain sähköinen äänivarsi neuloineen oli tarpeen ostaa. Sherlock teki vetohihnalaskelmat, jopa kahta eri nopeutta varten. Stroboskooppikiekolla hienosäädettiin oikeat nopeudet 45 ja 33 1/3 kierrokselle. Vahvistin rakennettiin vielä silloin radioputkitekniikalla. Sähkötarkastuslaitoksen luvat taisivat kyllä jäädä hakematta, mutta juristiopinnot minä aloitinkin vasta vuosia myöhemmin!

Soitinta käytettiin tuohon aikaan suosituissa kotihipoissa. Siinä yhteydessä Watsonillekin muodostui itsenäinen trehtävä. Jos näet vaasalaisneitojen maanittelu meidän hippoihin olisi jäänyt Sherlockin varaan, oltaisiin saatu tanssia kolliporukassa, vaikka miten hivelevät sävelet olisi uljas soittimemme ilmoille loihtinut.

Sitten Yrjö siirtyi tupsulakkien kaartiin — kuinkas muutenkaan! Mitä hän sen jälkeen on saanut elämässään aikaan, olisi toisen tarinan paikka. Ja sitäpaitsi – sitä tarinaahan on tässäkin seminaarissa setvitty pitkin päivää!

Kansleri Tauno Nurmelan eräässä mainiossa teoksessa todetaan, että vilpittömimmän arvostuksen ihminen voi elämäntyölleen saada vasta sitten, kun hänen viimeinenkin luokkatoverinsa on nurmen alla. Minä nyt katson vielä näin nurmen päältäkin voivani toisena lyseolaisena antaa täyden arvon Yrjön työuralle. Mutta tämä ehdottomasti vain sillä edellytyksellä, että hän aina myöntää hänen olevan mahdotonta saada elinikäisessä opinsaunassa kuitenkaan minua kiinni. Yrjö kun tuli vasta 5-vuotiaana Vuokkolaan, jolloin minä olin opiskellut jo kokonaisen vuoden elämäntaitoja lastentarhan 4-vuotiaitten Lemmikit-osastossa!!

Kiitokset tilaisuudesta olla täällä tänään mukana!

Menestystä Yrjön elämän jatkopuuhille toivotan! Kunhan vain muistaa, että metsätöissä voi digiloikka olla noin vanhalle miehelle kohtalokas!

This special seminar covered various topics in digitalization, mobile phone development, multidisciplinary research programs, education, and national and international science policy.

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