VISION FOR UNIVERSITIES - A 5-10-YEAR PERSPECTIVE

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Key words:

At present the institutions of higher education are facing considerable challenges in consequence of the development of communication technology during the last ten years. From the mid-80s and till today there has been a permanent development of new technological tools[1]. The development of the coming years[2] will imply still simpler and more powerful tools for communication and with that also learning. The access to knowledge and with it acquisition of competence gets more transparent and democratic and will, at the same time, liberate qualifying further education from the historically conditioned unified connection to nation states and their institutions.

INTRODUCTION

An old Chinese proverb says that *"when the winds of change are blowing, some people build windbreaks, while others erect windmills"*. Seen in the light of the challenges that the institutions of higher education are facing today this quotation can be used to explain the option of the educational institutions. One can accept the challenge and try to get energy out of the changes or one can hope not to be blown away.

A wind is blowing. I dare take the view that the force of this wind, that is the pressure of change at the institutions of higher education, is so comprehensive that it makes the 1968-revolt against the professor might look like ripples in a glass of water.

There will be no revolt, but there will be social changes created by what can be summarised as "the communication possibilities of the Internet" and "the distributed calculation power"[3].

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[1] Since the middle of the 80s we have got faxes, PCs on networks, the Internet, www, user-friendly browsers, hand-carried, distributed calculation power and latest broadband mobile telephony.

[2] The technologies of the coming years will partly be a multiplication of the speed at Internet 2, partly new standards for wireless communication (bluetoth). Furthermore, the newest (military) topographic mapping methods have created the basis for a total global remapping in 3D, which enables quick formation of a 3D virtual world to move in.

[3] The development of new communication-technological tools was mentioned under note 2 and 3. The distribution of the calculation power has two central characteristics. Still more calculation and transmission power is built into many everyday objects, which become still more intelligent, and the individual - private as well as professional - gains access to considerably more network resources by way of storage and calculation power. This will enable the single person or professional to organize his everyday and his professional efforts very differently from today, which implies striking changes in everyday and working life.

Changed patterns of communication

The Internet development[4] has created the possibility of an entirely new communication and learning culture at the universities. Previously it was, and in many places it still is, the "curriculum-fixing teachers" who - in co-operation with the study board - determine contents and levels in courses and professional activities. The objective is/was to secure the research-based education, which means that the scientific staff has to secure that the desired professional and scientific level of competence is acquired by the students.

Today the Internet has given the researcher and the student direct, under-the-fingertips access to the total sum of knowledge in the world. Operations, which were earlier connected with the use of the local department library or the library of the university, where scientific monographs and journals were available, have now been replaced by interactive search processes in, supervision of and participation in the creation of new knowledge, which will be on the network the moment it has been created. In that sense we begin to regard the Internet as the total sum of all the knowledge in the world.

Changed qualification requirements

At present, the knowledge-heavy work processes are being modified and place new demands on the highly educated manpower. That is demands, which in connection with AAU may sound like a commonplace and rhetoric repetition of the "old hallmarks" about the qualities of group work. I shall, however, assert that these demands have been changed qualitatively in many fields, because they particularly strengthen the demands and focus on the personal resources of the single staff member.

It is qualification requirements that besides comprising an attachment to a certain discipline, profession, line of business or other social segments also contain heavier demands on the personal and communicative qualifications. It is
- adjustability
- professional innovation
- independent organisation of work and learning processes
- communication ability in international relations and virtual organisations
- ability to function initiating, binding, independent and results-oriented in network structures.

Still an independent function as university

The universities have throughout the ages, that is the last couple of hundred years, continuously developed from elite universities with production of a limited number of academics to a mass education system with production of a large number of graduates with the same quality-assured level of competence.

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[4] The Internet has often been considered as a new medium. In my opinion this is a too narrow consideration, as the Internet may be characterised as both being **a new infrastructure, a new medium, an integration and innovation of workflows, at the same time creating a new and supplementary dialogue and work platform**.

In the same period a development has taken place at the research front. Previously, the universities and institutions of education produced theoretical scientific knowledge alone, while in this century they have been supported by still more other knowledge producers, that is sector research institution and industrial research which turned up as supplementary knowledge producers.

The latest development of course brings up the question about the role of the universities. It is my view that the universities - or at least some of them - will get a still more important role as **knowledge producers, interpreters of the surrounding world and distributors** of concepts, technology, competence, skills and insight.

The challenge of the university environment is to adapt to new tasks in this connection. The ideal, a little conventional view is that basic research creates ideas and results, which are published in writing and which - through newly educated graduates - are put into practice in society. This view is no longer adequate. Now the universities have to adapt to a far more varied and interactive interplay with the surroundings and thus communicate knowledge, documentation and quality in many other situations than the conventional ones.

One may say that the universities constantly have to develop their function servicing the surroundings with quality-assured and independent knowledge.

SPECIFIC CHALLENGES FOR THE INSTITUTIONS OF HIGHER EDUCATION

Standardising of graduations

During the last ten years the introduction of bachelor degrees has been debated much in Denmark. The objective should be to make the Danish academic graduation correspond to an international Anglo-Saxon inspired academic graduation scale. Whatever you think of the slowness of the Danish university system in this case, this tendency to harmonise the formal competence classification will continue.

European Credit Transfer System

At present the EU is endeavouring to break down barriers so that the students can regard Europe as a total space for further education. The objective is to make it possible for the students to piece together their education themselves by taking elements from different universities.

It is on this background that the Council of the European Union has put the member countries under an obligation to foster the so-called European Credit Transfer System[5]. This system shall contribute towards making it easier for the students to take courses at other educational institutions and piece them together with a course at their home

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[5] A few of the study programmes of AAU have already incorporated the ECTS system in orders and curricula. Besides, this system corresponds exactly to the module distribution system, which is practised at the Faculty of Engineering and Science of AAU.

institution. It appears to be a fact that the introduction of this ECTS system will make it much easier to "zap" between educational institutions and will imply that the student to a certain extent will choose institutions, where he can get the best education.

Increased international competition

Both the standardising of the academic graduations and the ECTS will result in increased transparency and with that accessibility for the students. Combined with the development of distance education systems this will, other things being constant, result in increased international competition between the educational institutions on providing education.

This will give the English-speaking universities a competitive advantage and imply that certain forms of learning, for example skills training, etc, which can be automated in self-instructing pedagogical environments, presumably will be in demand[6].

The development of such electronic learning environments will be an enormous challenge not only to the institutions of higher education, but the whole sector of education and large parts of the organisational learning, which takes place by acting in a job situation. The Internet will offer learning environments, in which both students and persons in active employment can acquire a relevant competence adapted to the requirements of the person in question.

More focus on communication and learning

The universities have so far distributed their knowledge through research publications in an analogous form and production of graduates. In the future - that is now - it should have a much higher priority for the universities to impart their research results on the network and make them accessible to a much wider circle. In this communication task is also integrated a task to do this in a way that makes learning possible for a far greater circle than today, where the research results are primarily published with a view to a scientific circle of readers, for students and as title to participate in the international research community.

The special obligation of the universities in this connection is intensified by the fact that the Internet development will change both the national and the international labour market radically. The relations between employees and their employer, educated persons and their professional organisations and the interface between the single enterprises will be changed. Organisational adjustment, lifelong education and new network forms will be in special demand, and this will place enormous demands for change on the personal resources.

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[6] Within my own field, "Spatial Information and Land Management", we have witnessed how an Eastern American private research institute (ESRI, Redlands, California) in less than 14 months has matriculated 60,000 students in a virtual campus. This has implied that a course in a specific skill field, for which the price was previously 10,000 DKK on the private Danish market, can now be followed at 20 dollars. Besides, the whole introduction course is free of charge.

THE READINESS OF CHANGE AT AAU

25 years of continuous change and development

The university in Aalborg became a child of the student revolt and got its first years in the period with room for growth in the public sector. AAU was allowed to create its own project pedagogy, where the problem centring, the teamwork and co-operation of the group work as well as the demand for social relevance were hallmarks.

Here at the millennial change there is consensus on this concept at the whole university, and it is used in the entire educational curriculum of the university and to a great extent in the research work.

The university has also received more than ordinary international recognition for this innovative work in the university pedagogy[7]. It is a distinctive feature of this pedagogy that it institutionalises professional innovation through the relatively great influence of the students on the design and contents of the projects. This continuous professional innovation means - particularly at the level of specialisation - that the resources of the students become active development and - occasionally - research resources to the professional environments around research and education.

By this an educational culture has been created, which is characterised by continuous change and development of the professional contents of the research-rooted education. The overall impression is that in this way a very dynamic and change-ready environment has been created, which contributes to keep AAU ready to meet the new global challenges and the adjustment to increased use of IT in research and education.

New educational initiatives are born all the time

During more than ten years AAU has developed a concept of distance education, which also comprises qualifying education at bachelor and master level. In this process the university has gathered considerable technological and pedagogical experiences from providing distance education and from offering targeted supplementary education courses that are based on part-time studies[8] as an offer to the people engaged in active employment.

The IT Innovation

The "IT Innovation" is an institutional strategy passed by the Academic Council, the aim of which is to incorporate information and communication technologies everywhere in the activities of the university, where it can contribute to quality improvement, opening of the university and create the basis for increased internationalisation. The Innovation was

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[7] In the book "The Aalborg Experiment" from Aalborg University Publishers, 1990 Enemark and Kjærsdam analyse some examples of international evaluations, where the project pedagogy has gained fair recognition.
[8] The part-time studies in question are master programmes in Health Informatics, Geoinformatics, Environmental Management, Technology Management, Business Language, Computer Science, etc. Furthermore, the university has offered programmes in business economics at the Faculty of Social Science from the beginning.

initiated in 1998 and will continue until 2003. It has received financial support from the Ministry of Research, Spar Nord A/S, etc.[9]

A VISION FOR THE UNIVERSITY: AAU IN 5-10 YEARS

In the rest of this paper I will present a number of elements which together have the aim of formulating a vision that can enable a discussion on development ways for the university into the first decade of the new millennium. It is given that the period will imply changes, which it is hardly possible to predict precisely. But through this vision some direction marks can be marked out which can be discussed specifically in a phase of politics and which, if possible, can be incorporated as elements in the total strategy formulation of the university[10].

The independent and accessible quality

Also in the future the universities have to represent the greatest and most comprehensive knowledge bank of the nation state. With knowledge collected, documented and quality assured as independent and generally accessible the universities will also in the future carry part of the cultural heritage and secure the knowledge basis for continuous adaptation to the demands provided through research and education.

- *The hallmark of the university shall remain "independent and free access to quality-assured documentation".*

Global scientific networks

The academic world has always been international. The scientific network organisation has been working well for many years through congress institutions, international journals and mutually recognised review principles. This function gets increased significance in the future, although it will find new forms, and there is every indication that it will increasingly be embedded in virtual, digital organisations, which enhances the transparency and the accessibility.

- *In the modern university of the future all professional fields will form part of a global, Internet-accessible scientific network.*

The local university

The local university will still be a local resource of knowledge of benefit to the youth of a region with access to qualifying higher education. In the same way, there will be good conditions of a continuously intensified interplay between university and actors in the region, that is firms, organisations, institutions, etc.

But the procurement of manpower with a high competence to form part of a still more knowledge-heavy and service-oriented production will in future get still greater

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[9] The IT Innovation can be studied in detail on www.iti.auc.dk

[10] To the extent that the university will incorporate elements from the strategy in its official development strategy these elements have a nature, which makes them suitable to introduce in the development contracts that the Ministry of Research is concluding with the institutions of higher education these days.

significance for the localisation of development and production enterprises. The fact that also in future the university will produce close to half of all the graduate engineers of Denmark and distinctively increases the production of elite engineers and graduates through the doctoral schools will imply that the region continuously will be in a strong position in the international competition for localisation of workplaces. The development towards still more global, but network-connected enterprises is in that connection only an extra advantage, as the access to the qualified manpower has a very decisive significance.

- *Education of persons on a large scale at a high level (masters) and elite level (PhD) shall still be the primary contribution of AAU to make Northern Jutland an attractive localisation environment for enterprises and a settlement place for the employees.*

The new tasks

The traditional university tasks with research and education have in Aalborg already been developed significantly and are beginning to set a fashion other places in the country. Unbiased and open co-operation between the university, enterprises and whole lines of business has shown that it is possible to make strategic partnerships between the academic and the business economic environment. In Aalborg an abundance of ideas has been displayed to develop such partnerships from sponsored research to science parks, informal networks and just-in-time learning as well as upgrading of long-cycle educated people.

- *Continuous focusing on strategic partnerships and networks shall remain the backbone of AAU's current development of the co-operation with the region.*

Vision about being the best in selected areas

The university in Aalborg already has ambitions about being the best in a number of fields, both in the international research and in a national context. There are already today environments, which are unique at these levels, and more are presumably well on their way[11].

- *The university is leading regarding research in selected fields.*

As an institution, the university already has decided to make the project pedagogy in the university education a common profiling task based on an admission of the fact that we have here creased something that is quite unique internationally.

- *The university is in front internationally as regards project pedagogy in the university education.*

Vision about forming part of international networks

The village of research is a reality, and all research environments are deeply integrated in international disciplines and research relevant co-operation, where knowledge production,

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[11] Several environments under the Faculty of Engineering and Science are today in front internationally (medico technology and medical informatics, image processing, database technology, digital signal processing, mobile telephony), and correspondingly there are many significant national leading or sole positions (humanistic informatics, labour market research, production and society, surveying/GIS, traffic research). The list could be lengthened considerably.

knowledge transfer, surroundings interpretation and learning are in focus. At the same time, English is the dominant working language.

- *All the research and professional environments of the university form part of relevant international networks of higher educational institutions and are able to disseminate their study programmes in English.*

Increased accessibility of research results and documentation

Modern universities have an overall strategy of making their research results easily accessible on the Internet. This means that all results are commented and made easily accessible on the network and can be acquired everywhere as "print on demand". Articles and books are distributed via the network in relevant payment systems.

- *All university research results and documentation are described on the network, and it is possible to order this documentation as "print on demand"[12] everywhere on the network.*

More focus on personal resources

The demands on the performance of the individual are increasing, not in number of hours, but as regards optimal personal performance and organising. This means that it is necessary that all human resources be utilised optimally in communication and task solution. Therefore, the connection between personal resources and professional competence and development in all study programmes and professional environments has increasingly been in focus.

- *All students are qualified in learning, communication and personal development, project management and work organisation. In addition, the staff members participate in development dialogues.*

The students and research-based learning in focus

The learning objectives for all study units are described and appear from the study documentation. The project supervisor function has been put more into focus and has in addition got mentor-character, where research experienced project supervisors advise the students to draw up very individualised study programmes dependent on qualifications, preferences and plans. In consequence of the fact that still more educational resources are on the network, resources are liberated, and more "on-campus" meetings and more intensive supervision are made possible.

- *The educational environments have put the individual conditions of the single student more in focus.*

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[12] Contrary to the predictions about the paperless society I am convinced that the print-on-demand technology will increase the number of publications, because the demand for profitability grows smaller. In principle, POD consists of a pdf-file, which is sent for printing and immediate binding at a POD machine - the successor of the copier.

All documentation and learning resources are documented on the network

All the mode of function of the university is organised around an Intranet in a relatively open structure. All courses are documented on the network and are accessible in special virtual spaces around the single course. In these specially designed and discipline-divided virtual spaces the learning environments are fully extended with self-instruction for basic learning and with link access to top-level competence for problem solution. These discipline-oriented virtual spaces are "taken care of" by research-active persons with insight in learning processes and web learning. Such virtual spaces are in the nature of discipline-oriented learning labs and are currently "reviewed" by external researchers and professionals with deep strategic insight into the field to secure the optimal quality in the learning. Also others than full-time students can be let into these learning labs.

- *Around the study programmes of the university discipline-oriented learning labs are established, where all knowledge resources and learning environments are accessible.*

All at the university are "wired" - all the time

At the campus of the university all notice boards are replaced by interactive flat screens, and all workplaces - for students as well as researchers - are on the network all the time and have thus access to video connections with talk, data exchange (images, sound, writing and numerical values), drawing and sketching via the Internet. Irrespective of residence and in connection with a stay abroad the person in question is still on the AAU network.
Employees and students also have access to the considerable individual storage and calculation resources of the network, and the network makes out the central communication channel as a supplement to the personal meeting and as a tool for individualisation of the use of the network resources of the researcher and the student.

- *The university staff and students are permanently "wired" on the network from their on-campus workplaces and via portable units.*

New reviewed media/periodicals on the network

All researchers maintain a dynamic and quality-assured document as a newsletter on own and global research within their field of interest. The document is accessible on the network and contains commented links to the - in the opinion of the researcher - most important global knowledge resources in the field. This personal newsletter is updated at fixed intervals and their maintenance is recognised as scientifically qualifying. The task may have the nature of a web editorship for the knowledge and research field in question.

- *Personal newsletters from the single researchers give an up-to-date local/global status for knowledge production and division in the field.*

Differentiation of the research duty

Some researchers work full-time on research projects, while others maintain research-based learning labs. Some researchers are engaged in participating in external research co-operations in science parks and dissemination networks. All teachers are research active and have completed a research education (PhD level). The research tasks are very individual. Also the senior researchers guide each other mutually.

- *Also in the group of researchers there is much focus on the development of personal resources to create a better working environment without attrition. The high quality of the working environment is a prioritised institutional commitment.*

Beautiful local surroundings with space for physical gathering and being together

The physical surroundings were previously characterised by small offices in buildings with limited space for planned meetings and structures for individual presentations (lecture rooms). The demands on university buildings have been changed so that there are more open places in the buildings for talks and meetings and with a lot of interfaces to the Internet. In the structure improved conditions for knowledge division and co-operation platforms have been created. The buildings of the university also contain hotel offices[13] and welfare facilities to promote spontaneous meetings and being together as much as possible.

- *The modern university requires another and more open architecture with space for personal gathering and direct conversation.*

Ethical challenges and global sustainability

The universities' independent role as knowledge producers in the creation of a more equal and global society is highly recognised these days. In relation to the unequal distribution of the world's welfare resources the Internet development can play a very considerable role. The need of welfare-creating competence lifts in Latin America, Africa and part of the Soviet Union is evident, and here the next step of the information disseminating structures with Internet access via satellites is a releasing and price-reducing possibility.[14]

- *The universities will get a considerable role as independent and accessible knowledge producers in the creation of a more equal and sustainable development in the world.*

TECHNOLOGY IN THE VISION - THE NEXT 5-10 YEARS

This presentation is deliberately "stripped of technical fascination and details". I wish, however, finally to point at some specific "instruments" that I think will come forward as tools in the ordinary operation of the universities - and here especially the AAU, if only the above vision is realised approximately. It is not future technology, but only communication tools, which today are accessible and in use in experimental environments, and which are facing a commercial distribution. It will be a challenge to the university world to bring these into play without prejudice.

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[13] Spartan offices with plank bed and network linking to enable other work rhythms than 8 a.m.-4 p.m. and low-cost overnight accommodation.

[14] At the AAU we have already gained experiences from knowledge transfer to the countries of the third world through university co-operation. Besides, several initiatives are on the way within the framework of the IT co-operation, where attempts are made to focus on transfer of experience with operation of networks to the countries of the third world.

All students with a lifelong digital signature

Concurrently with the creation of virtual spaces for provision of competence, graduates from AAU are offered a lifelong digital signature, which admits to the university resources on the network, where they are already lying in "updated form", accessible to full-time and part-time students and other "affiliates", who wish to co-operate with the university. This offer is in direct continuation of the university's offer for a free week's further education, which for the time being has been developed at the Faculty of Engineering and Science and the Faculty of Social Science.

Parallel virtual organisation (3D)

The integration of broadband capacity and multimedia technology creates new possibilities of "active digital worlds", and therefore a digital 3D version of AAU can be established in which it is possible to navigate actively and to which connection can be established. In the own research laboratories of AAU experiments with activity-releasing behaviour in these 3D spaces are already being made. The establishment of a parallel virtual AAU landscape can therefore be expected, which can provide the basis for orientation via browser and with that access to virtual spaces localised at the university.

Mobile multimedia terminals admit of the resources

The development of multimedia terminals for substitution of the mobile phones is already on its way. Today many students are connected directly with the university network via physical networks from their hostel rooms. However, within five years it seems natural to communicate about many things with the students via highly effective mobile terminals[15] and to let them use these to personalise a personal virtual space around their studies[16].

Personal avatar ("small assistant") for students and teachers

Already now development activities have started letting personal avatars - digital representatives for persons - act in virtual meeting rooms, participate in meeting activities, search knowledge fields and supervise the development in these. In a 10-year perspective, it seems natural to have all students equipped with a personal avatar, which they can use as their digital assistant in connection with the planning of their competence development programme. They can for example let the avatar follow activities in digital spaces at the university, while they are physically at an educational stay abroad.[17]

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[15] Already now, the next generation of mobile phones with WAP (Wireless Application Protocol) is expected to be able to communicate with the network, and within five years there will be the same mobile transmission capacity at the mobile telephony as at the fixed networks.

[16] As AAU itself has the most important research centre of the country in this field, Centre for Personal Communication, it seems evident that the university will be the first and thus trendsetting for such initiatives.

[17] I told my 11-year son about this avatar concept, and he exclaimed spontaneously that it is after all only something like the one Walt Disney's Gyro Gearloose has, and which he calls his "small assistant".

CONCLUSION

Some might think that this is pure science fiction, but I wish to emphasise that only known technologies are mentioned and some which are being introduced. The challenge for the university is to incorporate these in its organisation with a view to constantly getting better at that which has always characterised the universities, that is to form the basis for education and research, culture and communication ability to the surrounding society[18].

Furthermore, in reply to possible worried reactions I can mention that this presentation is limited to a conviction that in future the personal resources for change and innovation will be decisive.

BIOGRAPHICAL NOTE

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[18] Already Ludvig Holberg in Erasmus Montanus emphasises that the universities and their students must be able to communicate with their surrounding in keeping with the times.