

Learning to Learn

- Educational Trends for the New Millennium

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SUMMARY

The paper identifies some of the challenges facing the surveying community at the threshold of the new millennium. The educational trends in response to these challenges are presented.

There is clearly a trend towards increased focus on managerial issues and the acquisition and application of problem-solving skills. Regarding course delivery there is a trend towards increased use of project-organised education in order to facilitate the acquisition of skills for “learning to learn” on an interdisciplinary basis as well as skills for team-work, co-operation and communication. Furthermore, the use of computer assisted learning and the WWW tends to be an integrated tool for course delivery that may lead to establishing the virtual academy at a local as well as global level.

The challenge of the future will be that the only constant is change. Therefore, the educational base must be flexible. The graduates must possess skills to adapt to a rapidly changing labour market and they must possess skills to deal with even the unknown problems of the future. The point is, that professional and technical skills can be acquired and updated at a later stage in one's career while skills for problem-solving and skills for learning to learn can only be achieved through the process of academic training at the universities. The concept of project-organised education provides just that opportunity. The basic principles of this educational model are presented using the surveying programme at Aalborg University as an example.

The constant change will also underpin the necessity for an interaction between the design of university curricula at graduate level, and the design of adequate courses in the area of Continuing Professional Development. This, again, underpins the fact that university graduation should be seen as not the end in itself but as only the first step in a lifelong educational process. The Danish experiences in this area are presented.

THE GLOBAL CHALLENGES

The main global drivers for change in the spatial information world can be identified as technology development, micro-economic reform, globalisation, and sustainable development (Williamson and Ting, 1999). These global drivers therefore also affect the profile of the surveying profession and they challenge the whole educational basis of the profession.

Technology development is the major driving force in changing the face of the spatial information world. The GPS technologies for measuring have revolutionised the traditional surveying discipline and the high resolution satellite imagery tends to revolutionise the mapping discipline. The database technologies for storage of large data sets and the GIS technologies for data management, analysis and manipulation arguably have had the greatest impact on the spatial information environment. And in the future the communication technologies such as the WWW and the Internet will become the focus of attention for viewing and using spatial data. However, it must be acknowledged that technology development is not the only driver.

Micro-economic reform in many countries has had a dramatic impact on the spatial information environment. The micro-economic reform initiatives represent the institutional and governmental side of the changes observed during the latest two decades. This includes initiatives such as privatisation, decentralisation, downsizing, cost recovery, performance contracts, quality assurance, public/private partnership, and other policies to ensure service delivery and cost effectiveness. These initiatives have changed the focus from the pure technological issues to include also the more managerial components of building and maintaining national spatial data infrastructures.

Globalisation is becoming a reality driven by IT and communication technologies. A globalised world is one in which political, economic, cultural, and social events become more interconnected. The process includes that events in one part of the world increasingly have potential to impact on people and societies in other parts of the world. Globalisation widens the perspectives from the local to the global level. This should lead to a world movement towards improving the quality of lives of people by thinking and working together on common concerns. Globalisation has a social, economic, political, and educational dimension. The www is the most graphic example of this trend, even if the full potential of the web as an educational resource is still to be seen.

Sustainable development will be a driving force in policies developed through the decades ahead. Sustainable development means development that effectively incorporates economic, social and environmental concerns in decision making for development which thereby should “meet the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission, 1987). The professional areas of land administration and, more generally, land management include decision making of such a multidisciplinary nature to be carried out at national, regional and local level of government.

Taking these global drivers into account, it is no surprise that changes are taking place in the definition and nature of the surveying profession and practice. Some of these are due to evolution of technology and some are due to institutional changes as a consequence of political and economical development in individual countries. Changes in technology and institutional frameworks may provide new opportunities for the surveying profession, but they will also be the destroyers of some professional work. The challenges of the so-called information age will be to integrate modern surveying technology into a broader process of problem solving and decision making. We must assess carefully what range of skills will be required of those entering, and continuing within, the modern occupational world of surveying.

There is no doubt that the main challenge of the future will be that the only constant is change. To deal with this constant change the educational base must be flexible. The graduates must possess skills to adapt to a rapidly changing labour market and they must possess skills to deal even with the unknown problems of the future.

The point is, that professional and technical skills can be acquired and updated at a later stage in ones career while skills for theoretical problem-solving and skills for learning to learn can only be achieved through the process of academic training at the universities.

INTERNATIONAL TRENDS IN SURVEYING EDUCATION

Management skills, versus specialist skills. The changes in the surveying profession and practice and especially the development of new push button technologies has voiced the need for including the core discipline of management as a basic element in today's surveying education. Traditional specialist skills are no longer sufficient or adequate to serve the client base. Surveyors need to have the skill to plan and manage diverse projects, including not only technical skills, but those of other professions as well. In short, *the modern surveyor has to be capable not only of managing within change but managing the change itself.*

Technological developments take the skill out of measurement and the processing of data. Almost any individual can press buttons to create survey information and process this information in automated systems. In the same way, technological developments make GIS a tool available to almost any individual. The skill of the future lies in the interpretation of the data and in their management in such a way as to meet the needs of customers, institutions and communities. Therefore, *management skills will be a key demand in the future surveying world.*

Project organised education, versus subject based education. An alternative to traditional subject-based education is found in the project organised model where traditional taught courses assisted by actual practice are replaced by project work assisted by courses. The aim of the project work is "learning by doing" or "action learning". The project work is problem-based meaning that traditional textbook

knowledge is replaced by the necessary knowledge to solve theoretical and practical problems from the society/reality. *The aim is broad understanding of interrelationships and the ability to deal with new and unknown problems.*

In general, the focus of university education should be more on “**learning to learn**”. The traditional focus on acquisition of professional and technical skills (knowing how) often imply an “add-on” approach where for each new innovation one or more courses must be added to the curriculum to address a new technique. It is argued that this traditional subject-based approach should be modified by giving increased attention to entrepreneurial and managerial skills and to the process of problem-solving on a scientific basis (knowing why). The basic principles of this project-oriented educational model are presented below using the surveying programme at Aalborg University as an example.

Virtual academy, versus classroom lecture courses. There is no doubt that traditional classroom lecturing will be supported by or even replaced by virtual media. The use of distance learning and the www tends to be integrated tools for course delivery, which may lead to the establishment of the “virtual classroom” even at a global level. This trend will challenge the traditional role of the universities. *The traditional focus on the on-campus activities will change into a more open role of serving the profession and the society.*

The computer cannot replace the teacher and the learning process cannot be automated. However, there is no doubt that the concept of virtual academy represents new opportunities especially for facilitating for process of learning and understanding and for widening the role the universities. And the www techniques for course delivery on a distant learning basis represent a key engine especially in the area of lifelong learning programmes.

Lifelong learning, versus vocational training. There was a time, when one qualified for life, once and for all. Today we must qualify constantly just to keep up. It is estimated that the knowledge gained in a vocational degree course has an average useful life span of about four years. The concept of lifelong learning or continuing professional development (CPD) with its emphasis on reviewing personal capabilities and developing a structured action plan to develop existing and new skills is becoming of increasing importance. In this regard, *university graduation should be seen as only the first step in a lifelong educational process.* The Danish experience in this area is presented below using the distance learning master programme in Geographic Information Management as an example.

The challenge of the new millennium will be to establish a new balance between the universities and professional practice. This new balance should allow the professionals to interact with the universities and thereby get access to continual updating of their professional skills in a lifelong perspective.

THE ONLY CONSTANT IS CHANGE – THE DANISH EXPERIENCE

The professional profile of the Danish surveyor is turned upside down through the latest two decades.

The professional profile of the Danish surveyor is a combination of technical, judicial and design areas. The profile thus is a mix of an engineer, a layer and an architect. The professional fields then consist of three areas: surveying and mapping, cadastre and land management, and spatial planning. Cadastral tasks are the monopoly of licensed surveyors in private practice, and the role of this private surveyor (measuring and wearing green rubber boots) has traditionally epitomised the Danish surveyor. However, the profile of the Danish surveyor as well as the surveying profession is turned upside down through the latest two decades.

Since the late 1960's the Danish Association of Chartered Surveyors has carried out a survey of the surveying profession every 10 years starting in 1967. The changes taken place these 30 years and especially during the latest two decades are quite remarkable. In 1967 the number of surveyors working in the private surveying firms accounted for about two thirds of the total profession while surveyors employed in the public sector or in other private business accounted for only one third. In 1997 the situation is reversed. Two thirds of the profession is employed outside the private surveying firms. During these 30 years the number of active surveyors is doubled from about 450 in 1967 to about 850 in 1997. This means that the growth is located within the surveyors employed in the public sector or other private business while the number of surveyors working in the private surveying firms has been more or less steady during the last 30 years. The evolution of the surveying profession is shown in figure 1 below.

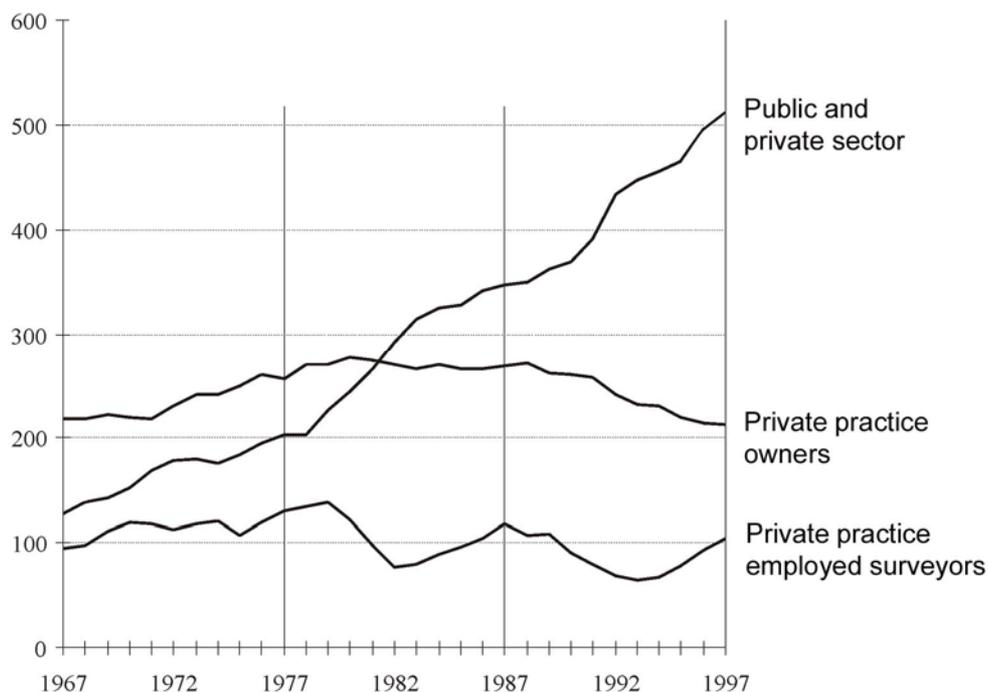


Figure 1. Evolution of chartered surveyors in Denmark 1967-97

At the same time, the professional profile has changed completely. In 1967 and still in 1977 the profile of the Danish surveyor was dominated by the cadastral area while in 1997 it accounts for only 20 percent of the total working hours. In 1997 the distribution was as follows: Planning and land management 23 %, Cadastral work 20 %, Mapping and engineering surveys 26 %, and “Other areas” 31%. The changes in the working areas of the Danish surveyor during the last 30 years are shown in figure 2 below. Next to decrease of the cadastral area it is remarkable that the biggest area in 1997 is located outside the traditional working areas. These “other task areas” include management, IT-development, and other business developments.

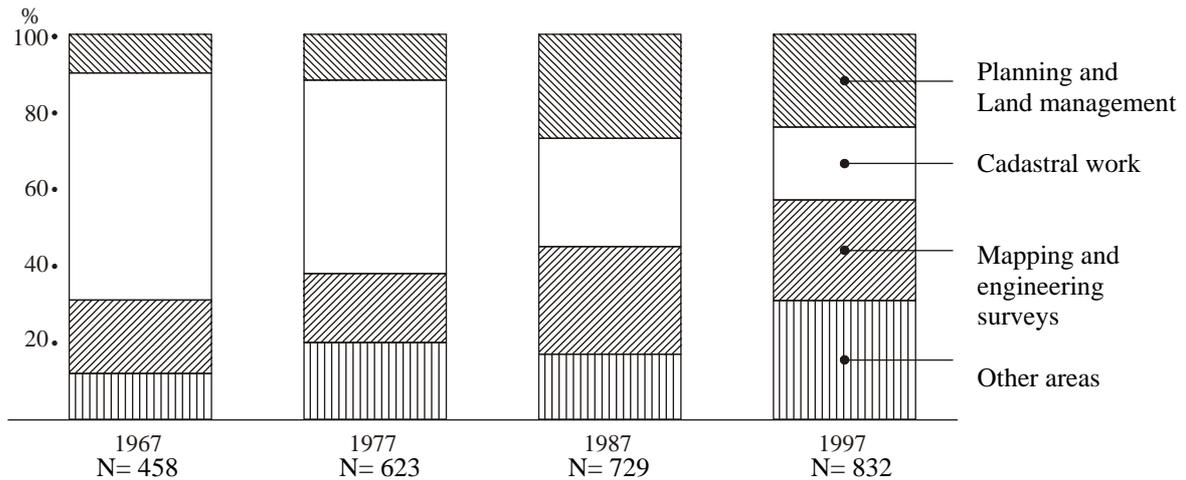


Figure 2. Evolution of the professional profile of the Danish surveyor 1967-97

The changes shown above are significant and must of course be reflected in content and structure of the educational base. In fact, the changes have been coped with rather easily within the profession and also with regard to the labour market. It is likely to assume that this is due to the flexible and project organised educational model introduced in 1974 when the surveying programme was moved from the Royal Veterinary and Agricultural Academy in Copenhagen to a new university established in Aalborg. It is also likely to assume that without a flexible educational base, the surveying profession would have faced some heavy problems.

LEARNING TO LEARN – THE DANISH EXPERIENCE

The educational base must be flexible and easily adaptable. Management skills and skills for learning to learn is a must.

As mentioned and almost proved above, the graduates must possess skills to adapt to a quickly changing labour market and they must possess skills to deal even with the unknown problems of the future. It is argued that the necessary adaptability can only be provided through skills for learning to learn. In this sense, the project-organised educational approach at Aalborg University has proved to be very successful.

Recent studies (Colemann, 1998) have confirmed that students retain only 10% of what they read and only 20% of what they hear. However, if a problem is simulated, then up to 90% of the lessons learned may be retained. This is one of the major pedagogical ideas beyond both project work and problem-based learning. It emphasises learning instead of teaching. Learning is not like pouring water into a glass. Learning is an active process of investigation and creation based on the learners' interest, curiosity and experience and should result in expanded insights, knowledge and skills.

A consequence of this shift from teaching to learning is that *the task of the teacher is altered from the transferring of knowledge into facilitating to learn*. The project work also has a pedagogical point. Each student must be able to explain the results of his or hers studies and investigations to the fellow students in the group. This demand may be the clue to professional and theoretical cognition since *knowledge is only established for real when one is able to explain this knowledge to others*. In traditional education the students mainly restore knowledge presented by the teacher. By using the project organised model the knowledge is established through investigations and through discussion between the students in the project group, and mainly without the presence of the teacher.

The basic principles of PROJECT-ORGANISED education

Project-organised means that traditional taught courses assisted by actual practice is replaced by project work assisted by courses. The concept moves the perspective from description and analysing into synthesising and assessment. The concept is based on a dialectic interaction between the subjects taught in the lecture courses and the problems dealt with in the project work. Each term has a basic structure containing, in principle, equal distribution of lecture courses and project work. But the study-time is dominated by lecture courses at the beginning of the term and by project work at the end. The project work is carried out by groups of four to six students having a teacher appointed as supervisor.

Problem-based means that traditional textbook-knowledge is replaced by the necessary knowledge to solve theoretical problems. The concept moves the perspective from understanding of common knowledge into ability to develop new knowledge. The aim of the project work is "learning by doing" or "action learning". The project work may be organised by using a "know-how" approach for training professional functions, or it may be organised by using a "know-why" approach for training methodological skills of problem-analysis and application.

The difference between traditional subject-oriented education and this project-oriented educational model may be expressed in short by an old Chinese proverb:

*"Tell me and I will forget
Show me and I will remember
Involve me and I will understand
Step back and I will act"*

The curriculum for educating Chartered Surveyors

In order to provide for the use of project work as a basic educational element the curriculum has to be organised into general subjects or "themes" normally covering a semester. The themes chosen in a programme must be generalised in such a way, that the themes in total will constitute the general aim or professional profile of the curriculum. The themes should provide for studying the core elements of the subjects included (through the lecture courses given) as well as exploring (through the project work) the application of the subjects in professional practice.

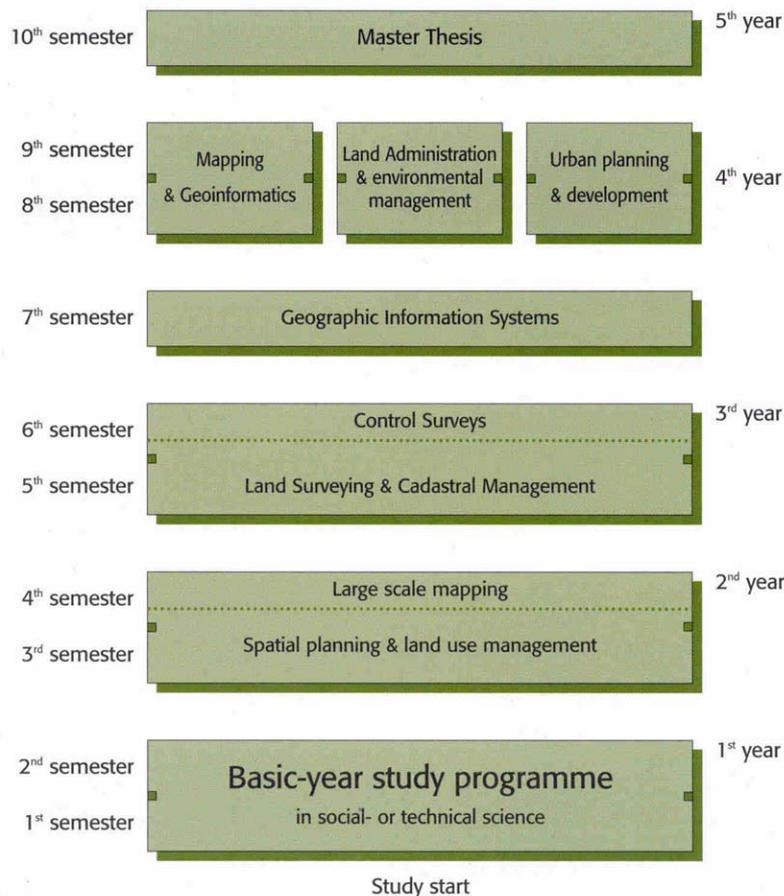


Fig. 3. The curriculum for educating chartered surveyors.

The *first* phase, 1st and 2nd semesters, includes one year of basic studies within Engineering Science. The studies include courses on the fundamentals such as mathematics, physics, computer science, foreign languages, etc., and the basic skills for carrying out the problem-based project work are trained.

The *second* phase, the undergraduate studies at 3rd to 6th semesters, includes two years of studying the main professional areas for surveyors. The themes provide for teaching the necessary disciplines through lecture courses and for training the professional functions through the project work. This phase therefore is characterised by a "know-how" approach.

In the *third* phase, the graduate studies at 7th to 9th semester, the curriculum provides for the possibility of specialisation. This third phase of the curriculum therefore has a more scientific approach, based on "*know-why*". The themes will provide for teaching the necessary theories within the specific professional areas, and for training the methodological skills of problem-analysis and application.

The *fourth* phase, the 10th semester, is only for preparing the master thesis, which is carried out as a project-work dealing with a problem chosen by the student group themselves. The master thesis then will prove the professional insight as well as the theoretical and methodological skills possessed by the graduate student, in principle just like a Ph.D. or Doctoral Thesis.

Flexibility and adaptability

The flexibility and adaptability of the educational structure may be explained under three headings:

- The adaptability of the *individual theme*. This means that the focus on subjects presented in the courses and dealt with during the project work are easily updated or changed according to the current technical and professional development in society. The subjects and contents of the courses given will be planned in advance before starting the semester, and will then reflect the most topical issues within professional practice.
- The adaptability of the *total curriculum*. This means that the focus of the themes in total may easily be adjusted or changed according to the needs and development of professional practice, and consistent with the current technological development
- The adaptability of the *graduates*. This means that each graduate will possess specialised knowledge within one of the three main areas (Mapping, Land Management or Spatial Planning). However, due to the basic knowledge established during the second phase of the curriculum and due to the methodological skills established during the project work, the graduates will also possess the insight to understand and adapt the interaction between the three main areas in total.

Consequences of the project-organised model

The consequences of this educational model is, that the new graduates are less experienced in solving standard everyday problems as they will appear in a further employment. On the other hand, they are expected to be much better qualified to undertake large and complicated tasks, to combine insight from different fields, to analyse new problems and to make themselves acquainted with new fields to which the problems of practice are related.

The aim is a broad insight into and understanding of the connections between different fields and skills, in order that the graduates may be able to function in a society, which is increasingly becoming more complicated. In principle it can thus be ensured that the graduates have obtained the skills and experience to enable them to solve also the unknown problems of the future.

LIFELONG LEARNING

University graduation is not the end in itself but only the first step in a lifelong educational process.

There was a time when one qualified for life, once and for all. University graduation was the ticket for a lifelong professional career. This is no longer true. Today, one must qualify constantly just to keep up. The idea of "learning for life" is replaced by the concept of lifelong learning. The response of many professions to this challenge has been to promote the concept of Continuing Professional Development (CPD).

It has been estimated that the knowledge gained in a vocational degree course has an average life span of about four years. While this will vary according to the discipline it does nevertheless highlight the increasing need to maintain an active interest in keeping up to date with changing technology, legislation and operational procedures. If at the same time professionals have expectations of increased managerial responsibility the need to acquire new skills and knowledge is even more acute (Kennie and Enemark, 1996).

The Danish Way

Open Education was launched by the Danish Government in 1989 and the system is now used widely by the universities - as well as many other educational institutions - to provide training courses for adults. The courses are heavily subsidised by the state for about two thirds of the costs. The universities have developed a number of courses to serve the need for further education of the graduate engineers within areas that recently have developed rapidly. The need for this kind of programmes is assessed in co-operation with the industry and the professional institutions (Enemark, 1997).

Distance Learning Course in Geographic Information Management

Within the area of Surveying, a post graduate course at Aalborg University was established in Geographic Information Management, starting September 1996. The course was developed in co-operation with the surveying industry and the Danish Association of Chartered Surveyors. The course is offered as a one-year part time study lasting for two years, and it is organised as distance learning using an electronic classroom for teaching and communication. About 45 students (half of them surveyors) enrolled September 1996 and 35 graduated in June 1998 - most of them with excellent results. Another 35 enrolled September 1997 and 25 graduated in June 1999. In the meantime we decided to finish one intake at the time. This was to ensure that the open education programme was not hampering the on-campus programme in terms of teaching resources etc. Next intake therefore was September 1999 aiming to graduate June 2001. At the first intake about 60% of the students were surveyors. This is now decreased to about 20%. The relatively high rate of drop-out is mainly due to the rather hard study conditions of overcoming a demanding part time study and at the same time undertaking a full time job next to family obligations etc.

The course combines lecture courses (distance learning) with supervised project work based on professional problems identified by the practitioners within their respective employment areas. The students take part in four week-end seminars organised each year on campus to have class-room lecture courses and to discuss and develop their project work. Furthermore, the concept of distance learning provides the opportunity for the students to master communication through a fully digitised environment. By passing the final examination the students will obtain a degree as Master of Technology Management in Geographic Information Management.

Open Education is a major challenge to Universities. On the other hand, the task of educating graduates having ten to fifteen years of working experience is also a major source of inspiration for the faculty staff. Some students may be very advanced within specific areas and this may challenge the role of the teacher. Also, it is a challenge to deal with students having very different educational background and coming from very different work areas. *In general, the concept seems to provide an innovative interaction between university and industry.* (Enemark, 1997).

CLOSING REMARKS

Even if the professional content of the curricula may vary between countries, some general trends may be identified. There is clearly a trend towards increased focus on managerial issues and the acquisition and application of interdisciplinary problem-solving skills. Regarding course delivery, there is a trend towards increased use of project-based education in order to facilitate the acquisition of interdisciplinary problem-solving skills as well as skills for team-work, co-operation and communication. And web based learning tends to become an integrated tool for course delivery leading towards establishment of Virtual Academy at a local and possibly global level.

The challenge of the future will be that the only constant is change. To deal with such significant change the educational base must be flexible. The graduates must process skills to adapt to a rapidly changing labour market and they must process skills to deal even with the unknown problems of the future. Skills for learning to learn become essential. In this sense, the project-oriented educational model at Aalborg University has proved to be successful.

The constant change will also underpin the necessity for an interaction between the design of university curricula at graduate level, and the design of adequate courses in the area of lifelong learning. This, again, underpins that University graduation must be seen as not the end in itself but as only the first step in a lifelong educational process.

In this regard, there will be a need to establish a new balance between the universities and professional practice. This new balance should allow the professionals to interact with the universities and thereby get access to continual updating of their professional skills in a lifelong perspective.

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