THE RISE OF A PROFESSION WITHIN A PROFESSION
The Development of the Architectural Technology Discipline within the Profession of Architecture.

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**A thesis submitted in partial fulfilment of
the requirements of
The Robert Gordon University
for the degree of Doctor of Philosophy**

**This research programme was funded by
The Copenhagen School of Design and Technology**

March 2011

Abstract

This thesis investigates the emergence of a new specialisation within the profession of architecture, namely that of the architectural technologist. The main original contributions from the research concern a deep understanding of how that emergence has been realised, and a study of the implications for buildings in the longer term. Using the UK and Denmark as examples it finds that this profession has existed for a long time, but until recently without formal recognition. It also finds that the consequences of the lack of attention are potentially major, and it suggests why recognition came so late.

By researching literature the history of the building and architecture industries was investigated and it is shown how the architects were cooperating with well-trained craftsmen for many centuries. This is compared with the kind of cooperation with architectural technologists going on today, and what will most likely occur in the future. Questionnaires, to provide data about current architectural and architectural technologist education, were sent to groups of newly graduated professionals. After statistical treatment the resulting quantitative data were thoroughly analysed by discussing the possible interpretations. Focus groups of highly qualified professionals also interpreted the data and insights into the needs of industry in both the UK and Denmark were provided.

Finally, the thesis concludes by identifying necessary means of improvement, and points at the serious risk of a further division of the construction industry into more consulting companies. This increases the risk of future architecture failing to properly integrate technology and design.

Keywords

The profession of architectural technology
Architectural education
Education of architectural technologists
Education and position of master builders
The position of building handicrafts
The history of building design
History of architectural education
Research within architectural technology

Declaration

The candidate has not, while registered for the present PhD submission been registered for any other award at a university.

None of the material in this thesis has been used in any other submission for an academic award.

Acknowledgements for received assistance are given under the heading acknowledgements below and any excerpts from other sources have been acknowledged by its source and author.

Niels Barrett

Supervision and Funding

Principal Supervisor: Professor Richard Laing

Supervisor: Mr. Graham Paterson

Funding: The research was funded by the Copenhagen School of Design and Technology

Acknowledgements

First and foremost I have to thank my employing school Copenhagen School of Design and Technology for supporting this study economically and morally. Without this support it would have been impossible for me to undertake it.

Then I have to thank my principal supervisor Professor Richard Laing for very good guidance and critical reading and comments to my texts, for showing a very good example in balanced academic judgment and for personal support to my conference initiative in Copenhagen 2008.

I will thank architect and course leader Graham Paterson for all the support he has given to help me, not least for bringing me in contact with key persons within and outside the RGU, for the engagement in the conference held in Copenhagen on architectural technology (2008) and for assistance with many other practical and theoretical matters.

I also want to thank the architects Jakob Knudsen, Finn Selmer, Kaj Wohlfeldt, Lars Hartmann Petersen, Lene Nepper Larsen, Iain Murphy, Virginia Rammou, Festus Moffat and Philip Tidd for their kind participation in the focus groups that helped me interpreting the rough data from my questionnaires into reasonable conclusions. Also participating in the groups were the architectural technologists Norman Wienand, Adam Thwaites, Anni Bryld, Gert Johansen and Jacob Ravn Thomsen together with the other representatives from organisations Ib Sander-Hansen, Keith Snook and Tara Pickles. All have contributed with energy and engagement to the qualitative data collection and I am very grateful for all their efforts; furthermore MA Birgitte Hestbech and my two sons Benjamin Barrett BA and Jonathan Barrett BSc have been supportive with corrections of language, layout and structure. Staff members at Copenhagen School of Design and Technology – the Building and Production Department at KEA have been so kind to reply to a questionnaire, thus supplying me with interesting and useful data, and I want to thank all who did so.

Finally I will thank my wife Susie Barrett for her always positive support and for accepting my being abroad and being so occupied with matters outside the family and her interests which this project so often demanded from me.

Thank you

Niels Barrett
December 2010

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Background

Within the discipline of sociology, it is regarded as valuable to collect information or data from "life histories", which give an insight into something typical within society. The discipline or category to which the present research belongs can be discussed, but it has clear sociological implications. According to the sociologist Ken Plummer (1982), life histories can even be used to inspire new theories. My personal background and history inclusive the literature I have come across has a clear relevance to the main subject and has established the background for the research.

Before and during education

Early in life I became interested in architecture and handicrafts and I decided to become an architect. I thought an architect knew all about how to put buildings together and on top knew a lot about how to shape a building to become pleasant, not to say beautiful. As a child I could think of no things in life more basically important than the buildings people had to live in and work in. I remember myself as a little boy standing in the door opening to a joiner's workshop and admiring the abilities of the craftsmen when they used their hand tools to cut and shape the materials very accurately. It was fascinating and it provoked a desire in me to develop the same abilities. This, in combination with my early interest in architecture made me decide first to become a carpenter and afterwards study architecture as so many in Denmark had done before me and so I did.

Looking at the buildings that normally surrounded me, I felt sure that I, if becoming an architect, could do much better when it came to the shaping and selection of materials, textures and colours. I could hardly understand why so many buildings were unpleasant and I was sure I had a mission within architecture.

The first surprise, upon entering education to become an architect, was the very small extent to which the education of architects in Denmark dealt with technicalities and more basic shaping principles. It was at an early stage apparent to me – at least so it appeared – that the lecturers in general considered it the most important ability for an architect to be able to shape a building according to the “right” political, sociological and artistic opinions of their peer professional fellows.

It became obvious to me that one could graduate without being able to build a house. The most detailed drawings to do would be in scale of 1:20 leaving an empty space between the surfaces of the walls and other building parts. This was initially rather frustrating, but later I realised all the valuable characteristics of the Danish education of architects, including a sharp focus on spatial and aesthetic design. I now feel I had a good and really useful architectural training at the Royal Academy of Fine Art in Copenhagen.

Looking back at my architectural education I appreciate all the training in the relationship between function and shaping – although not the almost religious occupation with the political issues of the mid-seventies! If I ask myself whether I think it would have been possible to deal with all the technicalities of a building to a much further extent within the same space of time the answer tends to be no!

Newly graduated

After graduation I worked in drawing offices and also ran a small business myself. In the drawing office I soon learned a lot of practical things, and especially how much it took to inform sufficiently about a building. All the information I had had before consisted of the main drawings and the few relatively simple details a drawing office in the old days would produce plus a tiny hand typed description of very few pages. At the attic of the office, which was a rather old one, I could find a lot of old folders with all the documentation the office had had to produce to account for the architectural features of a building. I realized that ten times more documents than before were needed and wondered why. I concluded that it had to do with all the changes in technique, the many new materials and that architecture had totally left the old tradition the craftsmen earlier knew so well.

A relatively newly occurred challenge in those days was to design windows. Again because the tradition had gone and new materials and new design requests were put to use. Of course architecture, as always, had to be state of the art achievements and now it was realized that the first generation of windows with double glazing in Denmark after 10 to 15 years were rotted and of a design that technically was a catastrophe. Earlier windows could last a century or sometimes the double and now they did not last one tenth of that time. Investigations were made and it was realised how good the old designs were. They were developed over centuries and nobody had really been aware of all the problems the traditional design had solved. And when the first generations of double glazing were taken into use, no one was thinking about how small changes could affect the lifetime of a window. Now it became apparent to the industry and to society the hard way, and the thought, that there could be other ticking bombs in the modern buildings that had not been realized yet, was frightening.

And yes, there were ticking bombs. The very popular flat roofs of timber of the early seventies proved to provide a number of problems, especially in certain combinations with wooden board clad ceilings and interior brickwork with recessed joints, which were all popular solutions in a certain period. They rotted because of condensation of hot indoor air in the cavities of the roof construction.

Again new fashions had proved to cause problems because of lack of awareness and lack of knowledge. Who was responsible? – That was in fact hard to figure out because the drawing offices could claim that they, when it came to detailing, had just combined what at the time was considered good practise and what none of the so called experts had had any objections to. But now it became still more obvious that the new designs had to be much more based on knowledge than on tradition and assumption. Apparently, the industry had to reconsider its practises.

This meant that the architects constantly had to require increasingly more expertise from different specialised engineers and other professionals but they still kept the responsibility for what we here call the ‘coherent technical design’, simply ignoring that this area had been growing significantly and continued to do so. I remember the descriptions I had to produce to the projects for which I became responsible. They were about 30 times the size of the descriptions of buildings of a similar size, but just 40 years older, that I could find in the attic.

In my training at the Royal Academy I had never had to make a description of a building that accounted for the technicalities. The descriptions we made were explaining the function, the shaping and the main choice of materials and that was all. So, what was my background for doing this new description work? It was my previous technical training before I entered the architect education and a kind of informal apprenticeship in the drawing office. This meant of course that I was fairly slow at doing the job in the beginning – and, as a more serious problem, that I made mistakes. Who had to pay for this? Sometimes the drawing office and sometimes the client, but in the end it might have been society that paid for this lower level of productivity in comparison with what a well skilled professional could have done.

How come I was asked to do something that I had no formal training in doing? Well, that was simply the tradition and my superiors had gone through the same kind of training in their days. But there was a difference and that was the above mentioned size of the description and all the many detail drawings now required. Now we were not acting within the tradition any more. We were facing the rather complicated challenge of doing 'the coherent technical design' of modern, designed buildings with all what it took of materials and possibilities to choose or not to choose. – And we had to carry it through with no educational background.

Did I find it strange that the industry made many mistakes in those days? No, not really. In fact, I realised how huge a challenge it was, but thinking whether other professionals could do the job better made me conclude that it was still the best solution that architects did the tasks because that secured a higher level of design integrity compared to what would probably happen to the building if engineers had to take over. Furthermore, no one was trained to do the job. The engineers were good at going to the very depth of narrowly defined areas but they had no idea about how to balance everything in a building to a nearly perfect design finish, which is always the goal of an architect with a healthy self-esteem.

Copenhagen School of Design and Technology

20 years ago I was invited to apply for a part-time lecturing job at Copenhagen School of Design and Technology (Byggeteknisk Højskole), which educated architectural technologists (Bygningskonstruktører). That was a real challenge because my initial subject was Building Material Science, which I knew about only from my practical experience. I had to prepare my lessons very carefully and in the beginning I used three times the time I was paid for to prepare myself for the lessons. In fact, I learned a lot and fortunately I also had a certain success as a lecturer and was soon asked to take on more subjects. Apart from Building Material Science I have been lecturing Building Design and Building Construction and today it is the two latter subjects I deal with.

Soon, I realised how useful these 3½ years of further theoretical training of educated craftsmen could be to a drawing office and had one newly graduated technologist employed in the office where I was then working part time. He proved to be very good, thus confirming all my assumptions about how useful this education was. In contrary to the newly graduated architects these technologists could literally speaking walk right in and earn their own wage from day one. I partly concluded that this was what all architect firms needed. **Architectural technologists should take over the architectural concepts from the architects and do the further "coherent technical design" on behalf of the drawing office – I thought**.

The School once arranged a seminar where representatives from a couple of big architect firms were asked to participate and to express their opinion about the position of the architectural technologist and the architect in comparison. Some companies did not use technologists and asked why; they said that they believed architecture should be made by architects. They had in fact no knowledge of the capabilities of a technologist.

Other companies had gotten used to employing both architects and technologists and were satisfied with the result of that politic. They said that the technologists had to become familiar with their design demands and pay respect to the values embedded in the architectural concepts before they worked really satisfactorily. The technologists tended to be a little too self confident about their area of specialisation and could be a little stubborn in the beginning, but proved to be good and suitable for the company in the long run. The architects were not that familiar with the technicalities and had to be trained in the area to be able to do that part of the job.

I noted that no-one mentioned that the two different educations could be considered two different specialisation areas within architecture and that the work should be shared based on such a consideration. **Apparently, all architects tend to equate profession and education**.

In 1992 I became the head of Byggeteknisk Højskole educating architectural technologists. I had then become a little preoccupied with the idea, that the area of "the coherent technical design" – the area of architectural technologists – deserved better access to further education. There was none and still is no further education within the core area of coherent technical design despite the fact that the area has been growing all the time. I also had the idea, that such a further education would serve two reasonable purposes:

1. It would raise the quality of architectural design technically, thus improving the productivity in the building industry by avoiding a number of mistakes and corrections in projects and in executed buildings.

2. It would be an answer to a request for further education among a growing number of graduates who did not know how to satisfy their hunger for more education that directly would build on the already achieved knowledge.

I established a contact to The Architect School in Aarhus and The Royal Academy in Copenhagen and to our good partner school for technologists in Horsens. Representatives from all the schools met and it was decided to appoint one representative from each of the schools to figure out how further education of technologists could be arranged at the two architect schools.

Initially it was important to the architect schools that technologists could not become "architects" without passing the existing 5½ year programme at the architect schools. But I asked for a two year programme to put on top of the existing 3½ year programme to reach the same master level as the architects, but within coherent technical design. The schools were in principle willing to do such a thing, but stressed that the graduates should not be allowed to call themselves architects. I said, that for us the most important thing was that the course was established – not what title people got. But of course they were right: **"The job title is important"**. – **Simply because the job title identifies the profession**.

After a while I had to give up my position as head of department and the architect schools got the government's permission to take in more students for their own course and the whole initiative vanished. I also feel obliged to tell that Copenhagen School of Design and Technology is only permitted to issue bachelor degrees and that the schools of architecture are considered universities and only granted master degrees and PhDs. Universities in Denmark traditionally rewarded master degrees after 5 to 7 years of study. Now they are all, because of the Bologna Agreement, forced to issue bachelor degrees as well.

During the years at the Copenhagen School of Design and Technology I have noticed that politicians of all kinds and civil servants of the Ministry of Education tend to uphold the idea that technologists who want to study further should go to the architect school or schools of engineering. This is due to the general lack of insight on the three educations and on the real needs of the industry. **In fact, the main problem is the technologist's lack of own profession in the situation where the two other groups possess their very well known professions**.

This means that the technologists are not recognised to the same extent as the two other groups who in the public opinion have their well defined professions with clear areas of responsibility. People ignore the fact that the technologists are doing an important part of the work belonging to the profession of architecture. I have never felt that the technologists should have their own separate profession because that would obviously cause a more split up design process with more risk for mistakes. **They share a profession with the architects and it appears fair to me that this becomes recognised somehow.**

A fact that emphasises to me that architects' education only cover the initial parts of the work an architect firm is responsible for, is the fact that some graduated architects have wanted to educate themselves as technologists as well. We have during the years had the pleasure of helping a number of architects to become architectural technologists and they have in general been very fond of it. At least they felt a need for the kind of knowledge to be acquired at our school. Normally, we have given this kind of applicant credits to enter our third or fourth semester and that has proved to be successful.

Projects

Of other happenings relevant to the subject, I can tell that I, in the late 1990s, was running a couple of European Social Fund supported projects aiming to help unemployed female professionals into employment. It was under the NOW-programme (New Opportunities for Women). Thus being able to compare the capabilities of the different professionals I got an even clearer view of the differences between architects, technologists and building engineers, which were the three groups we were dealing with. There were clear cultural differences and knowledge differences and they met the challenges in three different ways. To all of them the programme they had to pass constituted a new field of activities.

I did not investigate the different profiles scientifically. If that had been the case, I would have needed to collect data based on a well prepared and focused plan for doing so, which was not at all the aim at that time. But the differences were significant and not surprisingly they confirmed all biases:

- The architects had the best view for the totality, they were bright, the most talkative and very good at expressing their ideas, but they were also the most self confident, egocentric and uncompromising of the three groups.

- The technologists were the best at managing working groups and suggesting practical solutions and the most result focused group.

- The Building Engineers were in a way very practical orientated, but were obviously lacking practical experience. On the other hand they were absolutely the best when it came to using math and physics and develop the specific calculation methods required.

It became clear to me that education and educational environments really mean a lot to people's ways of meeting new challenges. I also got a strong feeling that I was dealing with people who had chosen their profession on the basis of personal leanings. I was dealing with: 1 performers and artists (the architects), 2 general technologists and managers (the technologists), and 3 practical orientated natural scientists (the engineers).

Present considerations

The above mentioned experiences have caused a number of assumptions which thave led to this piece of research and this thesis. I have realised that the building industry and especially the architect profession needs a clearer understanding of what is going on in education and a higher awareness of how it is using the available resources. I have also realised that we are lacking further educational opportunities in order to stick to today's needs of technical insight at the drawing offices and to meet the requirements of graduates starving for more insight. And I am in no doubt that the name of educations and professionals, like a label on a bottle of wine, means a lot to the level of recognition in society. It also means something to the labelling of a professional what kind of institution he or she graduated from – if it was a university with a fine reputation or something lower ranking. Such a difference is okay if that is what the relevant industry really needs and goes for but it is not okay if it needs professionals at highest possible level, which is my assumption here.

In a period of globalisation it also matters what other countries are doing, and I find it relevant to ask: "Why do Danish architectural technologists only need education from non research based institutions when they graduate from Universities in UK and Spain? Is it because Denmark only wants less qualified technologists and doesn't want its graduates to be accepted abroad to the same degree as graduates from other countries?" Of course not! But Denmark is behind in the development and adjustment of its educational system in comparison with almost all other members of the European Union.

In no other place do they have bachelor degree programmes provided by institutions for mainly basic educations, and then, as a next step, put the degree programmes into new designed institutions meant mainly for short term further education, probably just to please members of existing institutional boards and people in leading positions in the existing institutions. For a long time technologist education and similar educations in the other European countries have been placed at universities or at least at university colleges where the lecturers have research obligations.

Does research matter in this field of architectural technology? It is simply a request to any decent professional discipline that it can develop and control its own knowledge sufficiently and research is today's logical answer to that request (Macdonald 1997). What the industry has instead is a kind of development or informal experience collection in a field that is of crucial importance to the building industry.

Introduction

Background of the study

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Background of the study

Architecture is a key topic for all of society as it constitutes the physical frames around our entire lives, and provides a lot of possibilities and limitations for realising our wishes and desires. These are physical, perceptual and mental (Brockmann 1969 p. 7). Physical structures created by men are and have always been an important key to our understanding of the human society – what it is now and what it was before (Rasmussen 1964 p. 10).

Therefore, it affects us all when changes in the practices of architecture and physical planning occur, as is happening today. The changes referred to regarding architecture and construction did not begin recently but have developed over at least centuries (Frampton 1980 p. 12). Nevertheless, after the Second World War society has experienced an even more rapid development away from the traditional way of building due to new materials, new tools and new designs (Vadstrup 2005 p. 15, Gray and Hughes p. 40). This has been a challenge for all parties involved and especially for architects who previously relied on skilled craftsmen to figure out most of the detailing, which was normally a simple function of old highly developed crafts. Local craftsmen knew exactly how to put the different building parts together and the architect only had to show the main shaping of the building and a few preferred profiles for the more visible parts. The rest would then be shaped by the skilled workers and craftsmen who knew very well how to detail and execute the building according to the local tradition.

The development of those crafts was based on local resources and cultural impacts from sources the local society had been in contact with (Jensen and Ganshorn 1987 pp. 19-22). For example, the version of renaissance used in Danish royal palaces was the Dutch renaissance due to the fact that the Danish king (probably for political reasons, but maybe also because of personal taste), established a closer contact with Holland. He asked Dutch architects, (although possibly called ‘master builders’ at the time), to come to Denmark to introduce the new fashionable style of renaissance.

However, apart from the aesthetic design, the craftsmanship remained mainly within the existing established local traditions of materials and execution as the craftsmen were Danish (Hartmann and Villadsen 1979 pp. 63-64).

That tradition vanished many years ago, and architects have long since diverged from the role of solely shaping buildings, as belonged to the tradition. In the beginning of the 20th century, in the twenties and thirties, some architects welcomed the new modern shaping that put reinforced concrete into extensive use. When this proved to be too expensive in comparison with traditional method they tried to use the traditional materials and craft techniques to make their buildings look modern and as if made of concrete just for the look of it. It was like a new spirit or belief related to new ideas on democracy and how to set each individual free in a new world order (Faber 1977 pp. 185-186). Today, hardly anyone is capable of designing the traditional way and all the designs based on the tradition going back to medieval Europe and further back to Greece and Rome have now become history. Architects have been busy with the development of new kinds of space concepts and new theories of art, function and design. But what about all the more technical matters that used to be solved by the builders?

It is said that it was the emergence of new materials and new techniques that gave rise to a new form of architecture. People with a non architectural background had successfully in introduced such techniques in new kinds of construction which more or less forced architects to abandon the old technical traditions and design for the new materials and techniques – to invent a new architectural language that could meet the new requirements (Gideon 1967, Frampton 1980, Saint 2007).

Even if one still refers to 'craftsmen' there is no such thing as crafts work to be executed in modern construction, save for the rather limited activities within restoration of old structures. Even in such activities new automatic tools will very often replace old hand tools and drawn and written specifications, that were not available for the craftsmen originally, will today be offered by the drawing office to support the work, thus creating a new and modern situation in comparison with the original handicraft conditions. Vadstrup (2005 p. 37) claims reparation and restoration to imply what he calls a special craftsmanship and of course it requires a very different kind of preparation and execution procedure than the original execution process did. To build a new car is a quite different thing than just repairing an old one where the goal normally is to replace old worn out parts with new almost identical ones.

Gideon (1967 pp. 163-290) described how the new industrial technologies and the resulting new materials influenced architecture in different parts of the western world from the early 19^{th} century to our days. The development described was initially influencing the construction of buildings intended to be 'outstanding', whereas housing construction for ordinary people continued to use old techniques belonging to the handicrafts (Gray and Hughes 2001 p. 40). This can be noticed in most European countries inclusive the UK and Denmark, which are the two countries this research will concentrate on as typical examples from the western world and as areas of special interest to the author.

Langberg (1978b p. 221) stated that even after WWII the tools in use in the building industry in Denmark hadn't changed significantly for hundreds of years. Thus we can notice a long standing competition between new techniques and materials and the very old well tested methods embedded in the handicrafts. In Denmark it was not until the 1960s that the handicrafts of the industry successively gave up using the old methods and tools and got them replaced with new electrical driven tools to treat more industrialised materials and components. In the UK the process began earlier but also here, parallel with industrialisation and new techniques, the old methods were in use until about the same time. This slow change was due partly to appreciation of traditional qualities.[1] Whereas the industry in general gave up the old handicraft businesses the building industry kept its small businesses and the illusion of them still being handicrafts even if the old techniques were not in use anymore.

[1] From another industry we can mention that the export of butter from Denmark to the UK because of British conservative requirements continued to send the butter in wooden barrels assembled by handicraft by Danish coopers until the early the 1960s. When this request was given up the business of Danish coopery in general closed after having served society in probably more than 2000 years. (Fode.1995 p. 542)

Because of this, the construction industry has not been effectively aware of a significant change in responsibility, caused by a change in construction design and in the design and construction teams themselves. In historical times what the craftsmen were not capable of 'designing' was taken care of by the drawing office. However, now it is the case that the drawing office must account for all details.

The **aim of the thesis** is: **to uncover the situation of the discipline of architectural technology scientifically.**

To do so the following **objectives** have been studied:

- **Architectural technology and architectural design in comparison**
- **How to define architectural technology**
- **The history of architectural technology**
- **The role and profession of the architectural technologist**
- **The education of architectural technologists**
- **The architectural technology discipline in relation to the level of science and technology in society**

Research question and hypotheses

The building industry uses a growing number of new techniques, new tools and new materials or components to create new industrialized looking buildings whose whole appearance constitute a break from the traditional way of building (Gray and Hughes 2001 pp. 34-36). This arguably creates a problem – a problem calling for a new kind of architect with additional key skills to those traditional about shaping the buildings and then rely on the skilled workers capability to technically detail and execute – an architect who can inform less skilled workers about how to technically detail and execute new designs with new combinations of materials and do so within new kinds of organizational frames.

Such an architect has to follow all new developments of the construction industry and requires the capacity to take a modern architectural concept and detail it completely with all technical information. In other words, he or she is required to produce **the coherent** technical design of the building as a follow up on the designing architects' outline sketches or conceptual design and do so whether we talk about two persons sharing all design work or only one possessing both capabilities.

Does such an architect exist? And if so, how was this new professional then educated and trained? Is there a sufficient balance between the old area of responsibility and the newly arisen technical one when it comes to education? Can a single education of a standard duration cover all of it, or do we face a new specialisation area within architecture?

These questions drove the philosophical basis for this research, and link with real developments in terms of an emerging discipline area. To distinguish between the traditional area of activities in the architect's office and the new demanding technical area we will call them respectively 'architectural design' (AD) and 'architectural technology' (AT). This is in line with the terminology in use by the newly developed architectural technologist in UK. It is also necessary to distinguish between the discipline of AT and what architectural technologists or their like in different countries consider their professional role(s) at the time being. The fact that it is a newer discipline within the drawing offices and that the new profession historically derive from different national traditions have caused different ideas on the borderlines of the professions of architecture and architectural technology as will also be seen in the data from our chosen national examples of the UK and Denmark. However, the true international development is that of the AT discipline installing itself beside the AD disciplines in the drawing office – not how in detail the national tradition in different countries handles the situation right now. Using the UK and Denmark as examples the investigation of the thesis sought to explore the above mentioned questions through testing of two hypotheses:

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

Original contribution to knowledge

This research represents an original and planned contribution to knowledge. Testing of the two hypotheses has the potential to significantly change the understanding of the roles of the disciplines, and to subsequently cause a change within behaviours to establish radically altered and more realistic aims and focus, to the ultimate benefit of industry and of society (Bennets 2010).

The present understanding is that architectural technology was always a part of the responsibility of the drawing office and that the area just has expanded to be much more demanding than before. The thesis shows that this assumption is a bias and that what we today tend to call 'architectural technology' derives much from the skilled construction handicrafts, and represent a link between aesthetic and practical design. The importance of such recognition within the area of architecture cannot be over-estimated.

The second hypothesis is of significant importance because recognition of architectural technology as a profession in its own right will tend to drive other research within the field to reconsider roles within the building industry.

The research was innovative in its approach (mixed methods) and was designed to inform the manner in which a new discipline can be fostered to develop fruitfully in the future.

The research approach

To test the hypotheses, it was necessary to closely investigate the history of architecture, the handicrafts, education for the industry and the professions of the industry. The present day industry was also investigated in order to identify indicators for or against the hypotheses.

The research considers relevant historical data in the existing literature, to inform spaces in the current knowledge to be filled through series of primary data studies.

The first hypothesis presumes little awareness of the relationship between architectural technology and the area of responsibility embedded in the old handicrafts. This point is interesting in itself, and was addressed through review of literature, and through data collection pertaining to both the educational systems in the UK and Denmark, and through reference to current practice.

The second hypothesis infers that the construction industry has no awareness, or makes little distinction, that AT is by nature a different discipline from the one the architects are trained to undertake and any understanding in that direction is totally absent in society as a whole. This was investigated through the data collection which in the different studies tested both hypotheses and together with the literature review proved them right.

Initially, it was difficult to figure out how to design the tools to collect the right sort of data and it became necessary to develop and tailor a special kind of questionnaire for study 1 because of the rather complicated nature of the things to ask about. The problem was to ask in a way that appeared simple but in fact involved a number of factors and do so without forcing the respondents into a number of troublesome considerations. In the end this turned out successful.

From literature it was, along with general information about the history of the professions involved, possible to collect basic data for new statistics about the traditional education of architects thus providing unquestionable evidence about the historical relationship between architecture and craftsmanship.

Study 1 informed about the present educational profiles of architects and technologists in the UK and Denmark and showed a significant difference between the two in Denmark, but a much more uncertain picture of possible differences in the UK. This left a suspicion that the two British educations were very much alike and this became one of the key questions to get an answer to in the further studies.

Study 2 gave an insight on how Danish lecturing staff, as probably some of the most well informed professionals about the quality of the involved educations, see the professions of architects and technologists in comparison. This shoved a discrepancy between what well informed people tend to believe and what people in general assume if they know the existence of the technologist at all.

Study 3 consisted in arranging focus groups of highly skilled professionals in London and Copenhagen to make them discuss the data from study 1 in order to establish a proper interpretation of those data and to give further comments to the role of the architectural technologist. The study also gave strong evidence of a considerable difference between the two educations and their environments providing very different mindsets in their graduates. The groups of professionals saw a serious need for both educations and their resulting professionals for the good of the drawing office (Schön 1995 pp. 287 – 290).

Thus, the hypotheses were well approved and it became possible to articulate what is here called “The Theory of Architectural Technology” as a part of the conclusion. Finally, a chapter about possible further research to be undertaken within AT can be found.

Structure of thesis

The different parts of the thesis are these:

- The preface gives information about the personal background of the author relevant to this study. It describes how a number of assumptions about the role of architectural technology were formed.

- The introduction informs about the background for the study in the recent development of the industry and about what the study achieved.

- Chapter 1, the literature review, informs about the roles of the discussed professions and what was said about them until today.

- Chapter 2 describes the research methodology applied and why it was chosen.

- Chapter 3, Study 1 informs about the development of the questionnaire tool for newly graduated professionals, the selection of the groups to ask in the UK and Denmark and the data finally collected. It also discusses how the data can be interpreted in relation to the hypotheses.

- Chapter 4, Study 2 informs about a questionnaire for educational staff members in Copenhagen who were asked about how they saw the professions of architects and technologists in comparison. The reliability of the results is also discussed in the chapter.

- Chapter 5, Study 3 describes the work of the focus groups who were asked to discuss the data from study 1. Apart from the focus group meetings and the reports from these, following-up questionnaires were sent to the participants to secure the most informed and precise opinion possible.

- Chapter 6, Discussion looks at the collected data from different points of view and attempts to give a clear picture of what was achieved.

- Chapter 7, Conclusion comments very directly the data coverage of the hypotheses and shows how all the studies and reviews establishes the basis of a theory of architectural technology.

- Chapter 8, Research within AT suggests further areas of research belonging to AT to be covered.

- Chapter 9 informs about the references used for the thesis.

- Chapter 10, Appendices informs about data samples and conference presentations deriving from the thesis project.

1 Literature review

Introduction

History

Professions and Professionalism

The Architectural profession

About architectural technology

Discussion

1.1 Introduction

The preceding sections define how architecture and construction design have been served by education in recent times. They also suggest a development during the last 150 years and indicate what has caused this development. This chapter explores the literature and previous research in the field using four distinct thematic areas:

1. **History**
2. **Professions and professionalism**
3. **The architectural profession**
4. **Architectural technology**

1.2 History

1.2.1 Architects and buildings

The topic 'architects and buildings' is relevant to the hypotheses because the drawing office traditionally was the domain of the architect and because it is claimed that the drawing office today, being the home base of the AT professional, has taken in areas of responsibility originally belonging to the handicrafts.

The history of architecture is closely related to the history of building. However, it is also notable that the history of building is even more closely related to the history of handicrafts (Groll 1979). Referring to chapter 1.3, the same cannot be said about the relationship between architecture and building, simply because a building is possible without architecture (Pevsner 1976).

The architect occurred in history when powerful people outside the church felt a need for an 'exceptional' building design, in contrary to the vernacular building culture. This was a product of the new spirit in society we normally call renaissance. Brochmann (1969 p. 23) explicitly describes the situation when the profession of the architect stood out from the handicrafts to become a new independent position of an artist and a consultant who did not base his part of the work on building technique but on art skills mainly. At this stage in history the more technical part of the work to do relied on the master builder and the handicrafts. He says that this was possible because the traditions within the handicrafts were so strong, this situation lasting far into the nineteenth century (Brochmann 1969 p. 24).

In actual fact, the situation lasted until the mid of last century if the majority of the built square meters are considered. In line with this Graham, Linford and Lobban (2007 p. 27) state that: *"the construction industry's repair and maintenance cluster contains a wide range of activities that has not been recognised by the new build industry sector for at least the past 50 years."* However, Brochmann is perfectly correct, as early in the 19th century new kinds of structures based on the industrial development began to occur (Clark 1971, Frampton 1980 pp. 32-37). One can notice structures of cast iron with huge areas of glass already from the beginning of the century and can know for sure that this was in no way related to the old crafts and therefore must have required a quite different kind of documentation than the traditional one delivered (Pragnell 2007 p. 240, Brochmann 1969). However, most of these buildings were made by other professionals than architects – mainly engineers (Clark 1971 pp. 330-337, Graham, Linford and Lobban 2007).

1.2.2 The craftsman and the master builder

Historically it can be claimed that architects undertook the artistic part of the architecture whereas craftsmen and master builders undertook the technical design along with the manual work of execution (Groll 1979 p. 214).

However, the truth may be rather more subtle because when saying 'handicraft' we don't just think of the simple fact that something is 'made by hand', but automatically include the idea of 'craft' as something much more (Gelfer-Jørgensen 1998 p. 388). That is, one would normally combine with the term 'handicraft' something skilful and highly developed. It could even be said that we tend to think of craft as something involving a kind of art. It might be possible to describe different components within 'handicraft', thus being able to define what it is. This is very important because it will allow a recognition of possible similarities with AT, which was indicated to be there.

Vadstrup (2005 p. 32) states that the old handicraft methods required:

- *A deep insight on materials*
- *Ability to amend quality through the execution method*
- *Ability to make very tight and advanced meetings between parts and materials*
- *Possession of chemical and physical specialised knowledge*
- *Possession of special professional knowledge*

One must question whether these requirements are equivalent to those required from an architectural technologist today, in order to establish whether the technologist represents a modern refinement of the master builder or craftsman.

As an example of **material knowledge,** Vadstrup mentions that remains of small animals can be found in old lime pits. This was not due to any ritualistic behaviour, of course, but because organic lime improve the elasticity of the final product. Again it is interesting to question whether an AT professional should possess knowledge which enables him or her to understand and select appropriate materials (RIBA 2005). As an example of **quality amendment through the execution process,** Vadstrup (2005) describes different traditional techniques through which steel and wood become better performing and longer lasting than the originally selected rough material itself and how this was an integrated part of the professional performance of the craftsman. Again there is no doubt about the importance of similar techniques to be used by professionals today to stick to today's demand for sustainability (Graham, Linford and Lobban 2007).

Tight and advanced meetings between parts and materials requires according to Vadstrup (2005) both expertise and experience. This was available in the old handicrafts but today there is a lack of both the expertise and the experience when still new materials are used for new desired looks. Therefore, a kind of overall expertise in realising problems and difficulties is required from the professional in charge of the design. Regarding **chemical and physical specialised knowledge,** Vadstrup (2005) states that such knowledge providing an insight on electrochemical series within metals and on chemical reactions within minerals was a part of the experience based handicraft knowledge of how to do. One can conclude that today's requirement must be a high degree of basic understanding of the same factors combined with a high level of awareness to enable the professional to design something new which performs quite as good as the old solutions.

The final area mentioned by Vadstrup was **special professional knowledge.** By this he means that the experience of the professional craftsman was especially deep because he was dealing with a narrow area of specialisation that far exceeded bare theoretical knowledge. It seems obvious here that the industry faces a serious problem for the new distribution of responsibility within the industry. How can an AT professional or anyone else replace the qualities of this factor in the new structures to be designed? After all, much of the depth in such knowledge may arise or develop through experience and practical training. Fully in line with this Jensen (1921) describes the cooperation he as an architect had had with a blacksmith about some wrought iron work for a well: *"We, who compose work, which we only give drawings on paper for, because it is not our profession to manage the execution in the material, we are obliged to do our part of the work in a way that it can inspire the craftsman to do his work as an art. The one who creates the composition, has the full responsibility for the general architectonic and artistic effect through the surveying of the execution along with the balancing of all details, but the craftsman, who carry out the work in the material need as much freedom as possible to give the performance a personal artistic character. – Such a character has Hans Rasmussen managed to give the wrought iron work of the well. This is not only in the technical respect so well done that at the assembly of the different parts a single spot could be pointed out where a minor error could be noticed. The well is in general so well done that there can barely be found a smith in the world who could have carried out this* *work with a deeper understanding than this Danish village smith"*[2] (Jensen 1921 p. 37).

To further show the area of responsibility of the traditional craftsman one can also quote Bugge (1918) who about what is necessary to include in a description of a piece of craftsman's work says: *"It is the idea of the author that it is not necessary to give a detailed description of the craftsman-like execution for most of the works namely the works which for centuries have been in use and for which one have accepted well known performances. When it is about such works one can limit it to say that the execution should stick to usual first class craftsman-like performance."* [3] (Bugge 1918 p. 957)

Referring to Bugge it can now be realised that what he talked about is gone in the building designs of today and must be replaced with thorough and detailed descriptions of all the work to be carried out. There is a demand of a new kind of expertise requiring deep insight on techniques and performance to be transferred to instructions to the skilled workers at today's building sites (Gray and Hughes 2001 p. 76).

1.2.3 The history of craftsmanship and its definition

There is an implication within the idea of craftsmanship; one very often forgotten about but no less important. It is arguably a crucial factor in defining or deciding how to regard the term craftsmanship within this thesis. This implication is 'tradition'[4], and the extent to which the activity is embedded in the over centuries developed habits of a craft (Degn 1997 pp. 210-212, Groll 1979 p. 214, Bugge 1918). Without involving this in the definition of a handicraft the possibility to understand architectural technology in its historical context will be missed. By involving this component it can be claimed that the handicrafts are gone and that the work of a handyman of today is something different (Tafuri and Dal Co 1979).

[2] Translated from Danish by the author
[3] Translated from Norwegian by the author
[4] It is of course a part of what we call tradition that it develops slovely over time along with shifts in fashion and design

Harald Langberg (1978a p. 38) stated: *"Looking back at the buildings of the Viking period we notice mostly houses with planks dug into the ground. Judged by the discoveries, they have been dominant in the period, but we dare not doubt the existence of a lot of different kinds of buildings - least of all when we remember our lack of knowledge about the buildings of the peasants. Kept remains of treated timber bear witness of a high level of craftsmanship, and the tools were excellent; axes and spoon drills of iron are found in several places.* ***They are equivalent to the tools the carpenters were still using in the 19th century."***[5] It can be concluded that tools in use by carpenters in Denmark were more or less the same in a period of one millennium. This is vital in our understanding of the construction handicrafts.

Taking carpentry as an example, one can now notice that within a period of at least 1000 years the same tools offering the same kinds of treatment of timber have been used. It can be added to this that the material in use also remained the same, thus in combination with the available tools forcing the craftsmen to stay within the strict limitations this all in all gave. It can also be noticed that the craftsmen developed highly advanced and clever solutions to the problem of building in the local area (Jensen and Ganshorn 1987). Today it would be almost impossible for anyone within the same material and economic limitations to create solutions of the same standard as the crafts arrived at. It is still possible to see and enjoy the grandeur of the resulting buildings and their detailing; especially from periods of wealth it can be noticed how very elaborately craftsmanship was utilised (Jensen and Ganshorn 1987 p. 28).

The architect Søren Vadstrup (2005) initially claimed, in his book "Huse med Sjæl" ('Buildings with a soul'), to be the happy owner of a 265 year old building. He recognised 22 materials or components to be parts of the original structure inclusive the materials for the treatment of the surfaces. Six of these materials are different species of wood in different degrees of prefabrication. The prefabrication and all

[5] Translated from Danish by the author

materials recognised are of kinds that very well might have been produced locally as was the tradition in those days.

Vadstrup also claimed that replacing old materials and old designs with new gave less appropriate and less sustainable results than just repairing and renewing in the traditional manner. This is simply because the traditional solutions are so well tested and have proven their good properties both separately and together. Today we face a situation with thousands of materials and components available on the market and they are not surprisingly being used all over in today's buildings. This is a result of industrialisation and research and all the possibilities this have given to us. In addition, new ideas on architecture have contributed to a situation where the old crafts are not required any more (Graham, Linford and Lobban 2007, Degn 1997 p. 211).

In "Baalbek" (1971) Helge Finsen includes an image of *'the greatest stone cut in the world'* the locally called "Hadar el Hobla" 21.72 m long, 5.35 x 5.35 m in the one end, and 4.25 x 4.35 m in the other end, weighting 1211 tons. Finsen states that *"a researcher with a well developed sense of the absolute useless has calculated that it would take 40.000 slaves to draw it."*[6] This perpetual slave explanation is totally ignoring all the signs in the existing remains of the famous buildings of Baalbek in Lebanon indicating highly developed techniques used for transport and mounting of heavy and large components. The fact that we do not know precisely how it was done does not mean that it was not very advanced. Investigation of the stone material itself would have told the researcher that it required a high level of precision not to crush and damage the surface of such a heavy component when mounting it. For this reason alone, it is unthinkable that so many slaves could have done it. There is simply no way of figuring out all the cultural and technical circumstances under which the, undoubtedly, brightest individuals of their time invented the methods in use (Brochmann 1969 p. 12). Free guessing by none building professionals of our own time appears the most hopeless and useless of all explanation invention methods.

[6] Translated from Danish by the author

Therefore, a great deal of advanced knowledge regarding production methods and old tools has been lost with the shift of culture caused by the political and economical changes, but until recently society faced one long almost unbroken cultural development in Europe (Degn 1997 p. 210, Vadstrup 2005 p. 16) A development over a millennium after the collapse of the Roman Empire went on along with the establishment and keepings of the monarchies. The UK and Denmark officially still have the monarchies, but functionally we now have democracies as a result of the industrialisation and the relatively peaceful revolution that fortunately took place in our countries. Initially, the two countries shared the same king (a Dane) and Denmark has more or less kept the same royal blood line for the state representation in the whole period. But something has happened in other contexts. Early in the industrial period a number of handicrafts were outstripped by the competition of the industry, but others have more or less remained up to the middle of the last century but are now finally more or less gone (Frampton 1980 p. 43).

When Langberg (1978a p. 211, 212) in 1955 published the second volume of his book Danmarks bygningskultur II (The building culture of Denmark)[7], he could claim that many rules still obeyed within the handicrafts were so old that there was not the slightest chance of figuring out their origin. For example the simplest rules for a carpenter's use of the axe had such characteristics. The Danish way of equipping a door with a lock was at least 200 years old, whereas shaping of the handing had changed with the fashion many times in that period. He noted that many of the Danish rules and habits came from outside the country due to the fact that Danish craftsmen used to work abroad as journeymen for long periods and that foreign journeymen worked in Denmark thus causing a significant exchange of ideas. Of course, only rules and ideas that were suitable under the Danish circumstances regarding climate and resources would prove successful and survive in the long run (Jensen and Ganshorn 1987, Groll 1979 p. 215).

[7] Translated from Danish by the author

Looking at carpentry, one can now notice that the old methods and tools were still in use to a certain extent until the end of the 1950s. This involved the use of timber with a squared cross section to be joined with mortise and tenon the very traditional way for the establishment of the roof, of half-timbered wall constructions and of horizontal divisions (Pragnell 2007 p.111).

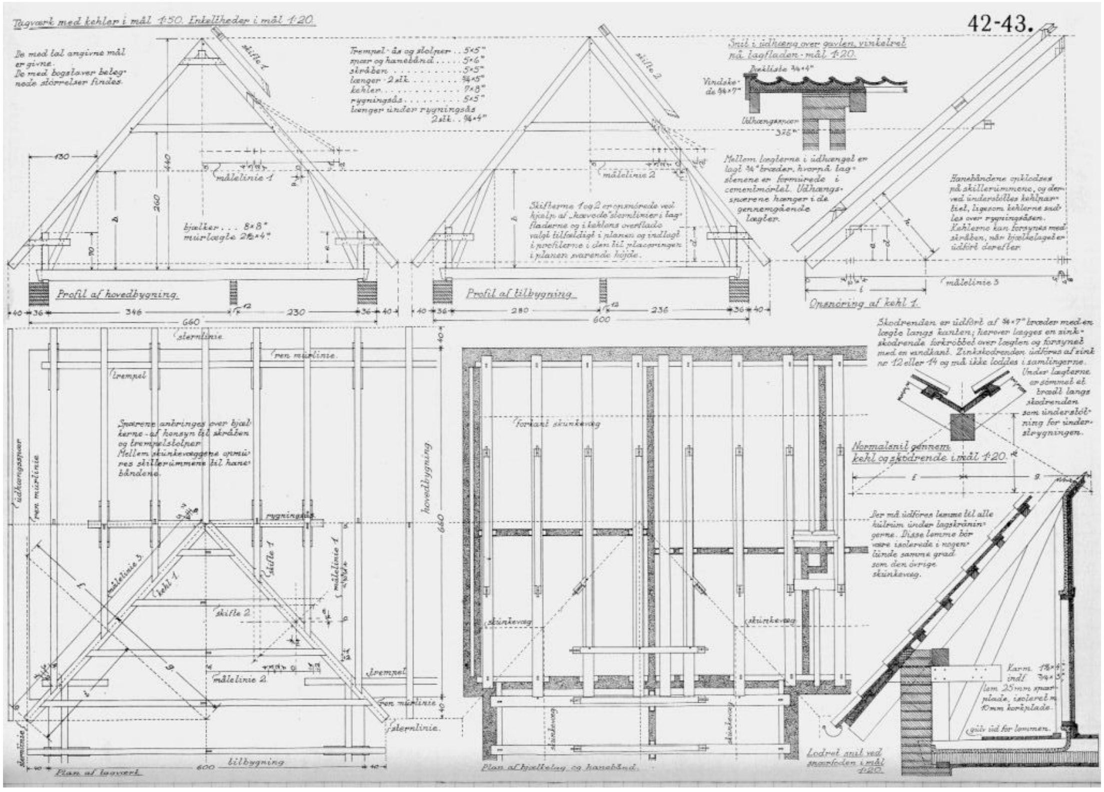


Figure 1-1: Squared timber rafters as still used in Denmark until 1960

After 1960 rafter manufacturers took over the production of roof constructions in Denmark step by step and something like the drawing above would only be made in case of restoration from the late 1960s and further on.

In the beginning of the 1930s it became more and more common with horizontal divisions of reinforced concrete replacing the old timber constructions, but the first five years after World War II the old methods were in use again due to lack of steel for the reinforcement of concrete. Around 1930 the wooden stairs, which also belonged to carpentry in Denmark, were replaced with reinforced concrete due to its fire resisting properties (Kjærgaard and Harboe 1982). From the end of the 1960s the old craft of carpentry has only been used for restoration of old protected buildings.

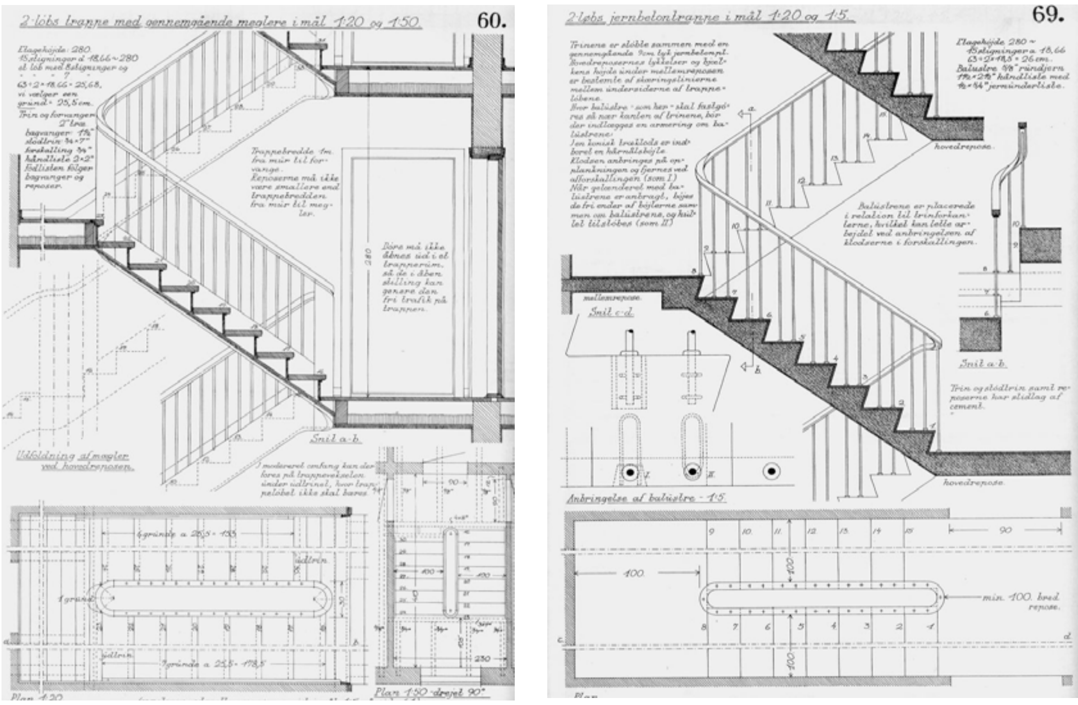
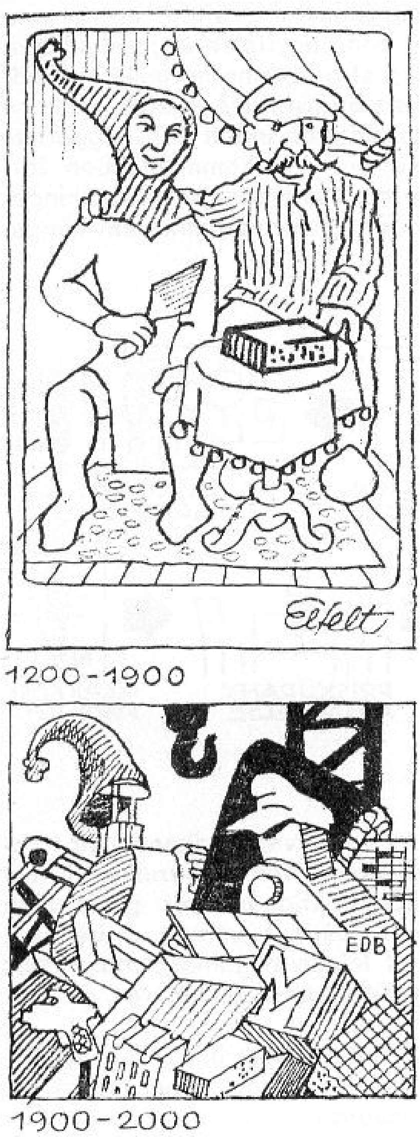


Figure 1-2: Traditional wooden main stair and the stair that replaced it

Figure 1-1 and 1-2 are taken from the third edition of a book by Jensen (1964). The original book (Jensen 1954) was meant to be used in the education of “master builders” but the name of the education was changed 1964 to be “Bygningskonstruktør”, which title can best be translated to “Architectural Technologist”. Denmark still has a trade called carpentry, but it has very little to do with the old handicraft of the same name. All materials are different and all tools are different and the only tradition available is less than 20 years old due to the rapid changes.

Bricklayers are still working with facades of bricks, but instead of the facade being a part of the load bearing structure, making the weather screen, and being part of the thermal envelope and thus creating the inner wall surface as one solid result of the exercise of the old craftsmanship, it is now used in a thin layer for the purpose of the weather screen only. Instead of operating with many advanced bonds it has become common to use the most simple and uncomplicated ones and the same can be said about the joints and their finish (Degn 1997 p. 211). Arches and vaults of bricks are extremely rare features today. So the old craft of bricklaying is also more or less gone with the development of new building methods and new materials. What is left for both carpenters and bricklayers are simplified activities requiring a much smaller body of knowledge and skills than before. For the joiners only the montage of manufactured components is left and there is only very few and rare activities that require anything else than a certain training in handling electrical hand tools.

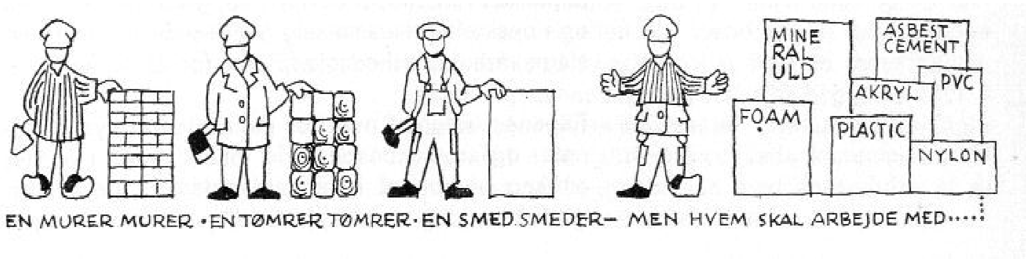
In the "Byggerapporten" (Eriksen and Thykir 1969), made on a request from the Danish Minister of Housing and Building, we find a description of the situation and illustrations to support the text.



This illustration from "Byggerapporten" (1969) (Figure 1-3) tells that what happened to education of craftsmen between 1200 and 1900 tended to be rather unchanged due to the utilization of the same materials and building techniques during the whole period. According to the drawing the most significant change for the bricklayers appears to be the kind of cloths they were wearing. The lower part of the drawing attempt to illustrate what has happened within the trade of bricklaying in the period after 1900. As described, most of the old handicraft has in fact disappeared but it has been replaced with numerous new more montage like activities. These tend to become narrow areas of specialization but they are all subject to rapid changes due to new methods of montage and introduction of new manufactured component based solutions.

Figure 1-3: The situation caused by introduction of new materials

The report also discusses the education of craftsmen and skilled workers and present further illustrations:



A bricklayer lays bricks. A carpenter does carpentry. A black smith forges. But who's going to work with……

Figure 1-4: Revolution within bricklaying

Byggerapporten (Eriksen and Thykir 1969 p. 95) explains a recent development at that time: *"The resistance of the handicraft organizations against new materials and new techniques and organization has – quite against the intention – strongly supported industrialization and new methods. In this context especially the montage construction with manufactured components to be mounted at the building site by a minimum of working force has to be emphasized."* [8]

To the right a small illustration from the report shows the two kinds of manual working force that could be noticed at the building site in 1969 and still can be found there: The handicraft trained and the not handicraft trained; the latter one now often with a certain minor theoretical specialist training.

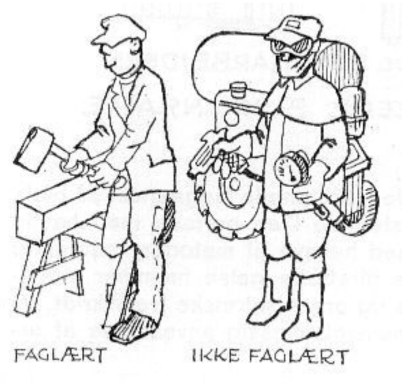


Figure 1-5: Two kinds of workers

There are still fewer of the real handicraft trained professionals left in the industry and this presents a problem as to the challenge of refurbishing and especially the restoration of valuable old buildings. In the UK the National Heritage Training Group (NHTG) was established to address this problem (Graham, Linford and Lobban 2007), and in Denmark a special centre for old handicrafts was established in order to keep and maintain the building heritage. Therefore, one could claim that the traditional handicrafts still exist and are in use.

[8] Translated from Danish by the author

However, this special activity constitutes another kind of profession than the one of the old handicrafts, as it is focused mainly on conservation and restoration work, rather than on the utilization of such skill in new build. This means that the new build work process is rather different and going on in quite another pace than the old process of erecting new structures. The challenge is to do or redo something that was already shaped once and normally very well described in drawings and written documentation and thus lacking the challenge of choosing a solution to a given problem, which was typically the case with the new structure to be made. A mechanic who is restoring a veteran car in his garage faces a rather different challenge than the manufacturer of the car did when it was first produced. This also regards the kinds of tools to be used for the restoration, and within construction a similar relation can be noticed.

So, how can the 'handicraft' term be defined for use within a wider debate? There are the old traditional handicrafts, not practised any more, that define the true meaning of the name. Today's activities of skilled workers in the trades carrying the old names require a different naming to be distinguished from the real handicraft results of the tradition. The skilled workers would definitely not be called craftsmen by the old ones practising the real handicrafts. They had their pride and nobody could tell them how to do their professional work. They were experts and knew better than any architect or engineer how to make the details of their handicraft. Consequently, the term handicraft means the tradition based activity of producing components or building parts or even whole buildings. Typically a handicraft was based on one main material, possessed its own special developed tools, and was over centuries it was refined to a level of detailing and execution that far exceeds what anyone with only short time training would be capable of.

Today's typical construction activities of skilled workers, whether they maintain the use of the old traditional names or represent relatively recently invented areas of activities, are merely 'mounting or fitting activities' of much more readymade products from a highly developed supplying industry.

1.2.4 The history and definition of the master builder

The master builder can be said to have been a professional acting in roles somewhere between the old craftsmen and the architect, but the limits to both sides are not very clear. According to Brochmann (1969 p.18), one thing which is certain is that the master builder always had a basic training in one of the main handicrafts of building, namely carpentry, stone masonry, bricklaying or joining. This was not the case to the same extent for the architects[9] as described by Hale (1967 pp. 115-124). But here it is necessary to be able to distinguish between master builders and architects in order to place the architectural technologist within a correct historical context.

In the existing scientific literature one normally doesn't find this desired strict distinguishing between master builders and architects. Langberg (1978b p. 318) for example says the following: *"The leading master builders of the country were engineering officers. Their knowledge of the civil architecture had been obtained as a part of their military education and travelling abroad had made them familiar with all the new within the field of the 'art of building' (architecture)."*[10] The period he is talking about is the first half of the 18th century.

Looking at the result of these people's activities we are in no doubt about what their work would be called today (Hartmann 1976). What they produced were without any doubt architecture and today they would definitely be called architects, but officially they were officers and master builders and the kings first architect had the title "generalbygmester" or 'general-master-builder' with the rank of a general in the army (Langberg 1978a p. 218, Hartmann 1976 p. 119).

Hartmann (1976) presents two kinds of professionals to us:

[9] Nevertheless, an interesting historical point is that the term architect means 'master builder'
[10] Translated from Danish by the author

Figure 1-6: General Master Builder Laurids de Thurah (Hartmann 1976)

Figure 1-6 shows a painting of the "General Master Builder" Laurids de Thurah (1706 – 1759). He is called the finest representative of baroque architecture in Denmark and there is absolutely no doubt about his position as a kind of national star architect. His buildings are tourist attractions today and known very well by common people in Copenhagen and he lived in a country site stately home or palace himself. He was also "Court Master Builder" with responsibility for royal property in Jutland and Funen. The painting belongs to the museum at Frederiksborg.

Figure 1-7: Master Carpenter (master builder) Johan Boye Junge (Hartmann 1976)

Figure 1-7 is a painting from the same museum showing Johan Boye Junge (1735 – 1807) a master carpenter employing 193 carpenters responsible for numerous buildings after the fires in Copenhagen. During the fire in 1794 he was head of the fire brigade. He also became a wealthy man with a palace outside Copenhagen, but something makes us see him in different social position than Laurids de Thurah. Where de Thurah designed churches and palaces, Junge made accommodation for the citizens of Copenhagen end where de Thurah made the fashionable and outstanding he made the modest and anonymous but fine and neat (Hartmann 1976).

Another important difference between the two was the pure role of a consultant possessed by Thurah whereas Junge was a contractor or builder as well. Thurah was educated as an officer and had studied architecture in Germany, Italy, France, Holland and Britain and Junge was trained as a craftsman. When Junge became Court Master Carpenter Thurah got a knighthood and the General Master Builder position. Below is an elevation of a row of fine buildings designed by Junge to be compared with the following section drawing proposal made by Thurah (Hartmann and Villadsen 1979, Faber 1977).

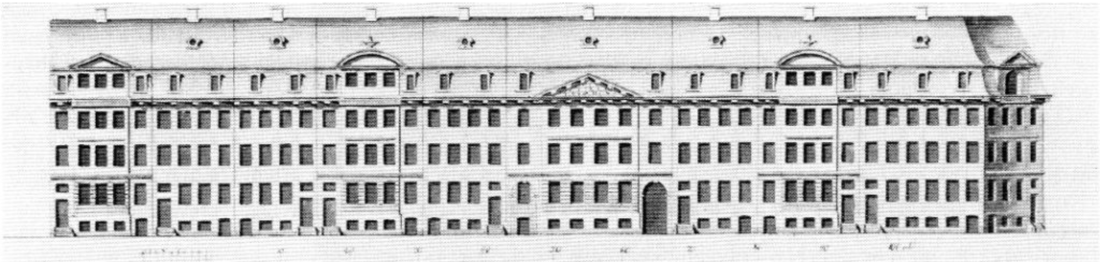
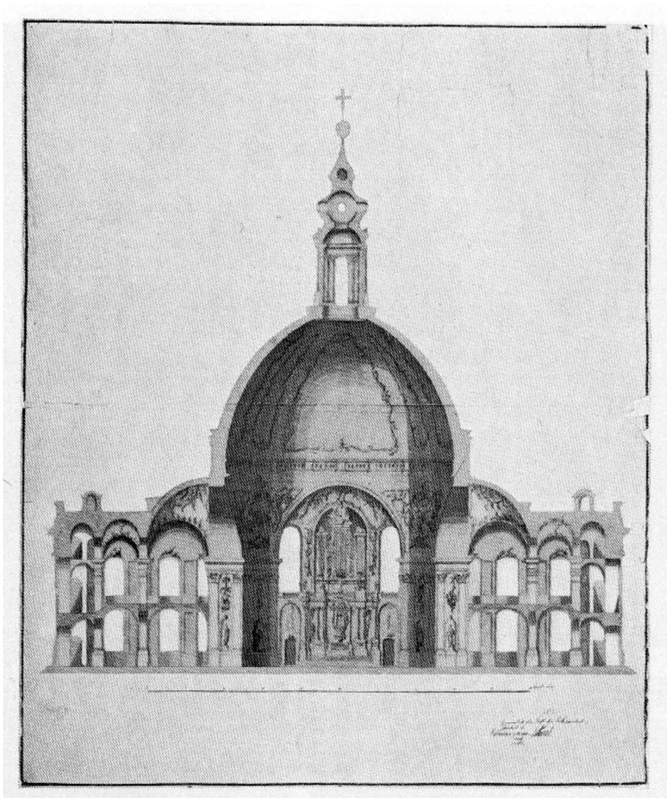


Figure 1-8: Buildings by Boye Junge 1781 **(Hartmann and Villadsen 1979)**

The two different kinds of assignments the two professionals got are very apparent in these two prospects even if it can be noted that the design quality of Junge's work is excellent.



What can hardly be uncovered is whether the two men had different manners in their way of moving, speaking and dressing according to their assumed different social contexts.
Something in the pictures of them could perhaps indicate it.

Figure 1-9: Proposal for Frederikskirken by Laurids de Thurah 1754 (Faber 1977)

In the past seventeenth century we find a situation where those today called 'architects' also could come from the handicrafts. In the book "Landbrugets Huse" (Brogaard, Lund and Nørregård-Nielsen 1980 p. 141) we read about the architect of Nysø palace Ewert Janssen: *"When people have refused to consider him the 'master builder' it is because he was considered a master mason, who took orders from others. The assumption doesn't hold water; today it can be proved that he was the master builder of several monumental buildings in Copenhagen and if one considers the number of master builders of the time, it is hard to see who else could have assisted the squires of South Zealand."*[11] In those days the architect was master builder and sometimes he was functioning as master mason or contractor besides, but obviously people distinguished between master builders and master craftsmen, the first category being synonymous with architects due to the use of the term in the period and the geography in question and due to the role as a consultant.

It also appears very clear that the naming of someone as master builder of this or that building in itself tended to be recognition of architectural achievements. Like with Thurah in the eighteenth century (Smed 2001) it is the relationship with the highest ranking people in society that matters, and the ability to meet their requirements of building qualities that could underpin their position by showing a high cultural level, that made the difference between an ordinary master mason or contractor and a master builder in this period.

This brings us back to the difference described between architects and technologists of today. Even if none of them are contractors there is a tradesperson who is very familiar with all the technical matters and there is one who can deliver the desired art and fashion to the shaping of the building. But as can be seen there were also persons who possessed both skills like for example Evert Janssen.

[11] Translated from Danish by the author

A British example of such a person could be John Wood the Elder, who began his career as a craftsman, in fact a joiner, probably beginning his apprenticeship in Westminster at the age of 12, which was also a common age for such a step in Denmark in those days. *"He was the son of George Wood, a local Bath builder who was still active in 1727, when he is mentioned briefly in the Chandos papers, but was otherwise without fame"*[12] (Mowl and Earnshaw 1988 p. 10). Wood was born in 1704 and already in the age of 21 he began his remarkable architectural career. He is known to have had a working relationship with Edward Shepherd who was also a craftsman; "*he was a plasterer, who rose by his own enterprise to create whole streets of houses. Shepherd's market in Mayfair is his modest memorial"* (Mowl and Earnshaw 1988 p. 15).

Looking at what John Wood achieved in Bath leaves no doubt about his architectural skills. He became, in fact, one of the best in the British history of architecture and he called himself an 'architect' despite his relatively poor training (Mowl and Earnshaw 1988 p. 215). This must have been due to the fact that the title had come into common use and perhaps also because that he was able to appreciate his own value. Without the latter ability it must be doubted that he had been as successful as he in fact became. On page 102 in Mowl and Earnshaw's book the following interesting passage can be found: *"What must have complicated the whole creation of Prior Park was the fact that Allen was no ordinary patron. He was a shrewd, self-made man with a large workforce of masons in his personal employ. Wood and he were already associates in the building and developing business. He will have heard the melancholy history of Wood's technological inadequacy as Chandos Buildings went up. When Allen was building his prestige town house and office in Lilliput Alley he had pointedly used Wood's design but then had the house built by someone else, probably one of his own men."*

[12] The Chandos Letterbooks in the Huntington Library, California, 6 April 1727: Chandos to Mrs Phillips.

Here is a situation where someone recognised to possess the skills of an architect did a design only, and afterwards someone else gets the responsibility of the execution or of being the 'master builder'. This has been the situation many times before and afterwards when art and fashion qualities have been requested on top of the more technical skills of the handicrafts and the master builders. Brochmann (1969) says the following about this. *"Through the whole medieval period the architectonic development was undertaken by the artistic skilled master builders. Of course this can be claimed to be due to primitive circumstances that didn't incline to the same specialisation and differentiation of the areas of responsibility as the well organised Roman. But at the same time the architecture of the period made this concentration of the responsibility almost necessary. It is the intrepidity which is practised in the slim columns, the airy vaulting and the slender flying buttresses – solutions which demands that the planner has a deep understanding of all technical subtleties and that the one who makes the project can also be responsible for the execution"*[13] (Brochmann 1969 p. 18). About the education of the master builder Brochmann says. *"The education of the master builders included many years as apprentice at the building sites concluded with the strictest tests before it was possible to be accepted into the guild." And a little later he says: "In addition to this training the really creative intellects have developed their faculties through journeys and self studies"*[14] (Brochmann 1969 p. 19).

It can now be concluded that the title of master builder is used in two meanings. One is what the term indicates itself namely a more advanced builder i.e. a person who can design, plan and lead the execution of a building of a traditional kind. The other one is a person who on top of this can add trendy art and fashion or even make the trend himself – in other words an 'architect'. Hereafter we will reserve the title architect for this old meaning of the word and only call people with the first less artistic skills for master builders. This is also what the art historians are doing when talking about for example the 'architects of the cathedrals' and when they talk about for example Junge and Thurah (Willadsen 1977). Pevsner (1973) talks about 'the

[13] Translated from Norwegian by the author
[14] Translated from Norwegian by the author

new type of architect behind St Denis and the later French and English cathedrals as a man who is both master builder and artist' – the latter capability entailing the title 'architect'. *"Guillaume de Sens is one of the first known master builders of the early Gothic period. He is architect of the choir of Canterbury Cathedral, which was quite as revolutionary in proportions in England as was St Denis in France."*[15] Again he gives two titles to the same professional (Pevsner 1973 pp. 92-93).

What we have been talking about here is the outstanding building that was supposed to be much more than just shelter for human beings. In "Architectural Britain" by Pragnell (2007 p. 117) it is said: *"As in France, it was the court which was responsible for the early use of Classical form in Britain: Henry VIII imported craftsmen from Italy and France to work on his numerous hunting palaces and manors, including Nonsuch, in Surry (demolished c. 1685)."* This gives a supporting insight on the situation in Britain a little less than 500 years ago.

The buildings for ordinary people were not made by anyone we would call architect in this sense, only sometimes when the buildings in question were substantial buildings made by master builders the term would apply (Engqvist 1953 p. 40). According to Barrow (2004) ordinary people's houses in the villages in the medieval period were very often built by themselves maybe with a little help from craftsmen.

Engqvist (1953) states that: *"There is probably no doubt that far the most buildings from after the fires were due to common master-craftsmen. However, there is one architect personality who builds a number of citizen's houses; that is Philip de Lange who is supposed to have arrived to the country shortly after the fire."*[16] Philip de Lange became the leading "master builder" in the Royal Navy but he was originally trained as a mason in Holland.

[15] Translated from Danish by the author
[16] Translated from Danish by the author

How was the organisation of the bigger building projects in those days? Below is a diagram indicating how it was organised in general:

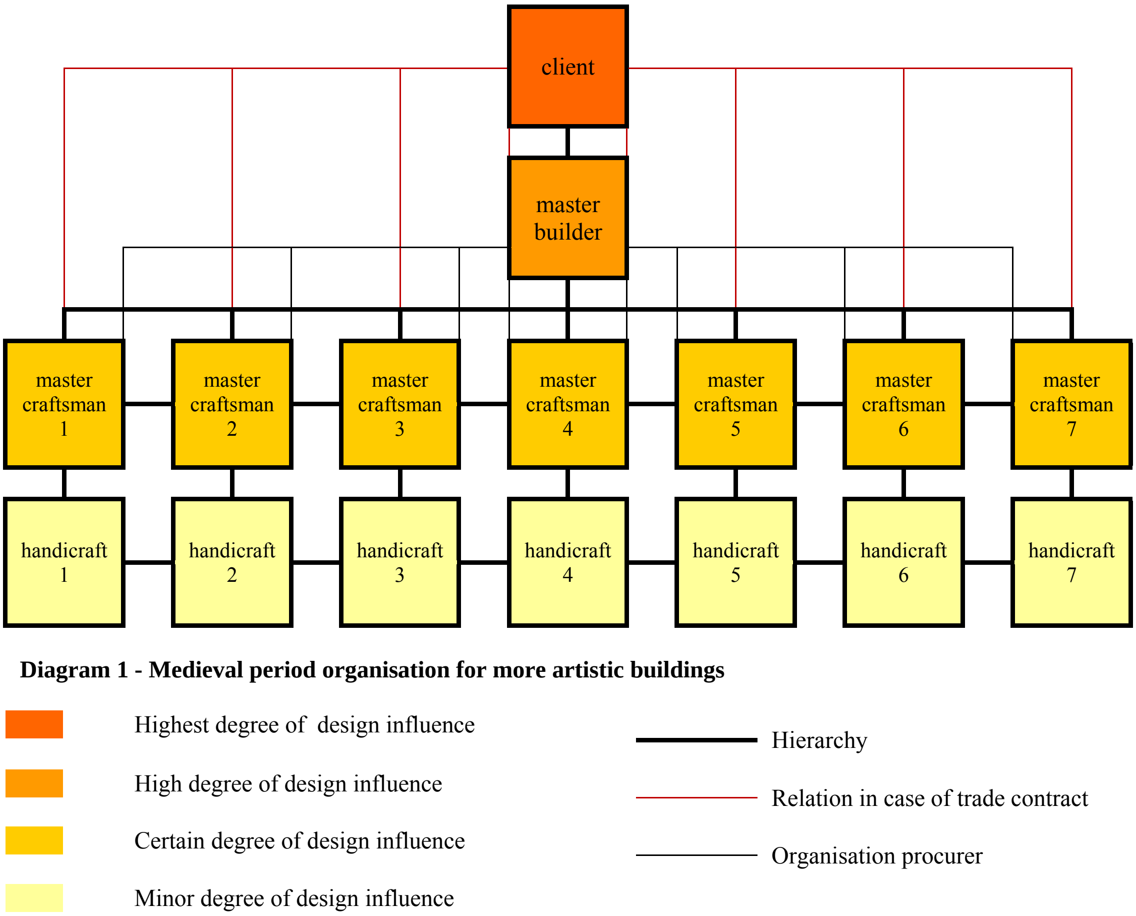


Figure 1-10: Medieval building organisation

In the period itself the architect title was not in use. The master builder sometimes accomplished what we today would call architecture, but most buildings were embedded in the tradition of the handicrafts and the local fashion (Jensen and Ganshorn 1987). The client, often belonging to the highest social layer, would, apart from having the initiative, normally also have an important influence on the overall design himself (Langberg 1978b p. 228). The master builder in our schedule, being an advanced master craftsman, would normally stay inside the local craft tradition with his designs, but some master builders now and then proved able to act as real architects and do something innovative and outstanding (Johannsen and Smidt 1981 p. 130). The outstanding designs in this period were very often linked to technical innovations as a consequence of the handicraft based inclination of the master builders.

The thin black lines in figure 1-10 between the master builder and the master craftsman are to indicate one of three possible situations: being that the master builder is also master craftsman of one of the involved trade contracts, which was rather common. The two other possibilities are that the master builder is only main contractor or that he has a contract for the delivery of drawings and management only, but has been helpful to the client by procuring the contracts with all the master craftsmen. The latter situation is in the capacity of an architect in a more modern version, and he is only called master builder because it was the term of the day. In the following we will keep an eye on the master builder when looking at the more recent history of the architect.

1.2.5 The architect occurs

According to almost all sources the renaissance borne in Italy around 1400 meant a shift in mindset of a new powerful group of people who now became influential in society. This was due to the rising wealth of merchants and bankers in the North Italian cities and their nascent interest in art and science (Hale 1967, Barrow 2004). Psychologically the phenomenon can be explained by the theory of Abraham Maslow who, with his pyramid model of human needs, put the interests in such matters at the top and so states that they first occur when all the more basic needs are satisfied (Maslow 1987). But the result of wealth within art and architecture is obvious everywhere and at all times in history. In the renaissance some of the power went from the church to the secular sphere of society. An early signal of this shift could be noticed when Marcilius of Padova (1275 – 1342) made his thesis “Defensor pacis” where he put down the old theocratic idea of society and claimed with reference to Aristotle that society was a result of the human brain and of common sense (Shanz et al. 2007 p. 303).

The result of this new spirit in powerful people who grew up to become a new aristocracy was a search for young talented people who could be trained to produce the art and science desired. The modern idea of the artist and his genius derives from Tuscany where for example the Medici family were offering such a support. Cosimo Medici was probably the first to proclaim that a painter is a genius and a godlike being (Pevsner 1973 p.174-175).

Barrow (2004) when talking about the significant change caused by the renaissance says: *"The integrative knowledge required for the process of architecture was included in the individual "generalist" architect-master builder who had evolved through and trained in the traditional guild system. The architect-master builder collaborated with fellow artisan/craftsman guild cohorts for the realization of architecture. The Pre-Renaissance architect used limited 2D and 3D representation; thus, the primary means of accomplishing architecture was on-site verbal communication and full-scale layout in the field with craftsman cohorts (i.e. stonemasons and carpenters). This required the architect to be on site and produce one project at a time. Further, the process of work (i.e. design, craftsmanship and building) depended on tacit knowledge of "informal" networks within mason-craftsman guilds. Subsequently, the historical architect (master builder) was a respected individual (builder-leader) who relied heavily on direct physical contact and on-site verbal communication with fellow craftsmen for design and construction (architecture)."*

About the renaissance architect Barrow (2004) continues: *"During the Renaissance, Alberti's treatise claimed, in an effort to elevate the status of the architect from the low class of master builder, "architecture had nothing to do with building." The master builder-architect was slowly decomposed into artist-designer, practising architect, and mason-builder. Predictably, conflicts existed between the mason's guild and the emerging architect. The decomposed master builder collaborative team of designer-architect-master mason are responsible for many of the great buildings of the renaissance."*

With additional reference to both Pevsner and Brochmann, it appears that in this new period the architects were rarely master builders but more often had training in art of certain kinds. This can be said about all the famous architects from Brunelleschi to Leonardo who both had a mere scientific approach and from Giotto to Michelangelo, who were painters and sculptors, with a strong attendance to the art aspect of architecture (Pevsner 1973 p. 177, Brochmann 1969 pp. 20–26). So now the building organisations for more prestigious buildings changed and from now on all the names of the people who did the work of the architect are well known. Now the organisation looks like this:

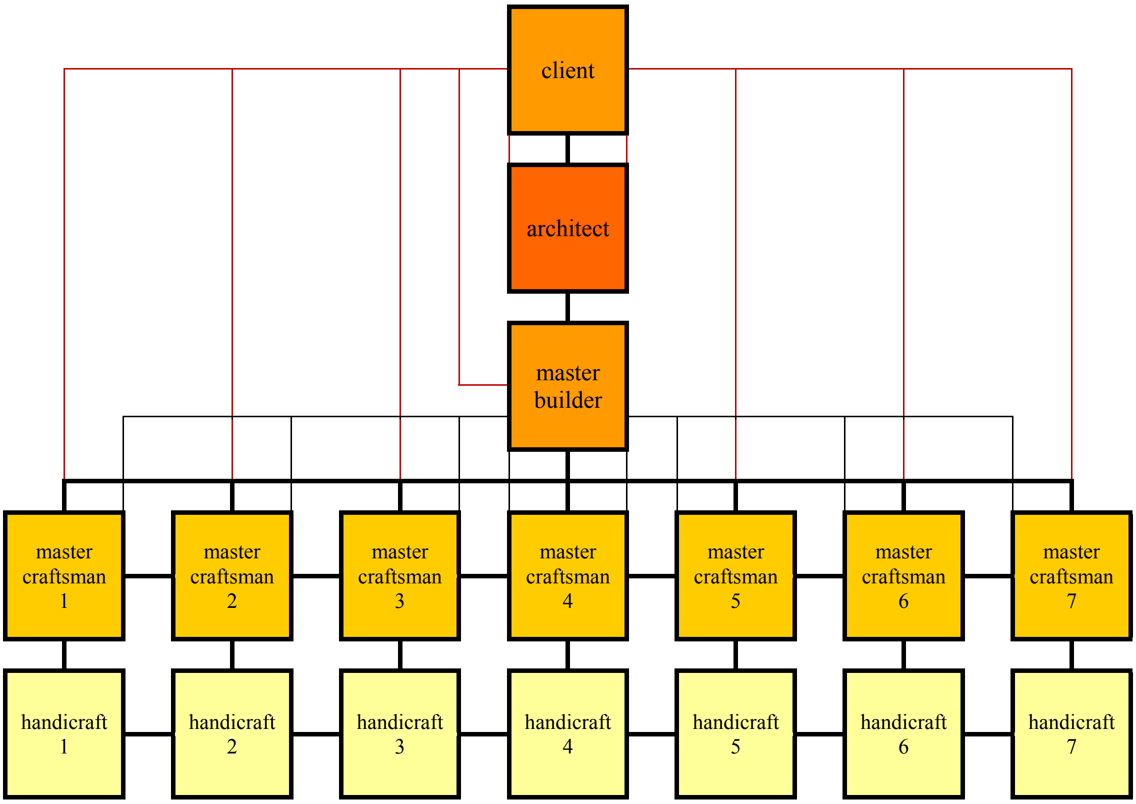


Diagram 2 – Renaissance period organization for more artistic buildings

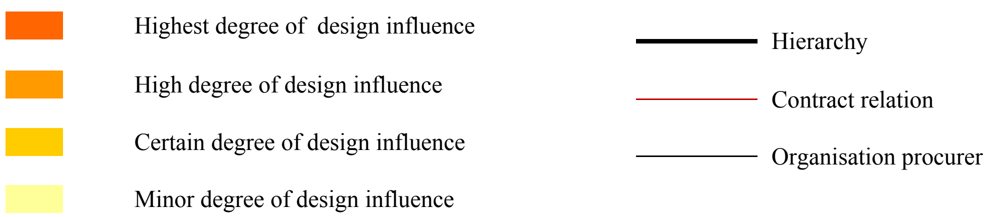


Figure 1-11: Renaissance building organisation

Comparing this diagram with the one for the medieval period it becomes clear that the master builder now had lost a part of his design influence to the architect and that the client probably also had because of the new won respect for this 'ingenious' artist.

In this situation a country like Denmark felt the need to call for help from outside and for a couple of hundred years the more famous architects, the masters of the master builders, summoned by the King and nobility came from Holland and France. A family dynasty of master builders from Holland named Steenwinkel served the Danish kings and did very elegant Dutch renaissance buildings in Copenhagen and north Zealand. Since the country was still very much influenced by the medieval spirit these architects were not really appreciated as in Italy, but anyway in a better position than the builders before them (Faber 1977 pp. 52-56).

In a big country like England the possibility of breeding one's own ingenious architects was better and a man like Sir Christopher Wren created a typical and very successful architect career supported by the fact that London lost a lot of important buildings in the great fire. Having had an brilliant academic career for a start, having made the marvellous design of the new St Paul Cathedral and by participating in the establishment of the Royal Society, we can say he made one of the most successful architect careers of all times. Or, maybe it would be more correct to talk about a successful career of a renaissance figure because as we can see a successful renaissance figure was active in a number of matters related to art and science (Pevsner 1973 p. 330, Campbell 2007 pp. 11,170).

In Paris something new happened in the time of Louis XIV. In 1671 Adadémie royale d'architecture was established and became an example for other cities in Europe. In Copenhagen the Royal Academy of Fine Arts was established with an architect school from 1754. It more or less replaced the other routes to the architectural profession. The military educational route vanished both within architecture and later on also within engineering which got its own civil institution a hundred years later. Because of this historical background we have the title 'civil engineer' and in Norway, in those days belonging to the Danish king, also the title 'civil architect' or (in Norwegian "sivil arkitekt"). In Scandinavia these titles stand for the academic level of a masters' degree whereas engineers with a degree equivalent to a bachelors' degree are named diploma engineers. In architecture there was no lower level than the masters, if we don't consider the result of the continued education of master builders as giving something like a degree level. Now we have to bear in mind that most buildings in the 18th and 19th centuries were designed by master builders and without any help from educated architects. The organisational diagram was in this period still very much like the one of the medieval period when applied to more profane buildings.

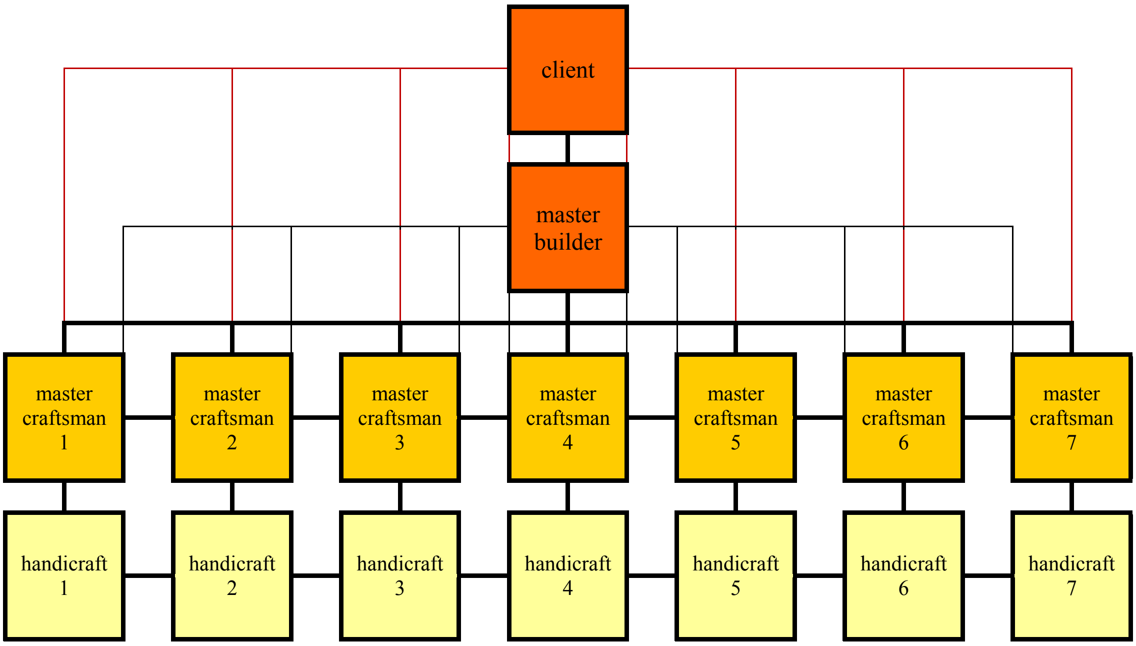


Diagram 3 – Eighteenth and nineteenth century period organization for ordinary buildings

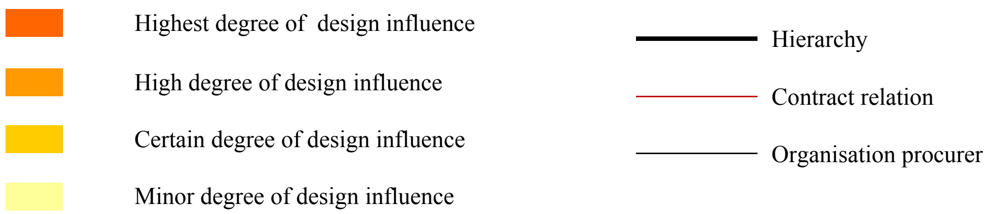


Figure 1-12: Eighteenth and nineteenth century period organization

Note that the master builder here is given the same influence as the client, which is caused by the fact that the client was often just an investor who would not live in or personally utilise the resulting building. Therefore, much more was up to the master builder to decide in many situations. The master builders also became influenced by the work and examples of better architects and continued to make many finely proportioned buildings (Faber 1977 p. 92). As the dotted lines from master builder to master craftsman indicate the master builder very often represented one of the handicraft businesses himself and had the others as subcontractors. In a more advanced situation all involved handicrafts would be subcontracts to his main contract.

According to Salling (1994) the Royal Academy of Fine Arts in the first many years of its existence also had to secure the educational level of craftsmen whose crafts required drawing skills like carpenters, masons and joiners. This continued until technical schools were established in the middle of the 19th century. (Salling 1994 p. 177)

Psychologically it must have meant a lot to the self esteem of the professional to possess an officially recognised architect education. From a certain time after the Academy began to operate, the graduates from there would have felt that they were the real architects and that especially people of their own age who were not educated there didn't have the same right to the title. This is imagination, so let us see what can be learned from the literature about the relationship between the two educational backgrounds and see whether they cooperated or what happened.

1.2.6 Cooperation between the two and support to assumptions

Still looking at the 18th and 19th centuries it is a little hard to find evidence of a close cooperation between the two professions. It appears that in case an architect was involved he would normally make all the drawings. Then the master builder would only be involved in the role as a builder or as a master craftsman of his own handicraft.

There is plenty of evidence that ordinary buildings were designed by master builders. Tobias Faber in his article "Back to the craftsman's skills" (Faber 2004 p.82) when talking about the period 1870 – 1905 says: *"Following the centuries long custom, the buildings were erected by master craftsmen, although the good building traditions of*

Classicism were coming to an end. Instead the master craftsmen often asked trained architects to design facades and decorations for their buildings." But when an architect was involved because of the requirement of a more advanced design the architect or the architect firm would do all the drawings. There is reason to believe that a number of master builders became employed by architects to make some of the drawing work as well as to act as clerk of works. So in such situations there was no master builder in the original sense of the word: 'both the designer and the builder in one person'. Now they only did some of the first part of the old combined role of designing and building. The role subordinate to the architect clearly tells what part of the design work they were asked to make, namely the part that would utilise all the technical implications of the handicrafts.

In the Dictionary of Danish artists "Weilbachs Kunstnerleksikon" (Weilbach 1947-1952 p. 28) we read about Carl Andersen, born 1879 that he becomes a mason by 1896 and graduates from Odense Technical School 1900 and then get employment as clerk of works in Master Mason Thaaning's firm in Kerteminde. In 1900 – 1901, he works as a draughtsman for architect Monberg in Odense, 1901 – 1902 for architect A. Bertelsen and later on for several other architects in Copenhagen – finally also as resident architect. It can be noted that the education at the technical schools in those days was normally called 'master builder's education' (Overgaard 1979).

Thus, it was a very similar area of responsibility to what the technologist aim for today. The only difference being that the body of knowledge was still a reply to the question "How?" and not so much to "why" because the standard answers to "Why?" was simply: 'because this is the way we are doing it here!' And if somebody wanted further explanation it would be: 'We are doing it this way because it is the well known and thoroughly tested well functioning way!' More insight was not required because the way was so well tested and well functioning and the master builder knew that for sure. Maybe he could add some almost mythic explanations that sometimes were true and sometimes not; it didn't matter because he knew that it would work and no one would be able to control him. But something was about to happen because of the many new technological inventions.

John Wood, active 150 years earlier, became a master builder first and then additionally achieved the skills of an architect. He practised all his skills, but it became a still rarer situation with such comprehensive areas of responsibilities and from a certain point in the 19th century the master builders would only make the buildings for ordinary people thus stand outside what in a more narrow sense is called architecture (Faber 2004).

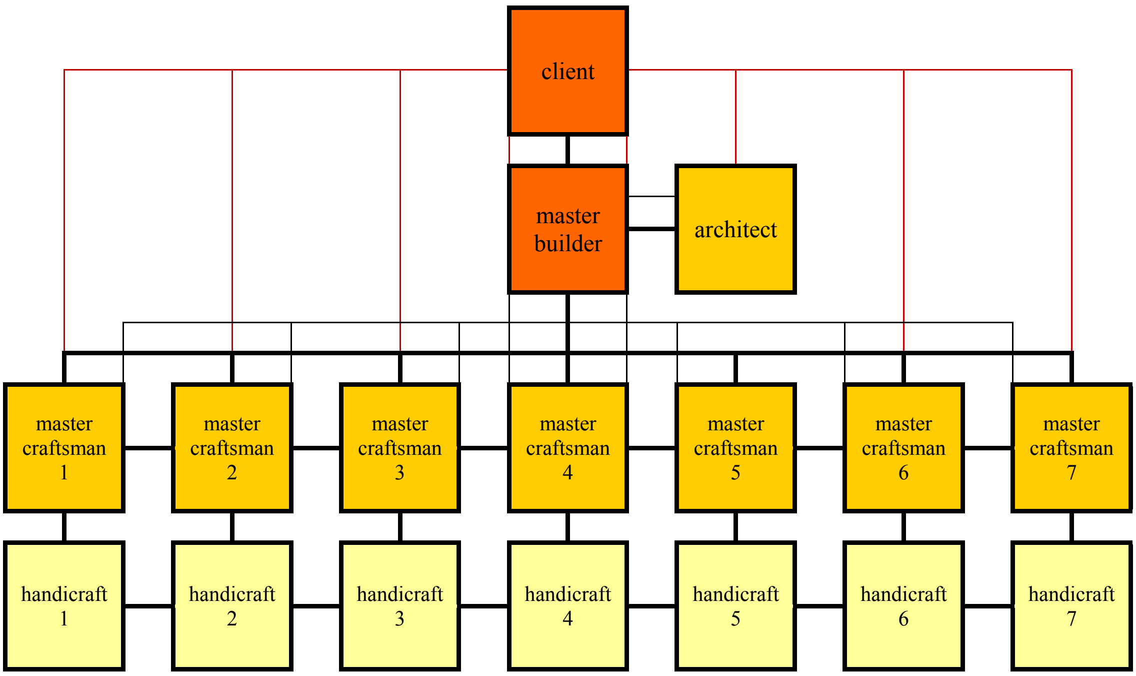


Diagram 4 – Nineteenth century period organization for better ordinary buildings

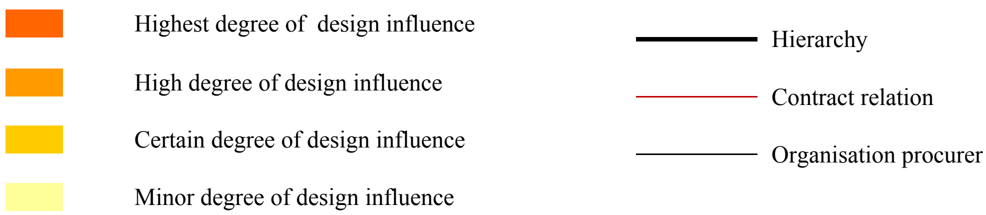


Figure 1-13: Organisation for more noble ordinary buildings in nineteenth century

Figure 1-13 is showing the common situation in Copenhagen in the last half part of the 19th century. As indicated by dotted lines the master builder was often also the client and he hired the architect to treat the façade of the building that he had already made the basic drawings for. The organisation for the best buildings like public institutions was now in the hands of the architects and the organisation was as shown in the following diagram:

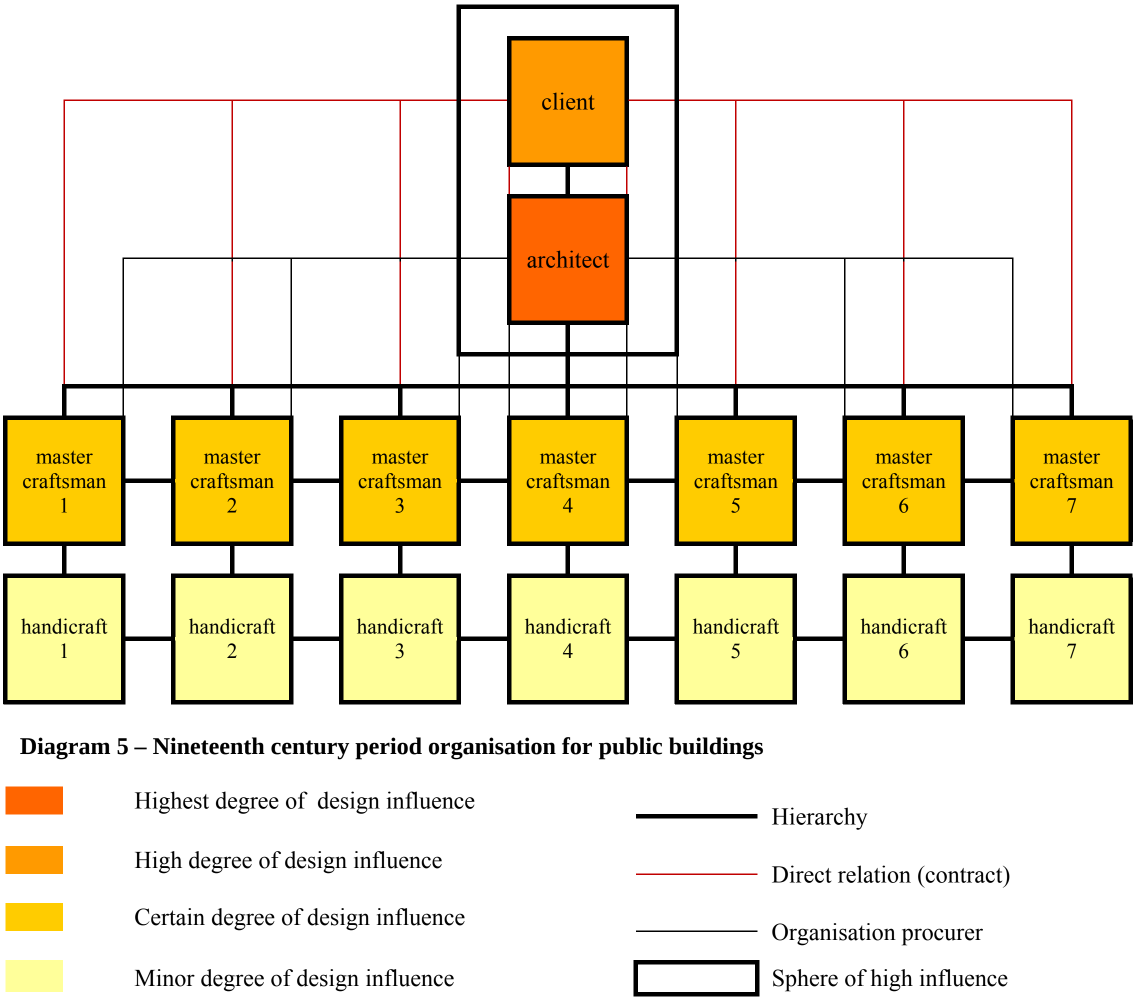


Figure 1-14: Organisation for public buildings in nineteenth century

In this diagram (Figure 1-14) the dotted lines indicate the contract relationship between client and the master craftsmen and that the relation is arranged by the architect on behalf of the client.

1.2.7 The twentieth century

The new development about to happen is described by Brochmann (1969 p. 28). Like Faber he claims that the master builders' achievements were dominant in the whole 19th century more or less ignoring what complaints there would be about loss of sense of form or other lacks professionals would recognise. Then he points out the engineers and their abilities as the source to the new possibilities in construction, materials and installations. This is also thoroughly discussed by Saint (2007).

At first the organisational result is like this:

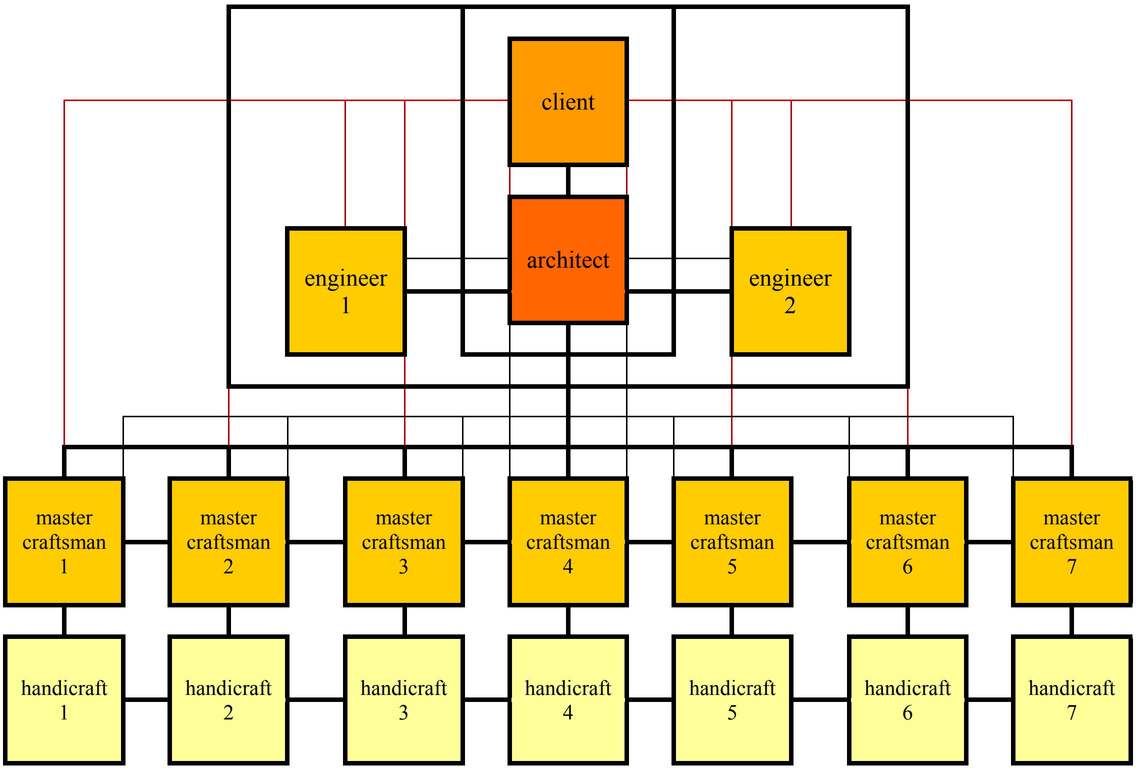


Diagram 6 – Late nineteenth and early twentieth century organisation for public and quality buildings

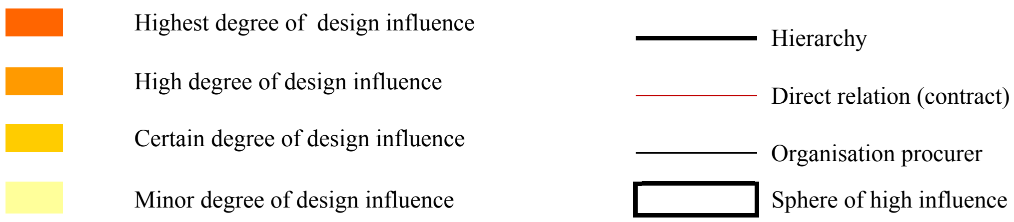


Figure 1-15: Early twentieth century organization for high quality buildings

In figure 1-15 it is shown how the engineers mainly work as consultants for the architect but are hired by and have a contract with the client. They are normally recommended by the architect with whom the client established contact in the first place. This organisation was dominant more or less until the middle of the 20th century and is still in use along with many others (Saint 2007 pp. 485 – 493)

This being the case the picture might look like this:

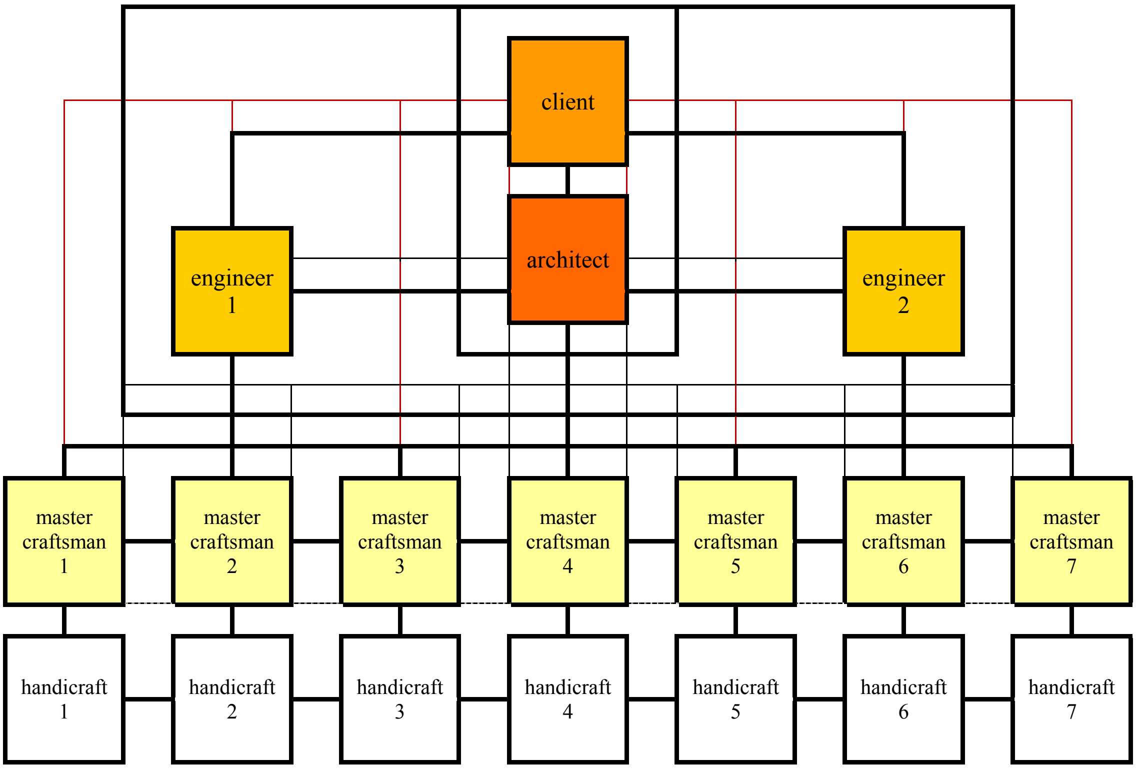


Diagram 7 – One of several possible late twentieth century organisations for public and better buildings

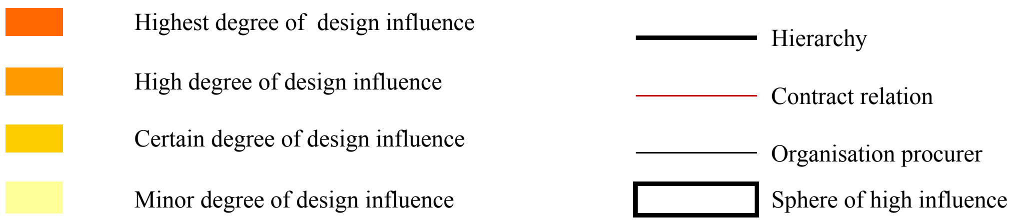


Figure 1-16: Example of late twentieth century building organisations

What is important here (figure 1-16) is not the precise version of a relatively actual organisation plan but the fact that the design influence has moved upwards and away from the so called handicrafts. This is the result of the change away from the traditional way of building as well as all the technical implications regarding materials, working tools and executing methods. Of course this is no surprise because the same can be seen in all other industries. On the contrary, the building industry has been the last one to adjust to the modern world situation. And the development away from the old handicrafts has been a rather long process, which is not totally finished yet. As mentioned earlier we still talk about craftsmen within the industry, a fact that shows the illusion about certain maintenance of traditional working methods. But they are gone and replaced with new that have very little to do with craftsmanship. The tools in the hands of today's 'craftsmen' are quite different and much less demanding to the level of training required. The other property of a traditional handicraft, the body of technical and design related knowledge, is also gone and replaced with numerous instruction drawings and documents (Graham, Linford and Lobban 2007). Among professionals the beginning of this development was already debated early in the 20th century.

Kielland (1920) from the Norwegian Museum of Art Industry, in an article entitled *"To what? For what? Of what? and How?"* states that: *"…today the craftsman needs a drawing for everything practically speaking. The tradition of the old workshops is broken; the culture of shaping is no longer in the blood of the craftsmen, and good taste and of course impartiality is neither inbred nor later implanted. It is sad as well as true, when it is said about most of the craftsmen of our time that they can no longer trust their own taste and their own initiative. And, they are not trusted either. Special drawings are required when they have to make even the smallest thing outside the purely handicraft technical area."*[17] This is exactly what the assumptions earlier mentioned say, but it is surprising that someone was able to see it so clearly already in 1920. Kielland also mentions the reasons for this situation and he does so in a rather specific manner that can here be profited from. He is mentioning three factors:

1. *"The termination of the guild system, the guard of the work quality and the good substantial handicrafts traditions."*
2. *"The inharmonious relationship with handicraft and art the machine driven industry went into from the very beginning"*
3. *"The copying habit that was adopted by the use of antiquated styles like Louis XVI and Empire, by which both the artists and the craftsmen as well as the industry, were trained for a life based on the work of other people and*

[17] Translated from Danish by the author

> *instead of being busy with own progress and new creations. A state that – immediately, one could say – led to stagnation, languishing and death of the personal initiative and creativity of the craftsmen and the artists as well."*[18] (Kielland 1920 p. 17)

Kielland continues by saying: *"here I probably don't need to dig further into how this system of copying upon which the whole of the handicraft and the industry of the nineteenth century have built, how it pitiably went bankrupt. Now no-one probably feel it more than the craftsmen and the artists themselves.*

And when, because of men like William Morris, van der Velde, Bindesbøll and Gerhard Munthe, the necessity of a renaissance was understood and the craftsmen and the artists had to begin again, the lacks became apparent. The craftsmen were missing the support of their old shaping traditions and the artists for their part had not only lost the contact with all alive and growing of the good periods of style, they were also completely without knowledge about pure craftsmanship – about technique and construction – and they had little or no understanding of the materials and what they demanded, in other words: the craftsmen and the artists were complete foreigners to each other."[19] (Kielland 1920 pp. 17-18)

Later in the article Kielland described the ideal future, seen from his point of view. First he criticises the role of the artists: *"And the artists for their part have not handled the task right. They have almost all had an inbred wrong approach to the machines. They have just understood them as simplified banal reproduction mechanisms. They have not understood that they on the contrary must be interpreted as unusually ingenious and precise self working tools with special requirements to own means of expression."* And a little later he says: *"The necessity to create types is not realised by them, types that are carefully thought through and thoroughly tested before they are given to the industrial reproduction."*[20] (Kielland 1920 p. 21)

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[18] Translated from Danish by the author
[19] Translated from Danish by the author
[20] Translated from Danish by the author

Kielland clearly saw a need for the artists to join the industry in order to give industrial products qualities at the same level as the old handicraft products earlier had. He was in fact full of hope, probably because he thought a majority would realise the same as he had – or that the industry at least would. Did this come true? No, unfortunately not. Attempts were made from all parties, but the majority of industries saw no need for it, and that was because most people were not able to distinguish the good design from the less good in the first place. Later it became a habit in the industry to produce high quality products in small series for the economically and culturally well off but in number very limited group in society. Some of these products could easily become cheap if they were produced in a larger scale and now copies in a less elegant shaping are in fact mass produced and are spreading the less good design everywhere. An example of this is the so called 'ant chair' of the Danish architect Arne Jacobsen (1902-1971). It was designed in the late 1940s and was meant for mass production, but it became easy to sell at a relatively high price and then it was easy for the factory only to address the well off group. It is still a popular chair because of its convincingly good shaping that can't be improved. All the copies that have to be different, in order not to be claimed copies in court, are then by definition less fine in their shaping.

Here one could ask: what is the situation in the manufacturing industry that delivers to the building industry? Kielland (1920), Eriksen and Thykir (1969), Faber (1977) and numerous others claim that this industry has taken over some of the handicraft production. A very obvious example is the window, which used to be tailored by the joiner but today almost always is a manufactured component. Let us again look at diagrams 6 and 7 and now compare them. The diagrams are meant to indicate where the design influence is placed. Looking at the symbolic colours for the participants it is clear that the handicrafts have lost almost all their influence on design. It looks like it has all been transferred to the consultants. But when concentrating on the areas covered with colour and comparing these it also looks like something is totally gone.

That is true; still more items and components are made by the industry and are delivered ready-made to the building site. In the old days, the craftsmen also prefabricated a lot in their workshops, but they were members of the building team and had a contract with the client. Their prefabrication was also tailored to the actual building design in cooperation with the architect and became automatically suitable to the possible extent. Alas, the quality of the resulting buildings is not exactly the concern in this context. In the attempt to find out where the areas of responsibility went and even if it can't be said that it is a quite different thing, the main concern is what the responsibility of the architect firm in fact is, and what kind of educated people this requires.

The whole story above shows us that the design influence might have moved up to the area of responsibility of the consultants and/or to the manufacturing building industry. It is also discussed that the industrial revolution has caused a much more complicated situation than earlier. When trying to conclude, what parts of the craftsmen's responsibilities that went to the architect firm, one needs to look at what happened to the building design after Mr. Kielland wrote his articles in 1920.

In fact, the architects managed to get out of the described mental trap of traditional thinking. Not necessarily the very same persons but new generations of architects began to develop a new kind of architectural design that was supposed to meet the requirements of the new political and economic period of industrialism. They introduced 'modernism' which was claimed not to be a style, but as expressed by Le Corbuseir: *"If we eliminate from our hearts and minds all dead concepts in regard to houses and look at the question from a critical and objective point of view, we shall arrive at the 'House Machine', the mass production house, healthy (and morally so too) and beautiful in the same way that the working tools and instruments which accompany our existence are beautiful."* (Frampton 1980 p. 153) – In fact it was a style – in the first place a cubistic white painted sculptural style also called the white style or "modernism" or sometimes "functionalism".

First this philosophy won the battle and became still more accepted in the period from 1920 to 1970 from which time the ideas again became more complex ending with confusion at the turn of the millennium. The blurred situation can be compared with the one a hundred years earlier where industrialism began replacing the traditional manual work, and again due to a shift in culture and production: the information society that now replaces the industrial society. Everything has gotten even more complicated and the ability for one person to control and quality manage every aspect of a large modern building is declining. This is no problem as to the area of engineering which can easily split up into more areas of specialisation, because it by nature is a specialist trade. Architecture in contrast is by nature a generalist trade and the expertise is to juggle with all the balls in the air at the same time. Of course, the more balls the more complicated and demanding.

1.2.8 History and assumptions

Looking at all the above mentioned historical information we are able to get closer to a confirmation of some of the initial assumptions. Let us look at the hypotheses again:

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

It appears that the first hypothesis is supported by the history we have already been looking at. It is seen (Kielland 1920, Eriksen and Thykir 1969, Faber 1977) that some of the activities went to the manufacturing industry, but it is also noticed that the majority went to the consultants. Whether the consultants choose the manufactured components in advance or they accept the offer given by a contractor it requires sufficient technical expertise to choose correctly on behalf of the client because the responsibility for the good performance belongs to the consultant. Thus most of the area of responsibility went from the handicrafts to the consultants and almost everything belonging to the traditional old handicrafts, apart from dimensioning of load bearing structures, went to the architectural consultant. All the newer kinds of installations are also, but only to a limited extent, the concern of the architect's office because the architect will be held responsible for mainly the appearance. What is not the responsibility of the architect firm is now the responsibility of engineers and surveyors.

This means that a lot of technical responsibility went into the architect office during the twentieth century and if we define this as identical with AT the first hypothesis is relatively well argued.

The second hypothesis is another case. Until now we haven't got any information about that hypothesis and, as can be seen from the title, it constitutes the main concern of this thesis. Therefore it is relevant to have a look at the architect and the architect firm to find the extent to which that hypothesis is right. It is necessary to know to what extent architects are trained to do this new technical part and also to know to what extent others take part in the work to cover the area of responsibility of the drawing office.

First step is to look at what the literature says about the education of architects in a historical perspective because it might give a better background for an understanding of today's situation.

Next step will be to look at literature about the professional position in relation to society, in general. Then, in specific, a look at the architect and at the architectural technologist is relevant and finally a comparison between the area of building design and planning and another relevant professional area to recognise similarities and perhaps differences will show the relative stage of development.

1.2.9 The education of architects in Europe

The study of the education of architects aims to give an understanding of the historical background for today's education of architects.

1.2.10 Historical educational overview

Our headline has been the investigation of history and we have already partly looked at the education and know the following:

1000-1400

In the medieval period the architects were also the master builders and they were all educated as craftsmen and after periods of training they had to pass a special test – a "master's piece".

1400-1500

From the renaissance (1400) there were architects in the sense of artists or independent professionals originating from painters', sculptors', goldsmiths' and architects' workshops and there were master builders who secured the technical quality of the craftsman-like work.

1500-1700

The 16th and 17th century also saw architects educated by the military along with the above described.

1700-1850

From the 18th century architects became educated by art academies. In the same period master craftsmen with the traditional background made the majority of buildings and some master craftsmen had got their drawings for their master's piece approved by the professors of the art academy (Brochmann 1969).

1850-1960

In this period architects are still educated by the academies (in the UK mainly part-time) and master builders are educated by technical schools. In the UK we also find architectural assistants whereas there is no such thing in Denmark

Figure 1-17: A foreman, architect Martin Nyrop and a master builder 1903[21]

1960-1995

Architects are educated by academies or universities, all considered university level education. Course duration is scheduled to 5½ years in Denmark but lasts more than 6 years as an average. Master builders in the traditional sense are not educated any more, but architectural technologists replace them in Denmark. The course duration is 3½ years of theory and only people with completed education as craftsmen (3½ years) or people with an upper secondary education and half a year at technical school workshop plus one year on a building site are allowed in. In UK architectural

[21] The painting is a part of painting belonging to the Hirschsprung Collection in Copenhagen

technicians and continuously architectural assistants work in architects offices. The technician education is 2 years of theory.

1995-2010

Education of architects in UK and DK consists of 5 years theoretical training and in Denmark a bachelor's course of 3 years is introduced in 2002. In Denmark the 5 year course has been considered a masters level like all other university courses that were all 5 years programmes traditionally. The Danish candidate degree is in fact considered superior to a masters' degree at the time being. In UK architectural technologist programmes of 3 or 4 years duration are introduced at a number of Universities. By 2001 people in Denmark with an upper secondary exam can access the AT-programme directly.

1.2.11 Weilbach – Danish architects 1754-1950

'Weilbach's Artist Dictionary', in Danish named Weilbachs Kunstner Leksikon, provides information about the education of architects and those master builders who made themselves famous by making what later on became known as pieces of architecture. The dictionary only covers Denmark and the thesis will use Denmark as an example because it is obviously rather typical of the situation in Europe. Here we will concentrate on architects who were educated between 1754 and the World War II and see how they were educated. After 1950 the importance of the handicrafts vanished, and along with this, the importance of an educational relationship.

No statistics about how architects were educated exists, but Weilbach provides us with all the necessary information to make one ourselves and even if it is a considerable piece of work to find the architects among all the artists and then note all relevant data about each individual, it appears desirable to be able to say how many percent had a practical background and how many had a theoretical approach to the profession only. To perceive how the data appears a look at a typical article from Weilbach might prove helpful:

"Hansen, Johannes Christian Axel, 1865-1935, Architect. B. 10 Aug. 1885 in Hjørring, D. 21 April 1935 in Ribe, buried at the same location. Parents: school headmaster in Hjørring, later on calculator in Aarhus, mag. scient. Hans Peter Christian H. and Elise Macrethe Olsen. Married 29 May 1926 with Ane Katrine Nielsen Esbjerg, B. 5 July 1890 in Esbjerg, D. 14 November 1931 in Ribe, D. of master joiner Søren Nielsen E. and Kerstine Pedertrine Kristensen.

Education: 1901 secondary school exam; graduate from Aarhus Technical School 1904, 1905 carpenter, access to the Academy April 1909; Graduation May 1919; 1907-19 worked at Hack Kampmann's drawing office in Aarhus, for Christof Hansen, Vejle (clerk for execution of Ribe Institution for the Insane 1912-14) and H. Lønborg-Jensen in Cph. (clerk for the restoration of St Kathrine Church and Black Friar Monastery in Ribe 1919-29)

Scholarships: K. A. Larsen 1918. Travels: 1927 Italy. Exhibitions: Charlottenborg 1918. Commissions: Board member and treasurer of Ribe Council Museum, 1931 Director of the Common Fire Insurance for the Royal Boroughs.

Works: Ribe Council News (1919); Farmers Bank of Southern Jutland in Ribe (1920); Chapel in Gredstedbro (1923); Ribe Power Station (1926); Cinema, Court Office, Nursery and Police Station in Ribe (1921); Public Library same place (1929); restoration of several churches and of The House of Hans Tavsen, Ribe."[22]

This example is chosen because it is very typical, apart from the fact that it is rather limited partly because of the relatively short lifetime of the architect. The typical characteristics being the secondary school level of basic education, contrary to upper secondary (the requirement for university access). Then to build up to the upper secondary level of basic knowledge, to pass the trade related technical school, and then add the craftsman training as the basis of studies at the royal Academy of Fine Art in Copenhagen, which was the only institution for architectural education in Denmark in those days. Furthermore, it was typical that the academy education took

[22] Translated from Danish by the author

a long time, due to the fact that the student in periods was employed in different architects' offices to add practical experience to the theoretical tuition at the Academy.

During the whole period looked at here (1754-1947) it was possible to win medals at the academy. There were two silver medals (small and great) and two gold medals as well. Students who won the great gold medal would not bother about graduating because winning the one and only great gold medal in a competition for both undergraduates and post graduates was considered the top of what could be achieved educationally. In our statistics we will see many examples of successful architects who never graduated because they won medals. Some of the professors of the academy were among those. Even in my time in the 1970s there were professors of that category.

In the three Weilbach volumes we find 696 architects with information about education to be included in our statistics. The spread sheets with the data can be found in the appendix I, while the sum sheet is added below. There are 24 sheets as can be seen in the sum sheet and the average numbers for all the 696 architects are calculated. Of course the value of such a calculation can be discussed for some reasons, for example:

- 'There are no two architects with the very same educational profile.' No, but there are fairly many who are alike and if we pool them statistically we can establish some typical groups.

- 'It is such a long period of time we are considering and a lot changed in society in that period.' Yes, but the changes were not so significant in relation to the academy and the pooling attempts to take it into consideration for our use as will be seen.

Statistics on architectural education in Denmark 1754-1950
based on Weilbach, 1947, 1949 and 1952

	Sum lines from Spreadsheets 696 architects	School education persons				Trade education persons		Further persons	University persons		Architectural education at the academy		
No	of 24	Basic school	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years of study	Number Graduated	Medals given
1		17	4	9	0	22	1	21	2	4	173	14	12
2		18	2	6	5	20	0	15	2	3	201	16	16
3		20	0	2	6	20	0	17	0	1	213	17	18
4		17	6	5	2	24	0	19	2	1	211	17	12
5		17	4	6	1	22	0	21	3	2	216	18	13
6		14	3	3	5	22	0	16	0	0	209	15	18
7		12	5	7	6	18	0	19	0	1	180	14	15
8		12	6	7	2	19	0	23	1	0	210	17	17
9		14	2	2	5	16	0	20	0	2	209	18	17
10		10	2	9	0	16	0	20	2	1	177	13	17
11		16	1	4	8	21	0	14	0	0	190	18	23
12		15	1	8	4	21	0	17	1	1	227	20	12
13		10	1	10	8	12	0	14	2	2	207	14	16
14		15	2	7	7	20	0	17	0	1	208	19	21
15		15	4	5	6	20	0	19	0	0	184	17	20
16		18	4	2	0	22	0	22	1	1	190	16	6
17		17	3	3	7	23	0	18	0	1	205	16	18
18		10	3	6	5	14	3	16	2	1	212	18	22
19		6	6	7	9	20	1	17	3	0	189	17	15
20		11	4	3	7	18	0	18	0	1	208	17	20
21		15	2	5	8	21	2	17	1	1	211	18	18
22		12	2	6	9	18	0	18	2	1	172	12	20
23		10	4	8	3	21	0	14	0	1	166	15	14
24		1	0	3	2	4	1	2	0	0	36	5	0
Sum		322	71	133	115	454	8	414	24	26	4604	381	380
Average of all 696 architects		46%	10%	19%	17%	65%	1%	59%	3%	4%	6.61	55%	55%
Average for the 651 architects who attended the Academy											7.07	59%	58%
Average number of medals for the 194 architects who got the medals													2,0
Number and percentage of architects who attended the academy but neither graduated nor got medals											143	22%	
Percentage of architects with no academy education												6%	

Figure 1-18: Sum sheet from Weilbach research

In the sum sheet you find the different aggregates and numbers calculated according to the law of average. It should be mentioned that the professionals in the 24 sheets (Appendix I) are ordered according to the surnames and not to the year of birth or what other order one could imagine.

Basic school education data

The first kinds of data are about the school education of the architects and we find 46% with only a basic education, 10% with an exam from the secondary school system, 19% with an upper secondary school exam and 17% with school background achieved at the Academy itself. This sums to 92% in total and the remaining 8% represent lacking information. Some of the 8% might have gotten their basic school training in the technical school system in relation to their education as craftsmen.

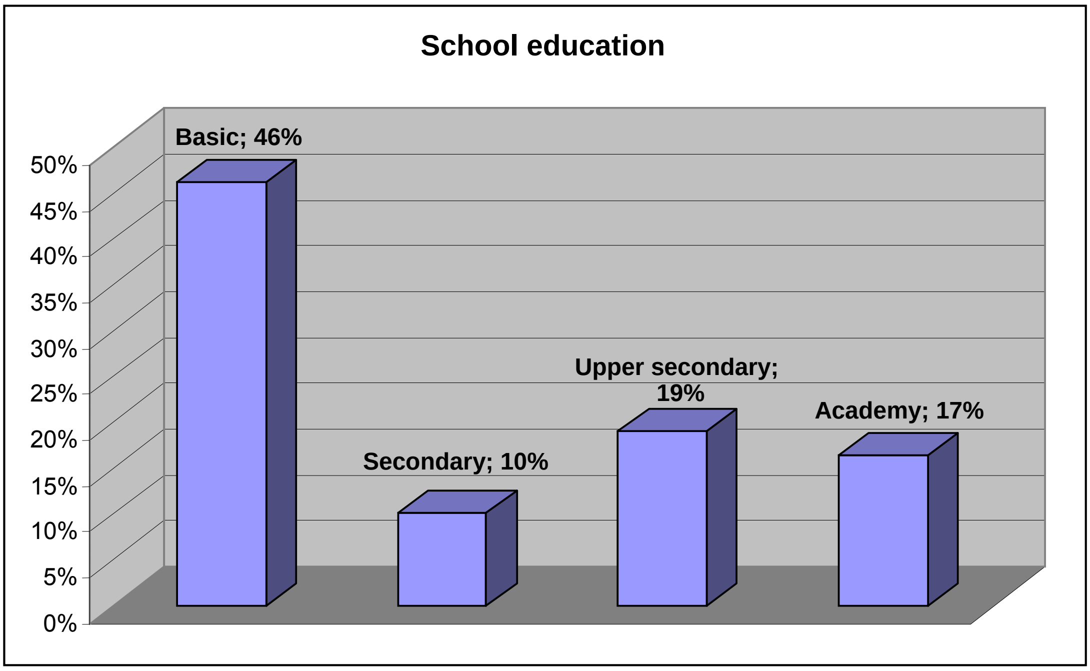


Figure 1-19: School education of Danish architects 1754-1950

According to Winther-Jensen (2001) 5% of the population got a secondary school background in 1900 and only 1% an upper secondary exam. 3% were educated at business schools and technical schools and 2% got a kind of further education. Previously the percentages were lower and subsequently they grew to a situation in 1950 with 5% of the population to get a further education. Today (2000), still according to Winther-Jensen (2001), 56% are getting further education. So, one can conclude that, due to their level of education alone, the people recruited to the Academy constituted an exclusive group in society.

Trade education

It can be noted that the whole of 65% from this period (1754-1950) became craftsmen and only 1% had a military carer as their further basis. But again, the whole of 59% graduated from a technical school, thus possessing a substantial technical insight on building and construction before their studies of architecture. It had become a custom to get both the practical training in the crafts and the theoretical training in the technical matters of the business before entering the courses of art and design at the Royal Academy in Copenhagen.

Because of these high percentages of students with a previously achieved body of knowledge about the handicrafts and structures and construction, it can be concluded that the education of architects could base itself on such an insight among the students. The lecturers and professors were no different; they had had the same career, and might have taken these qualifications for granted.

University background

A total of 7% (of the 696 architects) had a university background of a kind before they entered the Academy. One notices that in certain periods it somehow became extra posh to show up with the so called cand. phil. background. Cand. means candidatus (Latin for candidate) and phil. meant philosophiæ (Latin for philosophy) and in this period that meant the initial basic introduction to university studies completed successfully. 3% of all showed up with this background, but if looking in detail at the different periods we find that the number of these people peak in the period 1830-1910. The rest of the group with university background might have changed their minds and decided to become architects during their university studies.

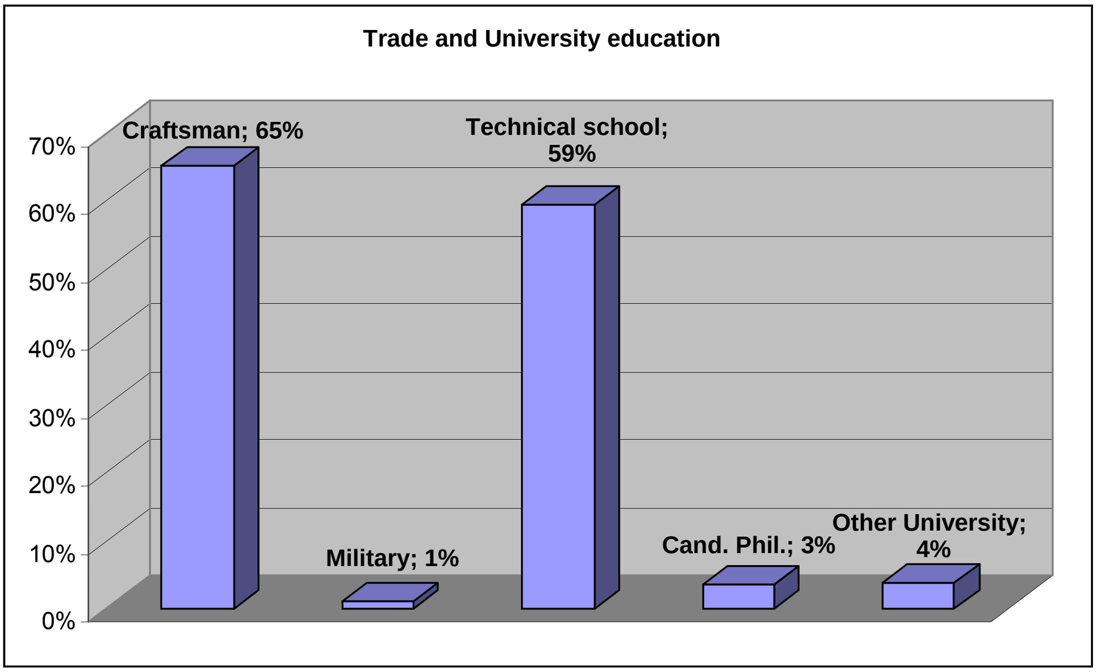


Figure 1-20: Further and higher education prior to the Academy 1754-1950

Architectural education at the Royal Academy in Copenhagen

One can notice that the average number of years at the academy was 7 but also that it varied a lot. In the period 59% of the students graduated, 19% left the academy on the basis of a medal and 22% left without any of these. 58% of students who received medals as an average got 2 each, but some won all 4 and some only one.

Some of the basic training at the academy was initially common for all art directions and in this early period students could also receive training in basic school subjects. It was not until later in the education that they decided in which direction to go.

Only 6% of the architects of the period (1754-1950), who managed to make themselves noticed as professionals, had had no training at the Academy.

From the beginning the Danish School of Architecture (part of the academy) in Copenhagen made a remarkable change to the education of architects in Denmark. From a rather blurred and uncertain educational situation the establishment of the academy meant a controlled and consistent system with the major influence coming from the same central source. This lasted until the establishment of the school (Arkitektskolen i Aarhus, AAA) in Aarhus 1965.

Most architects had personal experience within the handicrafts and all were working in environments where this background was utilised with their own participation.

Most architects also had a background from a technical school offering AT in relation to the handicrafts, and all architects were working in environments where this background was utilised with their own participation.

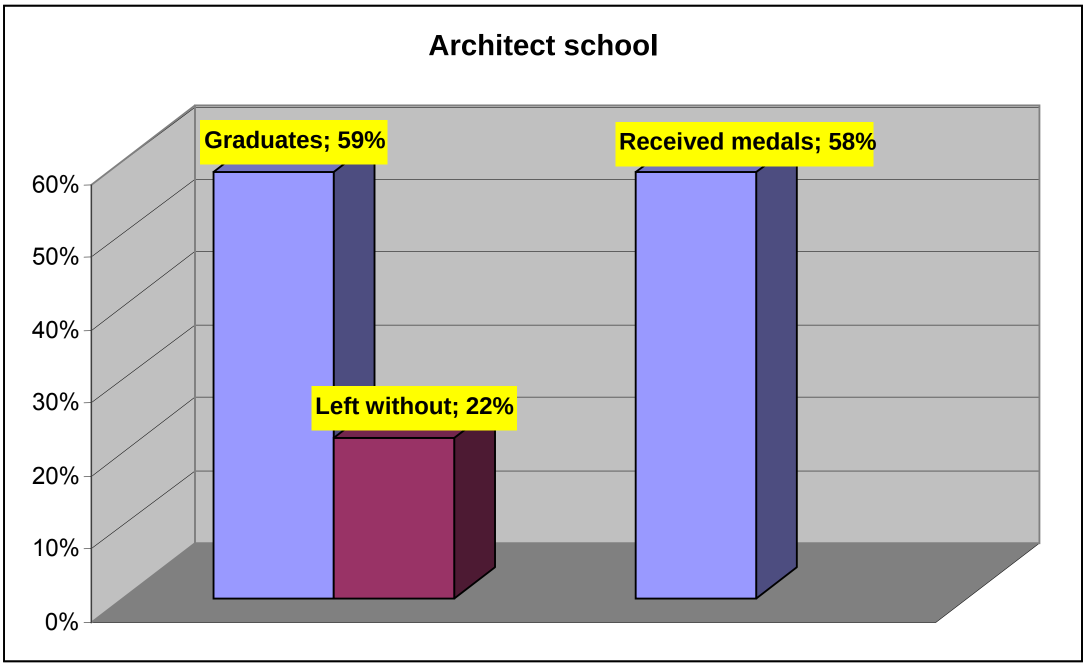


Figure 1-21: Results from the architect school 1754-1950

Almost all architects of the period can therefore be said to possess both the insight of the craftsman and the architectural technologist as well as that of the architect. All the required qualifications of the drawing office were more or less present in each individual.

1.2.12 UK 1750-1950

In the UK the education of architects took a different direction than in DK. As mentioned, Denmark followed the example of France and created the Royal Academy with a school of architecture that from the very beginning became dominant within all architectural education in the country. Of course the UK could have done the same and this possibility was also debated, but at first the dominant architect of the time Sir Christopher Wren (1632-1723) might have considered the existence of the British Royal Society and The Royal Works and their achievements quite as good as the new French Academy's. Shortly after a different kind of educational system, the pupillage, developed to become common in UK (Crinson and Lubbock 1994, p. 8).

Crinson and Lubbock (1994, p. 2) claim that: *"Before the mid-eighteenth century the vast majority of buildings were erected by builders with no pretensions to being designers. Architects, so called, were only responsible for designing major monuments such as churches and palaces and since there was no profession as such they were trained in many different fields."* This is a situation very much like the Danish. But from when Denmark got its school of architecture at the Royal Academy in Copenhagen it came to a parting of the ways. Crinson and Lubbock (1994) say about this: *"The variety of methods of entry into architecture that existed in the eighteenth century was not reformed and rationalised out of existence, as happened in France. This variety even survived vestigially until well into the twentieth century"* (Crinson and Lubbock 1994, p. 42).

Continuous reading says: *"Pupillage, established in the mid-eighteenth century, had become the most common but by no means the only form of architectural training by the end of the century. Its importance was maintained throughout the nineteenth century, although its form, conditions and length were never universally defined"* (Crinson and Lubbock 1994). Thus a clear difference between the UK and Denmark can be noticed for the period from mid 18th century to the beginning of the 20th century with Denmark possessing a well ordered and organised architect education in comparison with a quite diverse situation in the UK with rather different routes to follow (Saint 2007 pp. 462-469).

A certain control began perhaps when RIBA (the Royal Institution of British Architects) was established by 1834 and got its royal charter with an obligation to secure sufficient education. But we also read: *"It was to be nearly a hundred years, however, before the institute took on much of the regulation of the education and this was to happen within university and college architectural schools, in preference to training within offices"* (Crinson and Lubbock 1994 p. 41, 42).

Fiddes (2007) recounts the situation in Aberdeen where the Aberdeen Mechanics' Institution[23] (1824) shortly after its establishment began part time classes in architectural and mechanical drawing. There was a demand for some training in certain aspects of architecture, *"not only from architectural apprentices, but also from masons, builders and even joiners...The pattern continued with the establishment of an Aberdeen school of Art from 1853 onwards, and subsequently when the Aberdeen School became Gray's School of art in 1885"* (Fiddes 2007).

From the early twentieth century full time courses began to be established and the school joined into what became The Robert Gordon Technical College. The course for architects was a five year part time course. From 1910 a full time diploma course was established. The scheme was a 2 year full time course followed by a minimum of three years' apprenticeship in an office supplemented by a number of classes. In April 1914 RIBA approved the course provided that a, by them appointed, external examiner participated at the final exam. Fiddes notices that *"Aberdeen was the third school in the country after the Architectural Association and Liverpool, to receive RIBA exemption"* (Fiddes 2007, p. 8).

From 1913 the course in architecture was a full time course granting a diploma in architecture and from 1940 architecture went from being a department to becoming a school in its own right within the institution.

[23] Today's Robert Gordon University

In comparison with the education of Danish architects the British training in the period was much more diverse. From the description by Crinson and Lubbock (1994) it can be noted that the average contact with the work of craftsmen was much closer than today's educational situation. It is also clear that the technology part of the education was substantial. Therefore, the resulting qualification although being less academic might have had the same practical applications.

1.2.13 UK after 1950

To end the story some brief information about what happened afterwards is necessary and that can be given by continued use of The Robert Gordon University in Aberdeen as an example and by following the description of Fiddes (2007).

In 1973 the course of architecture was recognised as an Honours Degree. It took form of 4 years honours; 1 year practical training followed by 1 year Diploma in advanced architectural studies.

In 1965 the institution was named 'Institute of Technology' and in 1992 it got the status of a university with the name we know today: "The Robert Gordon University". Today The Robert Gordon University possesses the best possible reputation among new universities in the UK, its School of Architecture and Built Environment is to an increasing degree involved in research activities along with the other schools of the university.

Today both the UK and Denmark have their architectural courses in institutions at university level. In the UK the courses are controlled by RIBA and Architects' Registration Board (ARB) whereas in Denmark it is the state that gives accreditation to the courses. The Danish courses are still placed in kinds of art-universities, with the special angle to the subject that might give, and in the UK it is universities with the traditional university approach that are dominant.

1.3 Professions and professionalism

The theme about professions and professionalism aims to point at the factors that constitute a profession, subsequently to enable realisation of to what extent AT today can be considered a profession in its own right.

1.3.1 Initial considerations

How should the terms 'profession' and 'professionalism' be defined? – Probably everyone has a certain idea of what the terms mean and this enables them to use the terms as parts of their daily used vocabulary. So, how do people define the term profession and the term professional and what is their relation to education?

Is an education automatically identical with a course for a specific profession? – No, if it was so, a degree in business would make people think about the profession "Businessman" which is not to be considered a real profession since it is an idea embracing so many specific roles within business. It may be the term that makes people think of a successful owner of a big business, but it doesn't make people think of a specific education because it is well known that successful businessmen tend to have very varied educational backgrounds.

Being a managing director means that one possesses the specific position "Managing Director", which constitutes **a well defined role to play** within a big company, but it doesn't say anything about the education the director might have, whereas the profession "Solicitor" makes people conclude that the person in question possesses a law degree. Thus we might have professions that require a specific education and others that do not.

Does it give a profession a stronger profile if it is based on a specific education? The answer is not so obvious, but there might be a tendency in that direction. Especially if the neighbouring roles or professions possess the underpinning of a specific education this might be the case, but it is not always like that. The top position of the managing director is rather clear and unquestioned whereas the term "architect" sometimes refers to the top leader and owner of a big consultant firm and sometimes to a young newly graduated person from a school of architecture whose designs have never been executed. In the latter situation the education itself tends to provide the identity of the profession. As to this I experienced a curious habit of the secretary of the first architect firm I was employed in. Initially the newcomers were only titled with their names, but after around 5 years of experience she would begin to say "architect NN" when talking with clients or others about them. Maybe she did it because of the higher hourly salary the firm would require for their efforts and her own growing respect for the level of professional behaviour of the employee – I don't know, and I am not sure she did either.

When looking at architects, building engineers, and architectural technologists one come to see the last-mentioned as those with the less significant profile. All three kinds of professionals have their medium long or long term further education, but the architects and the building engineers have an education which gives a clear idea of what profession they are educated for, whereas the technologist's role or profession is far more subtle and uncertain. There are simply no traditional well defined roles to which they belong, seen from the uninformed spectator's point of view. Therefore the AT professional position is clearly less fortunate than the other two.

Looking at educational areas, with no or little direct relation to a specific profession, one see no less fortunate positions. These areas are by nature meant for different types of professions and supply the individual possessing a specific education with an open door to a number of professions that don't require a very specific education, but just a background of certain relevance. This pertains for example to business management and to many civil servants positions.

Can it perhaps be concluded that the way people in general define the term profession when they use it in their daily life is "**a well defined role related to the working life of people**" and **that this also cover the situation where people have just qualified for the role by finishing the required education if such one exists?**

Looking for 'profession' in an ordinary dictionary, it can for example be read: *"In a wider sense the work a person subsists on or is educated to do. In a narrower sense the term is used about a trade whose practitioners have their background in a specific formal education, which gives a professional authority and status."*[24] (Scheuer 1999 p. 471)

Taking this for granted we would realise that the daily life definition at the former page applies to the wider sense meaning of the term whereas it in a more narrow understanding require "a specific formal education", which means that a manager, as described above, doesn't possess a profession but just a high ranking position.

The ordinary interpretation of a term must generally be preferred for a more specifically elaborated and perhaps scientific interpretation due to the fact that the popular version tends to be the one that survives in the long run and that it is ordinary people who influence and change the meaning of the language in use. This idea is in perfect line with the ideas of Ludwig Wittgenstein in his later philosophical works on the idea 'meaning'*: "The meaning is the use"* (Klausen, Michelsen and Posselt 2008). However, here it will be rather relevant to look at how the term is discussed in a scientific context in order to identify more subtle aspects that could enlighten the position of architects versus architectural technologists.

But, before doing so, we owe to discuss the term 'professional' a bit. Two initial questions could be:

Can a person be considered a professional without possessing a profession?
Can a person possess a profession without being a professional?

Looking at the latter question and relying on Wittgenstein's definition of meaning one would feel inclined to answer "yes", because we all have experiences with professionals who proved not to be really professional within the exact piece of work they were wanted to do. They possessed the profession without being really

[24] The text is my translation from the Danish language of the dictionary.

professional. They might even have finished a comprehensive education, but without reaching a real professional level within their profession.

It also happens that a person possesses all the characteristics of a defined professional, but for some reasons doesn't possess the profession. It is even heard of that someone possesses high professional skills without having completed the education for the profession. One of the best motor mechanics I have had for my car service was not educated as a motor mechanic or a plate-smith but was able to exercise both professions to perfection. Would he call himself a motor mechanic? – Sometimes he did, when referring to his business, and sometimes he did not, when the debate indirectly also implied the idea of an education.

Thus, we see how to distinguish between the possession of a profession and that to be a real professional. **The professional simply master the profession, which unfortunately is not the case with everybody educated for the profession.**

What does **'professionalism'** mean then? – A spontaneous answer could be that it means all the means and efforts it takes to underpin a profession with professional behaviours and to make it known as such or **that it means to behave as a professional**. This is an immediate explanation of the term, but there is a need to dig deeper into this matter in order to describe as precisely as possible the conditions of the two professions in question.

A definition in short terms could be: **The professional is a well skilled person, the profession is a defined trade that someone can possess, and professionalism is more elaborated behaviours of those who possess the profession.**

1.3.2 Professions, professionals and professionalism

Perks (1993) mentions seven milestones in the development of an occupation to become a profession:

1. **It became a full-time occupation;**
2. **The first training school was established;**
3. **The first university school was established;**
4. **The first local association was established;**
5. **The first national association was established;**
6. **The codes of professional ethics were established;**
7. **State licensing laws were established.**

(Perks, 1993, p. 2)

This list might apply better to some professions than to others and it is seen from an American point of view anyway. Other societies might frame slightly different routes for the development and especially the final step will be more or less lacking in a country with constitutional laws like the Danish'. The European Union is continuously developing common standards for the different kinds of business and here we will probably find something like "licensing laws" to be implemented for all important professions.

Macdonald (1997) is pointing at certain characteristics regarding the establishment of a profession and mention ideas as **social closure, own jurisdiction, training, respectability** and, perhaps the most important for our subject, that being professionals people should attempt to **monopolize their professional expertise**. We will look at these 5 aspects later on when we discuss the architectural profession and the position of the technologists. Macdonald states that what he calls *"the professional project"* will tend to create a 'monopoly' on the basis of 'expertise' and he stresses that this is important because what the professionals offer their customers (clients) is service and normally not something material to be recognised and judged in advance by the costumers.

Macdonald explains that what he calls occupational groups have to struggle to establish themselves as a profession and that this is a process along with the development of their expertise. The shift from being just an occupational group to become an established group of professionals with a defined and recognised profession takes time and efforts.

Haralambos and Holborn (2008) mention under the headline "*The growth of the professions*" a number of reasons for the rapid growth of professions in the twentieth century and among other reasons they also mention: ***"The development of industry requires more specialized scientific and technical knowledge which results in the development of professions such as science and engineering."*** (Halambos and Holborn 2008, p. 47) This leads to the question about how this applies to the area of building design and in a more narrow sense the design parts undertaken by the architect's office.

Bayles (1981), in discussing the level of autonomy of the professions states: *"professionals are autonomous insofar as they can make independent judgements about their work"*. In many descriptions this criterion seems to be final and crucial to the full establishment of a profession as can be seen in the listing of Perks (1993). Guy Routh (1980) discusses the situation of different professionals and talks about **'higher professionals'** and **'lower professionals'** relating to the earnings of the groups. To the group of higher professionals he includes architects whereas the group of lower professionals counts groups like teachers and nurses. For good reasons he is not mentioning architectural technologists because they did not exist in the UK when he wrote about it.

Parry and Parry (1976) compared the medical profession with the profession of teachers and pointed out a key difference. The professional body of doctors early obtained a considerable control over the market situation whereas the control over teachers more belongs to the state than to their organisation. '*Teachers have then turned to trade unionism to improve their market situation'* (Parry and Parry 1976, Halambos and Holborn 2008, p. 48). This raises the question whether technologists tend to be more in the one or the other situation, and that is what will be investigated later on.

Parry and Parry (1976) also state that *'professionalism'* should be seen as a market strategy where the occupation tends to be controlled by the members. This is said to involve control of rewards, control of the conducts of the members and exclusion of others from the delivery of particular service. A success criterion is to have this reinforced by law (Parry and Parry 1976).

Heath, Jowell and Curtice (1985) operates with a higher class in society named the "salariat" consisting of administrators, professionals and semi-professionals whose power derives from either autonomy in work or authority in the workplace. There are other class definitions available but almost all put the professionals in the top position right below the very few extremely wealthy or the upper class consisting of owners of big businesses (1) and fortunes (2), celebrities (3) and nobility (4). These are positions that are almost always combined with one or more of the other numbered positions. In the UK a number of people possess all four positions. The professions do not fully belong to what could be called the 'salariat' group of people because the top professions tend to consist of businesses bearing the name of the profession. Thus, the leading members of the professions tend to be business owners of which some are wealthy, celebrities and even belong to nobility all because of their profession. In the architectural profession in the UK one can recognise a name as Lord Norman Foster, who fully owes his position in society to his profession.

Finally, it should be mentioned that the European Commission has been working with ways for the member countries to recognise and accept each-other's regulated professions, thus to ease the cooperation inside Europe. A list of about 800 "regulated" professions of all levels is now covering all professions that could be called "regulated" (Regulated professions database 2009). Initially it states: *"A profession is said to be regulated when access and exercise is subject to the possession of a specific professional qualification."*

This database together with the Directive 2005/35/EC (2005) is, of course, an important key to the understanding of the position of a profession within Europe. The Directive more closely describes the requirements concerning some major professions that especially have been subject to the concern of the Council. How this affects our two professions will be further investigated.

1.3.3 Key criteria emerging from the literature

A number of scientific considerations about professions, professionalism and professionals can be noticed and for the further research the field to be focused on has to be narrowed down to what is essential to the research at hand. However, each part of this 'field' should be described and argued. Is it possible to list a number of criteria of importance and perhaps even prioritise them to enable a more precise comparison and judgement?

On the basis of the above mentioned sources the following characteristics can be pointed out as important to the relative position of a profession in society:

1. **Level of skills and knowledge**
2. **Level of formal education**
3. **Level of organisation**
4. **Level of respectability**
5. **Level of exclusivity**
6. **Level of clients**
7. **Level of professional body control**
8. **Level of indeterminacy of knowledge and skills**
9. **Level of legitimacy**
10. **Level of income and fees**

Each of these areas of characteristics deserves a comment even if most of them are more or less self explaining and also more or less accounted for above. The term 'level' is here meant to indicate the position or ranking within society in the opinion of its members. What really counts in a democracy is the opinion of people in general, but people in general are normally following the considerations of the top layer of society, and in case of a new rising profession that is not yet well known amongst people in general, there is a need to ask those with an insight and enough influence in society to be able to tell what people might think about it later on. Who are they within our context? They must be the members of the neighbouring professions who meet with the members of the rising profession and experience their abilities and behaviours.

About what the ten listed topics mean, the following can be mentioned:

1. **Level of skills and knowledge**

   'Level of skills and knowledge' simply looks at how people in general consider the required skills and level of knowledge. Professions requiring the same length and formal level of education might possess different levels of knowledge and skills. Also, some professions require continued in-service education and passing of different tests to accept their members (Lian and Laing 2004 pp. 110-120). Michel Foucault (1991) puts emphasis on the close relationship between knowledge and power and how they go hand in hand. Accepting this as true means a need, not only to look at the general level of knowledge, but also to look at the value of the knowledge considered.

2. **Level of formal education**

   'Level of formal education' looks at the degree level or number of years of study required and/or the level of the educational institutions typically visited. Especially in Britain some educational institutions possess a much better reputation than others. For example, it could be considered more prestigious to have a BSc from Oxford than an MSc from another university. The sociologist Pierre Bourdieu 1930-2002 has discussed this and stated that the more widespread qualifications become, the more they become devalued and also that degrees are considered of high status if they are obtained at a university of 'high-status'(Bourdieu 1993).

3. **Level of organisation**

   'Level of organisation' is about where the professional organisation is placed on a scale from an occupational union to a fully developed professional body with a legal monopoly. This should, like all the other characteristics, be seen in relation to the rest of society (Perks 1993).

4. **Level of respectability**

   'Level of respectability' is about prestige and involves the importance of the service of the profession and may also involve how noble it is considered to be. Being necessary to society doesn't automatically mean being highly respected. Sewer workers are for example very important to society but are not highly respected just because of their profession (Lian and Laing 2004).

5. **Level of exclusivity**

   'Level of exclusivity' is about how accessible the profession is for people. Does access require something special or is the profession accessible for almost everyone who would struggle enough for it (Lian and Laing 2004).

6. **Level of clients**

   'Level of clients' is about the kind of persons the service is given to. Is it an exclusive group or is it given to everybody. What kind of people will the professional meet with in daily life? According to Bourdieu, who would call this social environment a 'field', such fields influence a person's so called 'habitus' (Bourdieu 1990). This influence could also be considered part of the relative position of the profession.

7. **Level of professional body control**

   'Level of professional body control' is simply about how well controlled the activities of the members are by their organisation. How high ethic standards are required and how much self control is exercised by the body? This is considered a key factor by most sociologists who investigate the professions (Larkin 1983).

8. **Level of indeterminacy of knowledge and skills**
   'Level of indeterminacy of knowledge and skills' is about the relative freedom to develop and to innovate on the capabilities of the profession. For example, are many members occupied with research and/or art? This is in general assumed to contribute to the esteem of a profession and indicate the highest levels of knowledge and skills.

9. **Level of legitimacy**
   'Level of legitimacy' regards to what extend the profession is recognised by the authorities and possesses a monopoly within society. The importance of this is relative to the society in which the professional body operate. In societies where this is the norm for high ranking professions, it is of course very important (Perks 1993 p. 2).

10. **Level of income and fees**
    'Level of income and fees' is very simple and straight forward what it says. The importance of income as indicator to the position in society is apparent to almost everybody, but sociologists have debated how far this factor is going. The Marxists, occupied with the ideas of the importance of the possession of the means of production tend to see economy as the most significant class indicator whereas Weberian sociologists (Max Weber 1864-1920) accepting the importance of the ownership of means of production also saw an important influence in the value of skills and qualifications (Weber 1947).

There could be different ways of giving priorities to the 10 chosen criteria, but if we now address the group of people mentioned above: "*the members of the neighbouring professions*" it might be possible to make them suggest the relative importance or value of the ten criteria. This makes sense because some might prove more important for some professional areas than for others depending on the circumstances, and the people who would know best must be those whom it more directly concern. The same group could also judge to what extent the profession in question is fulfilling the criteria.

Subsequently we might be able to make a comparison between the status of architecture and the status of architectural technology as professions right now. So, this is what is going to happen after a look into what the existing literature is saying about the two occupations or professions in focus.

1.4 The architectural profession

1.4.1 Overview

At a glance the profession of architects' seems very easy to explain: '**It must simply be about what it takes to make architecture** – or what?'

Maybe it is that simple, but then one may ask: 'What is architecture?' and then we become unsure. However, what is certain is that most people, when asked this question, immediately think of buildings. But, do people consider all buildings as pieces of architecture? No, they won't call any building they see a piece of architecture. At least there are small anonymous, unpretentious buildings all can recognise as not 'designed' by an architect and that no one would call a piece of architecture. So, the simple fact that a physical structure can be called a building or even a house does not mean that it is considered architecture in a more narrow sense of the term. It can be compared with pottery where it can be said that not all pots are pieces of art but some pots are definitely shaped and given surfaces that make them recognised as art pieces. Thus, it can be concluded that a piece of architecture is a building that has more to it than the bare fact that it is a building.

What exactly is this additional quality? – Here comes the difficulties and in my whole life as an architect I have never heard or read a definition that I felt precisely covered all what I thought belonged to this difference. Is that odd? No, it is not – because a significant part of the difference is about art and, as most people very well know, art might be easy to identify, but hard to define.

In his book An Outline of European Architecture Sir Nikolaus Pevsner initially says: *"A bike shed is a building but the cathedral in Lincoln is a piece of architecture."*[25] He points out the difference as a matter of aesthetics, which is not exactly the same as art. But aesthetics is definitely also and most often a significant ingredient in

[25] Translated from Danish by the author

architecture because it, like in the case of pottery more often than the free arts or other fine arts, is meant to please people's feelings – not to provoke them like paintings and sculptures often do. As a matter of fact it is fair to say that Pevsner in his book considers architecture an art, not by direct definition, but by mentioning it again and again in terms that say so. He talks about 'the art of building' and architecture as 'the kind of art that is closest related to life itself'. *'We can imagine a period without the art of painting but a period without architecture is impossible,"*[26] he says (Pevsner 1973).

In his book "Huse" ('Buildings') the Norwegian architect Odd Brochmann concludes: *"Architecture is at the same time a material and aesthetic organisation of the external environment and embrace everything from items to buildings, towns and lay outs in the landscape in order to satisfy man's physical as well as psychical needs."*[27] (Brochmann 1969) I am not sure this very far reaching definition will be accepted everywhere but at least it tells that architecture also includes the environment created by a number of buildings and the installations between them of a certain scale. Considering what most people are thinking of when the term is used, it would be too narrow a definition to limit architecture only to concern buildings.

A third and most interesting definition of architecture can be found in the book Design of Cities by Edmond N. Bacon (1978) where he at page 21 says: *"Architecture is the articulation of space so as to produce in the participator a definite space experience in relation to previous and anticipated space experiences."* Here the focus is on the creation of space whereas the other definitions tend to focus on the buildings and other physical appearances. Seen from my point of view architecture is about both the shaping of space and the filling of structures including the limiting of the physical surfaces, because the spectator will notice both space and structures (Rasmussen 1964). Another interesting thing about this third definition is that, in contrary to the other two, it does not mention art and/or aesthetics as preconditions to the label of architecture. But it talks about "articulation" thus

[26] Translated from Danish by the author
[27] Translated from Danish by the author

indicating the requirement of an ability to articulate or master a vocabulary of shapes and combinations of shapes and further lay a stress on certain parts to express something. This is somehow in line with the two first definitions that definitely require a professional skill. The involved special way of thinking, compared with traditional reasoning, is described by Goldschmidt (1994 p. 158): "*In contrast, we assert that interactive imagery through sketching is a rational mode of reasoning, characterised by systematic exchanges between conceptual and figural arguments*." Pratt et al. (2009 p. 503) supports this description by saying that: Studies of design suggest that designers proceed by circles of see-move-see. Goldsmidth (1994 p. 169) quotes Alvar Alto for saying: "*When I have to solve an architectural problem … the … demands … are so numerous that they form a maze which cannot be worked out by rational methods. The ensuing complexity prevents the basic architectural idea from taking shape. In such cases I proceed in an irrational way as follows: … (I) busy myself with something that can best be described as abstract art. I start drawing, giving free rein to my instinct, and suddenly the basic idea is born, a starting point which links the numerous, often contradicting elements already mentioned, and brings them into harmony with each other …*"

Further definitions and further attempts to define the idea of architecture can be found, because most books on architecture have direct or indirect definitions in their initial parts. But one can also notice another use of the term to embrace almost everything physical created by man. This wider, informal definition is used in many contexts by everyone, but it is easy to hear or read when people become more concise about the term and use it in its narrow sense like Pevsner did.

Thus, at least two ways of using the term architecture can be noticed: 1 the more narrow distinguishing between buildings and spaces in general and those with the characteristics of "architecture" and 2 the focussing on our physical man-created surroundings and structures in general (including the bike shed of Pevsner).

Considering all this **an architect is defined as one who creates architecture**. **Architecture, as to be used in this context, is defined as the result of the addition**

of art and aesthetics to a building or an environment or a space. – But the role of education within the architectural profession has not yet been considered.

As discussed in the chapter about profession, education has a role to play in any more narrow definition of a professional. Being a professional normally requires an education and within the profession of architecture it is a very rare thing if someone is considered a professional without possessing the education of an architect but it happens.

Known examples of architects without an architectural education behind them are Le Corbousier and Piere Luigi Nervi. They are very typical for the kind of people who at a certain stage in life feel inclined to enter the profession. They typically come from neighbouring areas or professions and bring with them and utilise the qualifications of their previous profession and education. Le Corbusier, who originally trained as an artist, has utilised his sparse educational skills as engraver, painter and sculptor in his famous and influential architectural designs, and the engineer P. L. Nervi has visualised artistically the beauty of the laws of nature in his expressive structural designs. They became accepted because their designs were so impressive and convincing; whereas people with a lesser talent will definitely need the normally required educational background to make people call them 'architect' (Møller 1994, Kühn-Nielsen, Sørensen and Thomsen 1999).

As discussed in the profession chapter, the simple fact that a person has completed the formal university training as an architect will in most places and in most situations allow him or her to use the title of an architect. In mainland Europe the education itself entitles to professional use of the title 'architect', whereas it in the UK tends to be necessary to hold a membership of an organisation or a register requiring some extra experience and perhaps testing as well. A newly scheduled development within EU points at a more shared kind of qualification and registration in all the member countries (Directive 2005/36/EC).

1.4.2 Architects in Denmark and the UK

Denmark has since 1857 had free trade and almost no protection of professional titles. This means that everyone who wants to call himself an architect legally can do so, but if people recognise that such a person hasn't passed the education they surely will consider it cheating and lack of reliability. Therefore, it is a very rare situation if someone is doing it. What is not so unusual is that our equivalent to the UK architectural technologist, the "bygningskonstruktør", is practising as an architect or occupies a position in a municipality with the architect title.

Sometimes people feel inclined to go back to an original meaning of a term, obviously thinking that that meaning must be the right one. In the case of the term architect they will find that its origin is the Greek arki + tekton, which mean something like 'master carpenter' (Brüel 1971). This idea does not make sense anymore and hasn't for centuries. Today's term came to us from the Latin 'architectus' and is for example explained as *"a person who shapes the physical environment of people for example buildings, town plans, gardens and landscapes and also items like furniture and industrial products"*[28] (Møller 1994 p. 591).

This explanation is a special Danish one probably deriving from the fact that the education of architects in Denmark has been undertaking all these disciplines, whereas some of the disciplines in other countries are linked to other educations. Thus the Danish education of architects has been focusing on what kind of basic qualification all these disciplines have in common and has turned to be still more art and philosophy related because these basic subjects, together with a kind of shared working method and attitude, has established the Danish architectural entity as it appears now. There are other people than architects who are dealing with some of the disciplines involved and who in their daily life work together with architects, but when architects meet they share some common experiences that are only theirs and the professional brand 'architect' tends to be very important to them.

[28] Translated from Danish by the author

Quoting G. Stevens' book The Favoured Circle (1998) Leonie Milliner in chapter 22 in the book Changing Architectural Education (2000) says: *"For instance one is identified as belonging to the profession not only by the letters after one's name, but also by the clothes one wears and the language one uses: 'Intelligence, in any absolute sense, is not a major factor in the production of distinguished architecture. Arrogance, coupled with a sense of competition and a pleasure in the fashionable and exotic are much more important.' (ibid.)"* This is originally expressed in the USA and afterwards quoted in the UK but also matches very well the Danish situation. I take it that it describes a mere global situation. As a comment to this the RIBA report, 'Constructive Change: a strategic industry study into the future of the Architect's Profession' could be quoted. On page 43 it is recommended: *"Discourage professional norms and behaviours that are perceived as outdated – for example the introverted design perspective of architects, and their lack of integration with other members of the construction team."* (RIBA 2005)

In the UK and other countries urban planning is undertaken by planners who come from specific planning educations of a different internal culture, which most likely might implicate less awareness of art and the third dimension (space perception) and perhaps concentrate more on rules, regulations and two dimensional layouts.

It can be concluded that the term architect doesn't cover precisely the same 'meaning' in the UK and Denmark (Klausen, Michelsen and Possalt 2008). Most of what it covers is the same, but there are small differences, and it is probably fair to say that all the different nuances in the meaning from country to country in Europe are not more than what still allows a widely shared common use of the term architect.

1.4.3 Education of architects and politics of organisations

The previous chapter was about the history of the education of architects; so, the following will only look at the present situation with a focus on Denmark and the

UK. – A brief look at the role of the professional bodies in both countries and how they influence the content of the education also appears appropriate.

Professional bodies have always been trying to influence the theoretical education of professionals and if looking in the magazines, which speak on behalf of the bodies, one will every now and then come across articles that express ideas on how to change the education to be more suitable for the profession. A good example can also be seen in the Strategic Study of the Profession (RIBA 1992, 1993, 1995). This has always caused tension, because education and profession tend to establish two different cultures and, automatically related to them, two different mindsets. Apparently this difference becomes more significant when the education is elevated to university level with its philosophical and research based angle to the subjects of the profession whereas the profession itself tends to stress the value of practical skills – the simple ability to do the job or the 'competences' of the graduate is what is desired. Digging a bit deeper one could suspect that the profession holds a more short term point of view than education at a higher level traditionally tends to do, especially when this is going hand in hand with research. Higher education tends to put an emphasis on the insight and understanding of complicated things and their relations much more than on the bare ability to do something in praxis (McClean 2009 p.76). The talk is about the requirement of 'knowing how' in contrary to the desire of 'knowing why', and the tendency to stress the latter in higher education.

It could differ from profession to profession how significant this difference is, and it can be assumed that especially professions that require some more practical skills more often will experience the difference as a problem. It is not enough for a dentist to understand own profession fully to satisfy the clients. The dentist also needs to master the handicraft skill to drill a hole very precisely and quickly and fill it skilfully by using the hands to do so. A psychologist doesn't need any such ability but can as far as the author is informed base almost all the consultations on the more theoretical knowledge achieved by studying alone. The result of the work of the dentist is a well filled hole in a tooth and the result of the psychologists work is typically some recommendations as to the client's behaviour perhaps followed by some notes.

An architect's work is like something in between the implications of these two professions. Like the dentist the architect needs to be able to do some handicraft by sketching and making illustrations, but today most of the work results come from a computer where modelling programs have replaced most of the drawing work of the business. This means that most of the more handicrafts-like parts of the profession are gone. To do the sketching and the modelling the architect has to obtain and combine an increasing amount of information, collected from almost all kinds of subjects, and balance them in the documentation for a physical structure that looks well in order to satisfy his clients. In contrary to the pencil or pen, which were used during many hundred years to make the necessary documentation for a building (note the term 'documentation' referring to the technique itself and not yet replaced with something referring to the new technique), the use of the computer is an ever changing matter, due to the flow of newer, better, and more accessible drawing and modelling programmes introduced each year (Flanagan et al. 2001 p. 20, 65).

What is an unchanged requirement for the architect is the ability to imagine, compose, and visualise the well balanced physical structure of a building or an environment, but a number of the means to do so are changing. Each time something changes it tends to be due to the introduction of new technology, and each time new technology is introduced it becomes a question whether the new technology justifies a kind of specialisation or perhaps even a new profession. At the conference "Arkitekter nu og i fremtiden" (Architects now and in the future)[29] in Aarhus 2007 architect Per Feldthaus said: *"Therefore, it is important recognise the fact that parts of the architect's work have artistic characteristics and content. That there continuously is given space to the imaginable and not verbally expressible in the activities of the architect"*[30] (Feldthaus 2007 p. 57).

[29] Translated from Danish by the author
[30] Translated from Danish by the author

The opposite could also happen, which is almost the case for the building engineers in Denmark. They have been used to rely on the craftsmanship of technical draughtsmen, when it came to the final drawing documentation of their work. Today many of them can, quite as easy as they earlier made their small drafts on squared paper to inform the draughtsman, now make the final document themselves, because the computer programme is very good at making straight and precise lines and installing the different symbols the drawing or the 3D model needs. But this is due to the fact that the engineers are the ones who know all the technicalities to be considered in their part of the drawing or model documentation.

What about the architects? Are they ready to use the new techniques fully, or are they differently situated? – We will get back to this later, but all what is said about it until now (Hougaard 2007) indicates that architects, due to the very nature of their theoretical education, can't master all it takes to fully inform about all the technicalities of a new building. This means that they, even if they might master the computer technique, will not be able to use it for the more technical part of the responsibility of the drawing office, or is architect office a more precise term? **Here a discrepancy, between what the profession of architects claims to be capable of and what the education of architects is actually containing is indicated.** Harty and Laing suggest in the conference paper "The impact of coded Digital Design of Architectural Process and Management" (2008) that the technologists most likely will be the ones to do this part of the job (Harty and Laing 2008).

In the report Aftagerundersøgelsen 2007 (The Purchaser Investigation)[31] (Hougaard 2007 p.8) it is emphasised that the newly educated architects in Denmark are well equipped regarding *"theories on aesthetics and shaping, the theory of the profession and its history, sketching, physical modelling, digital 3D modelling and graphical lay out."*[32] At the same time, these qualifications are the most desired abilities among the employers of the profession.

[31] Translated from Danish by the author
[32] Translated from Danish by the author

The report also says that the most significant lack of qualification-match regards *"technique, construction and materials, projecting technique and insight on society and economy, programming and regulation"*[33] (Hougaard 2007). This is no surprise and it underpins the assumptions of the project at hand, but what is a surprise is that the employers don't consider the achievement of these qualifications a case for the school of architecture. Obviously, the idea is that this area will be covered by informal training in the business perhaps combined with small in-service courses.

In the report Kandidatundersøgelsen 2006 (The Graduate Survey) (Hougaard 2006 p. 51) it is shown that when it came to a comparison between achieved capabilities and required qualifications (100% = all relevant qualifications) within technique, construction and materials, there was a discrepancy expressed in the percentages 29% for achieved qualifications and 84% symbolising the required qualifications in the first job. The figures were 18% to 78% within the praxis of the profession and 3% to 72% regarding insight on society and legislation. This is noticeable, because these areas constitute the core of the architectural technologist education in Denmark.

In Aftagerundersøgelsen 2007 architectural technologists are seen as the primary competitors for the jobs in the drawing office (Hougaard 2007 p. 7). This indicates that it is taken for granted that the education of architects should cover all the educational needs of the drawing office, whereas architectural technologists are trespassing into parts of this area. It will be investigated later how the different educations cover the needs of the drawing office, but now the question is if the situation is seen the same way in the UK.

In the UK the "RIBA Constructive Change: a strategic industry study into the future of the Architects' Profession" from December 2005 also discusses certain lacks in education: *"Professional education and training for architects is seen as a key area of weakness, discussed widely and frequently during the workshops. Architectural education initiates and enforces certain negative behaviours and attitudes amongst*

[33] Translated from Danish by the author

young architects: the profession's introverted perspective is instigated during education; architects are not educated to meet industry and wider market needs; and the education system often lacks sufficient exposure to other built environment sectors" (RIBA 2005 p.12).

In the end of the RIBA report it is recommended:

- *"Reflect market demand and opportunities by educating and training architects in a flexible and wide range of skills;*
- *equip students with skills required for refurbishment and recycling of existing building stock;*
- *provide more business and management training for students;*
- *strengthen links between students and the industry;*
- *encourage greater involvement from practitioners during education;*
- *provide more cross disciplinary (built environment professions) modules;*
- *identify, train and invest in the profession's future leaders"*

(RIBA 2005 p. 44)

In all the writing from RIBA the author has come across there was no mentioning of the role of the architectural technologist as a professional having a supplementary educational background to be utilised in the drawing office. In informal discussions I have heard the idea expressed, that the architectural technologists are competitors because they have begun establishing their own drawing offices in some places.

Contrary to the Danish organisation of architects the members of RIBA are obviously eager to strengthen the position of the profession by improving the education in the direction mentioned above, whereas the recent Danish report (Hougaard 2007) shows a general satisfaction with the existing education's emphasis on the core architectural design skills and points at informal training and in-service courses to solve the problem of lacking skills. It points at the architectural strength, being able to think the entity and overview the entire project, as causing certain weaknesses as well. The report is quoting one of the interviewed persons: *"There has been some inherent self-satisfaction. We become much like, "we know everything,* *and we are capable of everything" (….) Recognising that we don't know everything and are not capable of everything we have begun employing other professionals"* [34] (Hougaard 2007 p. 45, 36).

Thus a certain difference is recognised, in how the different national professional boards are considering the question about education for the profession of architects. This is also in line with what was said by Orbasli and Worthington (1995) in their comparison with the education in the Netherlands.

But even within the individual countries one can notice differences in what the educational discipline of architecture requires. In his thesis Knowledge Requirements in Architecture page 83 Ali Alai (1998) describes a considerable lack of consistency in the syllabuses from the schools of architecture in the UK. Denmark is such a small country with only a tenth part of the population of UK and has only 2 schools of architecture, and originally the newer one in Aarhus was meant to copy the old one in Copenhagen. Today there are differences, but they are not significant.

In the UK it is the professional body RIBA that accredits the courses at the universities, but in Denmark, like in many countries in mainland Europe, it is the state that allows a course and has arranged accreditation by a special organisation named "Evalueringsinstituttet" (The Evaluation Institute). It is worth noticing, that the idea of accreditation is a recent thing that spread to the rest of Europe from the UK by the help of the European Union. The quality of the educations was originally secured directly by the ministries and the institutions themselves.

Here, one also has to note that the Directive 2005/36/EC of the European Parliament and of the Council now influences the educational politics of the member states. Architecture, among a few other professions, is now supposed to obey all what is said in this directive. Section 8, article 46 to article 52 regards architecture, and here we find a rather specific list of requirements for those who should possess the profession. Obviously, it is relevant to mention them here. It reads: *"That training,*

[34] Translated from Danish by the author

which must be at university level, and of which architecture is the principal component, must maintain a balance between theoretical and practical aspects of architectural training and guarantee the acquisition of the following knowledge and skills:

a) ability to create architectural designs that satisfy both aesthetic and technical requirements;

b) adequate knowledge of the history and theories of architecture and the related arts, technologies and human sciences;

c) knowledge of the fine arts as an influence on the quality of architectural design;

d) adequate knowledge of urban design, planning and the skills involved in the planning process;

e) understanding of the relationship between people and buildings and their environment, and of the need to relate buildings and the spaces between them to human needs and scale;

f) understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors;

g) understanding of the methods of investigation and preparation of the brief for a design project;

h) understanding of the structural design, constructional and engineering problems associated with building design;

i) *adequate knowledge of physical problems and technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate;*

j) *the necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations;*

k) *adequate knowledge of the industries, organisations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning"* (Directive 2005/36/EC of the European Parliament).

At an overall level the above mentioned requirements appear quite reasonable and in line with any fair definition of the profession, but they are rather overall, and must probably be so, if they are to be accepted by all member countries. This means that one can notice plenty of room for local interpretations and that varied versions of architectural educations can be noticed from country to country.

However, the list might prove useful to our further investigation in architectural education and gives us a guideline for which topics to look at.

1.4.4 The image of the architectural profession

"It is a fine old profession" – a colleague architect once expressed his idea on our shared profession, and I was not tempted to disagree with him. At least everybody know or think they know what the profession is about, and it is also well known that it requires a long term further education at university level to achieve it. But other professions might have the same two characteristics, without making people use the terms fine and old, so, what exactly did he mean by saying so?

There is no need to discuss the term "old"; because it is a simple fact that it is a very, very old profession, and far back in history the names of architects who made themselves famous by their professional achievements are known. Odd Brochmann refers to the architect Imhotep who lived around 4800 years ago and made the remarkable tomb building for Pharaoh Zoser. He is probably the highest decorated architect in history. In most countries today architects can obtain prizes and medals and in the UK they can even get knighthoods and become barons, but Imhotep became more than that, he was declared to be a "god" in old Egypt (Brochmann 1969). Of course, it is impossible to imagine anything higher than that and one could feel that the position of architects has declined ever since, but that is not the case. As a matter of fact, the position went up and down with the wealth and relative freedom in society. In the early medieval period ('the dark ages') it was the highest social ranking person involved in a building project, typically a bishop, a prince, or a king, that won the honour related to it, but in the renaissance and later on the name of the artist – the architect – was again to be emphasised.

This indicates that in most periods in history, but with certain intervals, there have been influential people who have found the achievements of at least certain architects 'fine' and have wanted to show their appreciation of their work. The 'fine' has probably often consisted of a mix of surprising new techniques and a pleasant and powerful shaping of buildings; at least it is like that today, as it also was with Imhotep back in time. Again the thought is of the implications of art as a part of the 'fine' about architecture. By quoting, Saint (1983 p.19 - 23) uses Goethe to describe the grandeur and impressiveness of the cathedral in Strasbourg. He states that a thorough investigation shows it is the result of the work of a number of architects and that no single name can get the honour for its design. Goethe was wrong in his self invented description of an artistic genius designer but certainly right in his recognition of a very mundane and 'fine' building.

According to Kant (1790) 'fine art' is constituted in its contrast to handicraft and to the classical idea that art is something everyone can become capable of; it becomes mysterious – the oeuvre of the genius. This idea has to a certain extent survived to our days and we hear about "star architects" – celebrities like well known musicians, composers and actors. Back in the old class society, where nobility were superior to everyone, architects, lawyers, medical doctors and a few other professions were accepted as the next layer in society. They were accepted as someone the nobles would sometimes, and under certain circumstances, meet with and even invite to more private gatherings. Brochmann expresses it this way: *"The cathedral builder of the medieval times undisputedly belonged among his fellow craftsmen irrespective of how appreciated he was, whereas Leonardo da Vinci was treated as a prince at the court of Franz 1"*[35] (Brochmann, 1969, p. 24).

In Copenhagen the education of architects, as earlier mentioned, is placed at the Academy of 'Fine' Arts and has been considered belonging to the fine arts ever since the establishment of the school back in 1754 (Dirkink-Holmfeldt and Keiding 2004).

Summary: The profession of the architect is well known, it is respected and it is first and foremost unquestioned as a higher ranking profession in society of today. Nobody is in doubt about what an architect is doing. The architect possesses a relatively strong professional image in comparison with other professions. Also, architects are recognised as belonging to the group of higher professionals according to Routh (1980) and other listings of professionals one can recognise. Looking at the theory about social class and culture of Pierre Bourdieu (1984) the members of the architect profession will most likely belong to the dominant class of society due to their education, their "cultural capital", their "social capital", and their "symbolic capital", and sometimes also their "economic capital".

It might be possible to test this, by using the ten criteria mentioned in the former chapter (1.3 p. 94), and furthermore, it could be compared with a similar test for the architectural technologist. In the first place a look at the more sparse literature about architectural technology, and how the position of the technologists is right now, might prove appropriate. And again we will look at both the UK and Denmark.

[35] Translated from Danish by the author

1.5 About architectural technology

1.5.1 Initial considerations

What is architectural technology? – What does it mean? – It is a British term, now also about to be accepted in mainland Europe due to the cultural empirical status Britain still possesses because of the shared use of the English language in the still more unified Europe. Thus, it would be logical initially to look at what the British professional body of architectural technologists says.

At the website of CIAT the page about "The Institute" is saying: *"Architectural Technology is the science and technical aspects of architecture primarily based upon the twin concepts of designing for performance and production through the use and integration of technology"* (CIAT 2007). Looking at this definition, it seems as if all what can be called science within architecture together with all technical aspects that are related to performance and production is involved. That sounds as if it involves almost everything.

But how is "*performance*" defined here? Is it the more technical performance, or is it perhaps all what could be seen as the performance of the building inclusive the architectural message? Spitzer (2007 p. 2) says about performance: "*If we are focused on the wrong measures, then we might very well miss the things that are most important* – ". If we deem from the course curricula from the universities around UK and other information available, the term performance is referring to almost all the performance of the building. This means that architectural technology is dealing with most of the same building performance problems as courses of architecture do. But reading the CIAT definition we sense a certain limitation expressed by the phrased stress on *"integration of technology"*.

At the RGU website one find the following sentences below the headline Architectural Technology: *"The course will equip you with specialist expertise in technical design and management. These skills make a key contribution to the output* *of architectural design teams in shaping the future of existing buildings and creating new environments."* So it is stressed that the graduates are seen as potential members of architectural design teams. Under the headline "Career Opportunities" it is said: *"Architectural technologists work within in a broad range of environments, both in UK and internationally, including architectural practice, built environment consultancies, contracting organisations and manufacturing industries"* (RGU 2009).

At a conference about AT held in November 2008 in Copenhagen the programme front page pointed at the mere technical project design as the core of the AT profession. It said: *"Architectural Technology in this context is not mainly about the many techniques used by the architect to produce the documents, drawings and models, but rather the techniques of how to put the building together that are to be embedded in the documents produced by the firm of architects. It is about how to master the "coherent" technical design of buildings in the drawing offices today and in the future"* (Barrett et al 2008). This more narrow definition was not questioned at the conference where it was also in a shorter and simpler form described as "***the coherent technical design of buildings***" (Barrett 2008).

Traditionally, this coherent technical design was the responsibility of the architect office, and if we look at the RIBA phase model it looks as if it is still seen that way (RIBA 2007). The Danish organisational equivalent in this context, "Danske Arkitektvirksomheder" (Danish Architect businesses), has borrowed the model and has only changed few less important things in it, meaning that the RIBA model is fully understood and accepted in Denmark. This is going to be an important fact in the later data collection phase of this project (DA 2008).

Since the technologist is trained to do the overall technical design within the traditional area of responsibility of the architect office, it would be relevant to distinguish this area from the rest of the work of the architect office. Can this be done? – Yes, accepting a certain overlapping with the rest of architecture one could perhaps visualise it in a principal section drawing.

The drawn figure 2-22 at next page expresses the hypothesis that the main concern of the architect and the main concern of the technologist, due to their training, are quite different. That they in fact tend to be contradictory to each other in their mindsets. One tends to see the 'forest' and the other the 'trees'. Perhaps it is even more like the famous vase example described by the Danish psychologist Edgar Rubin (1915) when discussing human perception.

Figure 1-22: The vase of Edgar Rubin

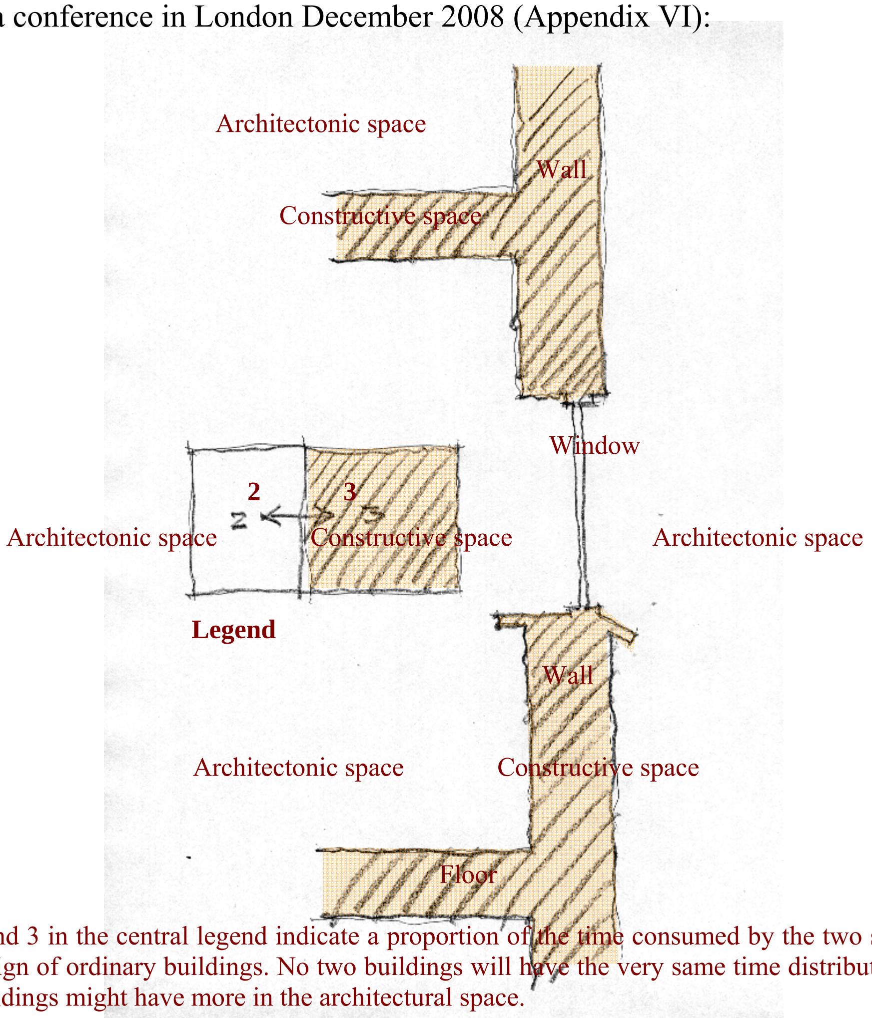
According to Edgar Rubin one can't see both the vase and the two faces at the same time. The shaping and distribution of space is the concern of the architect whereas the technologist concentrates on all the material things it takes to create the space and to keep it and maintain it there. Of course, both can shift from the one view to the other and also do so, but here the focus is on their primary concern, based on their training and developed inclination.

Where the architect, for good reasons, thinks of how to shape space and give it pleasant aesthetical surfaces to meet practical, functional, and aesthetic requirements, the technologist, for quite as good reasons, will tend to concentrate more on the technical performance of the building.[36] Everything belonging to this technical sphere has to do with what is contained in the invisible part of the architectural structure. Thinking of space we could talk about an 'architectonic space' and a 'technical space' or 'constructive space' with a structure of different materials put

[36] As earlier noted the CIAT in the UK claim their members' ability to do the AD as well, which raises the question if they are not architects?

together in order to meet requirements considering the influences on the readymade structure along with the construction procedure.

A sketch illustration of the different concerns of the architect's dealing with AD and the technologist's dealing with AT could look like figure 2-22, which was presented at a conference in London December 2008 (Appendix VI):



2 and 3 in the central legend indicate a proportion of the time consumed by the two spaces within the design of ordinary buildings. No two buildings will have the very same time distribution. Outstanding buildings might have more in the architectural space.

Figure 1-23: The architectonic space versus the constructive space

Everything visible when the building is completed, along with the space conception, is the first concern of the architect, and everything that will be hidden, but is required to create the building and make it sustainable, tends to be the first concern of the technologist.[37]

[37] Of course, there may be British technologists who don't see it this way due to the present British ambition to enable technologists also to cover the AD discipline, thus making them mere architects. Britisk architects (by name) might also claim to cover the AT discipline and some Danish architects might do the same.

In the jubilee number of 'Arkitektur', covering the period from 1929 to 2004 (Dirkink-Holmfeldt 2004), that celebrates the 250 year anniversary of the Royal Academy of Fine Arts, no technical drawings can be found. There are 269 photos, sketches and drawings, and the closest it gets to something technical is the small isometric drawing by Jørn Utzon below.

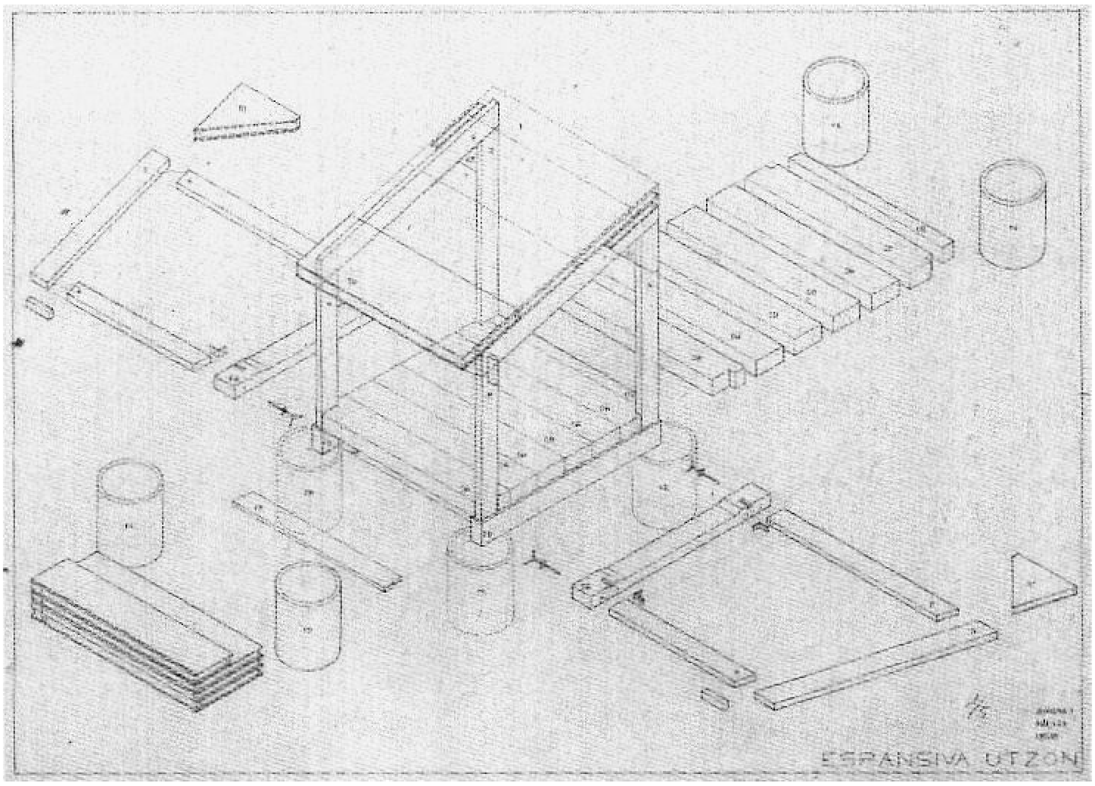


Figure 1-24: Expansiva building system 1970 by Jørn Utzon

It can be summarised that the profession of architecture strives towards aesthetic or artistic building design, with technical performance and design utilised in the service of such a vision. The role education plays in the creation of this situation will be investigated. Kim et al. (2007) notes that: *"Perceptual abilities vary immensely as a function of where an individual voluntarily allocates attention."* Therefore, it is logical to summarise that the educational process, and the content of the education, will play a large part in forming the emphasis of each design team member in both training and practise.

The word technologist clearly indicates the concern and the professional mindset of the person possessing the title: 'A professional who can solve technical problems' would be the simple interpretation, and when talking about an architectural technologist it must be: 'A professional who can solve the technical problems within architecture'! Looking at it this way, one feel inclined to see architectural technology as a part of what is required within architecture, whereas the word 'architecture' embraces all of what architecture takes. Thus one could conclude that the professional possessing the title 'architect' is capable of everything belonging to architecture, whereas the 'architectural technologist' is capable of the more technical part. This is what will be investigated, because it very much affects the position of the two professions in relation to each other and in relation to society. As clearly indicated above, the assumption is that the architect can't embrace everything architecture requires today and especially lack abilities within the more technical areas, thus offering a growing space for the technologist to fill out professionally.

When looking at the European list of 'regulated professions' one also locate the British architectural technologists, but one looks in vain for the Danish bygnings-konstruktør. Also, one can notice that the technologist profession doesn't possess the degree of regulation and recognition as the detailed described professions in the Directive, amongst which the architect can be found (Directive 2005/36/EC).

1.5.2 Education of architectural technologists and politics of organisations

In the UK the education of architectural technologists is going on at more than twenty-four universities. The fact that the professional board in UK (CIAT) has recently gotten a royal charter makes an important and meaningful step forward in the direction of becoming recognised by ordinary people. CIAT issues accreditation to the courses at the universities, thus controlling that certain professional standards are maintained. The courses are of 3 years of theory and additional periods of practise.

In Denmark, where accreditation is a relatively new business, the courses of architectural technology are now accredited by a special state board established for the purpose. The Danish schools are mostly placed in institutions at a level that is not even secondary, but only tertiary to universities, even if the people who graduate now get an officially accepted bachelors degree. Today, this is a special situation in Denmark where educations for school teachers, diploma engineers, nurses, journalists, and professions like those are placed in 'university colleges' that are secondary to universities and are still not research institutions but are supposed to rely on the research provided by the 8 universities. Because the degree received in those colleges are not granted by a university they are called "professional bachelors' degrees", thus indicating that it is more practically orientated than the research based degrees from the universities.

Such a special Danish invention creates of course some extra problems. The universities do not feel inclined to accept graduates with such degrees for further studies at post graduate level, and that is not in line with the intentions in the Bologna Agreement. The Danish report about the follow up on the agreement says: *"All bachelor graduates have access to second cycle programmes (in relevant and/or specific subject areas). Depending on subject area, bridging courses may be necessary. Particularly for professional bachelor graduates access to fulltime second cycle programmes (traditional candidatus programmes) often require completion of additional course*" (Otte et al 2008). This is a truth with "modification". In the case of the architectural technologists there are no relevant courses available in Denmark when this is written. If a technologist wants to continue studies within his/hers chosen area, there are no courses available. If he/she wants to enter the bordering area of architecture he/she has to begin all over again, which a certain number of graduates in fact do every year, thus ending up having studied for 9 years to obtain their two degrees. Earlier, this combination of educations was more common than today, and the business of architecture tends to appreciate employees who possess both degrees.

Considering the growing international competition within almost all professional sectors, it is of course a problem for a small country like Denmark that a considerable number of its educations are ranking lower than those of the competitors in the international market, and one can doubt that this situation will be allowed to last much longer. The Bologna Agreement is obliging the countries to establish a transparent and comparable educational system, and regularly the countries send in reports about the progress they make in that direction. In the latest Danish Bologna report (Otte et al 2008) the technologists are indirectly mentioned. It is said that: *"Institutions providing professionally oriented first cycle higher education (Professional Bachelors' degrees) have been merged into eight multidisciplinary, regionally based university colleges and two engineering colleges in order to create stronger and more modern study environments. In addition, institutions providing professionally oriented short cycle higher education (Academy Professions degrees) have also joined in ten academies of higher education in order to strengthen short cycle programmes and join the university colleges in strengthening and developing programmes in the economic and technical areas."* In fact some of these Academies are also possessing programmes for professional bachelors' degrees and, because they belong to the university college sector in theory, they have had to "join the university colleges" by making partner agreements with them. This is the present situation of the technologist education in Denmark, but according to the latest legislation it should be placed in university colleges by January 2015 at the latest.

There are now 5 Academies and one University College possessing the state accreditation for the architectural technologist education.

Until recently neither Denmark nor the UK offered master degrees within architectural technology. This appears very strange to the author, because this technical discipline is a still growing and still more demanding one that looks no less demanding than the traditional discipline of architecture and many other research based disciplines. In the UK there are now a few universities that offer master courses in the discipline, but in Denmark there is none. Why is that?

In Denmark it is simply because AT has been placed in a none-research based institution, and in UK it is probably because it is such a relatively new discipline at university level. Is the discipline lacking research? It certainly is, as also indicated above. But it is a new research area, more or less ignored until now, which has yet to define itself and to develop research habits and perhaps even methods of its own. The headline could be: "The coherent technical design of buildings." Of course, the research will base itself on more basic research within materials, influences and performance requirements coming from natural science and engineering, but its focus is on how this can be utilised technically in standard constructions, in key junctions and endings and beginnings of building parts. Given this is right, it is also an illusion that universities not possessing the discipline of AT can deliver the necessary relevant research to create the situation described in the Danish Bologna Report 2008: *"A key characteristic of the university college and academy profession sector is the integration and transfer of the latest national and international knowledge, research and development, which must be applied and developed in all programmes and activities as well as in professional practice. This was emphasized in the recent legislative reform of the Professional Bachelors' and Academy Profession degrees, which introduced the term "development based programmes". Development based programmes are characterised by having a strong knowledge triangle integrating profession/professional practice, research and education/training."* Of course the AT discipline has always based itself on the available research of the bordering disciplines and the practice of the industry, but it is an illusion that these areas within engineering and architecture, when it comes to education, cover the core area of another profession, which has its own area of educational activities not covered by the others. This means, as indicated above, that society is missing an important research sector that could cover the gap left by the old handicrafts. The sooner this is realised the better for society and for the members of the profession.

It should be mentioned that the Danish education, despite the fact that it concentrates on the AT discipline mainly, delivers professionals to both the discipline of construction management and the one of facilities management as well. The graduates are competing with building engineers for these areas, because such a small country as Denmark has not found it appropriate to invest in special educations at undergraduate level for these two areas.

Strangely, the Danish education was earlier placed in a more fortunate situation regarding professional development and research. Until 1992 two institutions (Byggeteknisk Højskole) with special regulated constitutions were responsible for the education, and they were obliged to develop their own learning material. In fact, they managed to influence the whole construction industry with a number of inventions regarding planning, coding, and quality management.

1.5.3 Architectural technologists in Denmark and the UK

In Denmark the education of architectural technologists, in Danish "bygningskonstruktører", derives from the old further education of craftsmen to become master builders and has an unbroken history far back in time (Konstruktørforeningen 2011). In the UK the architectural technologist is a newer invention deriving from the profession of architectural technicians, a further education developed from the architectural assistant role traditionally used in Britain (CIAT 2011). If comparing with other European countries one find something like the technologists in a number of countries, but there are also countries where such a profession can't be identified.

In Ireland they have developed AT educations at some of their universities recently (IATGN 2011). Within the last couple of years the Nederlands they has begun an AT education at the Hoegeschool van Amsterdam (HvA 2011). One can see the development those places as very similar to the one in the UK. In Spain they have an old traditional 'technical architect' profession with its own defined professional area of responsibility, relatively independent of the architects (CGATE 2011). But there are countries where they have felt no need for such a profession simply because the education of the architects is very technically orientated and/or because architects only deal with the more outstanding and spectacular building projects, while the majority of buildings are made by master builders who, besides managing the execution, also deliver the necessary drawing and further description material for the building. There are also countries where the architect profession is split up in more areas of specialisation and where some of the courses officially belonging to architecture are rather technically orientated. Here, the architect business can just hire architects with different areas of specialisation to do their projects from the beginning to the end. Thus, we face four principally rather different situations as to the architectural technology discipline in Europe:

1. It is a fully integrated activity within architecture, meaning no separate profession (Germany, Switzerland)

2. It is a totally independent profession not sharing any of the same area of responsibility as the architects, meaning a true profession in its own right. (Spain)

3. It is a hidden activity within architecture undertaken by specialised architects, meaning no separate profession but just a separate activity. (Poland)

4. It is partly a hidden activity and partly an occupation for AT-professionals within the business of architecture, meaning a partly hidden but true profession. (UK, Ireland and Denmark)

Subsequently, the differences between the situation in the UK and in Denmark will be discussed more in detail, as they are significant in certain contexts and deserve to be considered. In the UK the AT professional board (CIAT) recently achieved a Royal Charter and now constitute a recognised profession. Looking at the European Commission's listing of "Regulated professions database" in the list of "regulated professions by country" we find Chartered Architectural Technologist with the ID 7459 in the UK list. If looking at the similar Danish list one can't find the technologist under any name, simply because the profession is not regulated. The UK has 210 regulated professions and Denmark has only 134 regulated professions by December 2009 (http://ec.europa.eu/internal_market/qualifications).

This difference in regulation between the two countries could have different reasons, but at first it appears a little strange that the country, in which AT has been an occupation in the longest period of time (40-50 years), is the one that hasn't regulated the profession. In the Danish list we find "Arkitekt" with the ID 8763 but the title is not really protected in Denmark, and one could suspect that this listing is mainly due to the fact that the profession is so heavily regulated in most other European countries.

In Denmark the architectural technologist profession doesn't possess a real professional board, but has at the time being a "union" as organisation for all graduated architectural technologists. Earlier it was mainly a professional organisation and the change can, among other reasons, be caused by the fact that the graduates possess rather different occupations. Only a quarter of the graduates are working in architects' companies, but of course they all more or less utilise their AT skills in the kind of business they are working in.

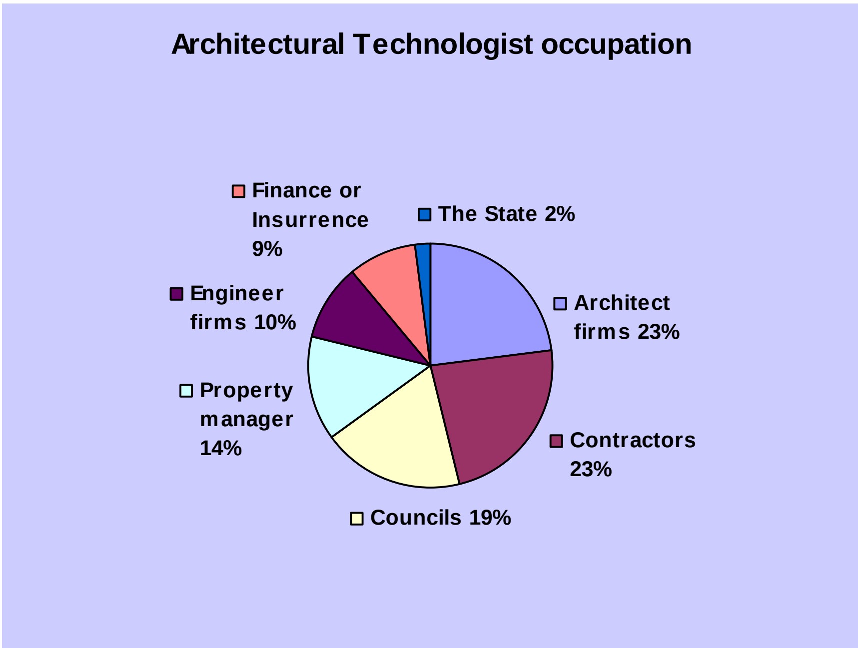


Figure 1-25: Occupation of Danish architectural technologists' (December 2009)[38]

[38] The data are taken from the homepage of the Danish AT organisation KF.

The diagram (Figure 1-25) above is copied from the website of Konstruktørforeningen and shows the occupational distribution of the Danish technologists as it appears to be right now (December 2009): 23% of members are working in architects' offices, 23% in contractors companies, 19% in councils and municipalities, 14% in property administration, 10% in engineering consultancies, 9% within finance and insurance and 2 % are employed by the state.

The profession of architecture is, as previously mentioned, very well known to almost everybody everywhere in the world. How is it with AT? Without being able to give a very accurate detailed answer which would require a more detailed investigation, it would still be safe to say that AT is far from possessing the same position in the minds of people in general. What are the consequences for the profile of the profession?

1.5.4 The image of the architectural technology profession

Following up on the profile of the AT profession one could claim that the profession is almost invisible to ordinary people and has no image at all to people in general. Unfortunately, this is almost true when talking about people outside the building industry. But when looking inside the industry one may face a different situation. When AT professionals graduate from 24 universities in the UK every year and CIAT has 6000 members possessing the technologist membership, surely somebody knows about it. Denmark has nearly the same number of professionals within AT due to the fact that the profession has been there all the time. So, the number of professionals itself should be sufficient to establish a clear profile.

Naturally, it is not only, or even mainly, the number of people possessing a profession that determines how well known and well profiled the profession is. There are relatively few prime ministers in the world and despite that the profession is very well known. This is, of course, because it is considered very important and consequently very much talked about in the media, and because the members of the profession tend to be widely known by name and appearance. They are all celebrities in their home country and some are world famous.

Architecture is considered important as well, and as a result the profession of architecture is well profiled. Some architects are also known by name and by their designs and their buildings. They become known to people belonging to the so called ‘creative classes’, and some have even become celebrities because of their professional achievements.

But architectural technology – what is that? People might ask. One could imagine that ordinary people would consider it a part of the work an architect has to do to complete a building project. The same might apply to many architects who, while being aware of the existence of the technologists, are not used to cooperating with them. It is presumably the same in both the UK and in Denmark. – Will it remain like that, or will one see a growing recognition of the technologists due to professional realisation within the business? This is the question the thesis has been circling around all the time. Being in line with the so called Weberian approach, Keith Macdonald (1997) claims that a profession will try to ‘monopolize’ its area of expertise, but it can be concluded that this has not happened with AT yet, because so many architects are still doing the kind of work in focus.

The technologists in Denmark claim that they are better than the architects when it comes to working with the constructive space described above. This becomes a still more significant reality as times goes by and the area becomes still more demanding. If they are right, society may be witnessing the rise of a new profession within the profession of architecture instead of just seeing lower ranking professionals assisting the architects in doing their jobs, as some architects still tend to see the situation.

1.5.5 Medicine and surgery in comparison with AD and AT

A comparable pair of disciplines to our building design and building technology could in certain contexts be those of medicine and surgery. Instead of dealing with the body of a building they are dealing with the human body. Of course, they are not designing their body but they are maintaining and repairing it when needed, so the comparison is not so much about the more detailed implications of praxis but rather about the relationship between the two professions and their development.

As to the relative importance of the two areas to be compared there is no doubt about the relevance of both to the human society. A building to live in is a more basic need than abilities to treat and repair the human body. Being such a basic need, it presumably came first in human history. But the architectural attribute to buildings could be considered the most exclusive and last human beings would require according to the pyramid of Maslow (1954). However, it constitutes a need for people with the basic needs covered. According to Kenneth Clark in his book Civilisation the most trustworthy historical message about a society is the one given by the architecture it has left to the generations to come (Clark 1971 pp. 1, 330). If this is true, which the author is inclined to believe, architecture has an important role in passing on history to the new generations.

The problem is the almost hidden and presumably underestimated role of AT today and what is causing it. We have architecture as an overall professional area and within it architectural design (AD) and architectural technology (AT) with the first as almost synonymous with architecture in the minds of most people and AT as something not heard of and barely recognised. Thus it would be interesting to see if, within the overall profession of doctors with the two well recognised professions of medicine and surgery one can find reasons for this less recognised position. It is especially interesting if it can be found what technological development has meant to the position of these two other professions (medicine and surgery), because the assumption is that changes in the position for AD and AT were caused by technological development mainly.

According to Brix (1998 p. 405) the Danish education of doctors goes back to the establishment of the University of Copenhagen in 1479. A faculty of medicine was established and for many years it was possible to get an education that was mainly concerning theology, philosophy, Greek and Latin. The practical medical education could only be obtained abroad at universities in central Europe. From 1757 it became possible to get medical training concerning contact with patients at the Royal Frederiks Hospital in Copenhagen, and one bear in mind that this was around the same time the civil architect education was established at the Royal Academy of Fine Art (1754).

Still according to Brix (1998) the profession of surgery was a separate one not covered by the title of 'doctor'. From far back in time barbers and other types of craftsmen had had the responsibility for all surgery. From 1787 a special surgeon academy was established in Copenhagen, and that was initiated because of certain technical scientific inventions. For example the influence of British J. Hunter (1728-1793), who founded scientific surgery at the end of the 18th century by introducing systematic tests on animals; a method that has proved very successful to the profession and is still widely in use (Lauridsen 1998 p. 564). From around this time surgery was not considered a handicraft any more. Now it became a science based activity requiring a higher education but still separated from the doctor's profession.

Bynum and Porter (1993) in their Companion Encyclopaedia of the History of Medicine wrote: *"The licensing of physicians, first recorded in the West in 1140, was in the hands of the Universities. Surgeons, however, were regulated by the trade guilds and had their closest occupational links with the barbers. It became usual though not inevitable, for the two trades to be carried on by a single practitioner, the barber-surgeon.* (....) *Training was by apprenticeship and it seems possible that many surgeons were illiterate"* (Bynum and Porter 1993 p. 968-969).

Shortly after the educational elevation of surgery from pure craftsmanship to a research based profession, young surgeons began – before their surgery education –

to take the basic medical education at the University, thus in the end possessing two educations but preferring to practice one. This caused a new change in the educational system in 1842. Now surgery was made an area of specialization at the university within the doctoral department (Rygaard 1998 p. 564). The historical development could be visualized as in figure 1-26:

Position	Approved reason for change	Position	Approved reason for change	Position	Approved reason for change	Position
since 1842	end 1700s	1736-1841	1543-1736	1543 -1736	1500	Medieval period
Highly recognised at equal level with the medical profession	Applied research (systematic tests on animals)	Recognised profession in own right with surgeon exam	Further development of body of knowledge and technical skills	Still belonging to barber business but later tending to be independent	The new renaissance spirit and technical improvements	Part of the handicraft of the barber

Figure 1-26: The historical development of surgery in Denmark

As can be noticed the three changes were caused by a **new spirit in society**, development of **new scientific and technical knowledge** and finally application of **systematic research**.

Position	Approved reason for change	Position	Approved reason for change	Position	Approved reason for change	Position
since 1788	1788	1672-1788	1672	1479-1672	1479	Medieval period
Highly recognised at research based level	The new master degree in medicine was introduced	A well established and esteemed profession	The university introduces thorough medical subjects	University degree in basic subjects with additional medicine	A university established. Medicine already belonged to universities elsewhere	Self studied profession quacks

Figure 1-27: The historical development of medicine in Denmark

Regarding medicine one can note that an **international trend** placed the education in the university and that improved **concentration on professional subjects and research** and reform of the educational system caused further improvements.

Position	Approved reason for change	Position	Approved reason for change	Position	Approved reason for change	Position
Since 1920	1920	1754-1920	1754	1500-1754	around 1500	Medieval period
Highly recognised at art and research based level	New architectural language and new materials introduced	Now a well established and well esteemed profession	The Architect school at the Royal Academy introduced	Independent profession with practitioners of different educations	The renaissance ideas of the artist, the architect, occurs	Embedded as a part of the handicrafts for building

Figure 1-28: The historical development of architecture (AD) in Denmark

The reasons for change within architecture were an **international** trend about engagement in art followed by the **establishment of an art academy**. The latest change was a result of **artistic development** caused by **technological development**.

Position	Approved reason for change	Position	Approved reason for change	Position	Approved reason for change	Position
Since 1967	1967	1920-1967	around 1920	1857-1920	1857	Medieval period
No possession of own profession. Increasing employment in architect firms	The AT-education is prolonged to 3½ years outside university and research	Some master builders get employed by architects others become contractors	Master builders stop practising formal AT in combination with contracting	A part activity of the business of the master builder	The guilds lose their privileges. Theoretical education of master builders	Embedded as a part of the handicrafts for building

Figure 1-29: The historical development of AT in Denmark

The three important changes within AT were first **new trends** and regulations, next business **development** and finally a need for further education due to the **technological development**.

Looking at AT in Britain one can note a rather parallel development until the beginning of the 20th century. From here Britain and Denmark followed different routes. The Danes ignored that master builders did not do building design any more but became merely contractors and continued to educate people to do both with the result that some went to contracting and others went to the business of architecture. In Britain the combined further education of craftsmen stopped and technicians were introduced to the drawing offices and at the same time architects were encouraged to enter into AT as well. The term master builder now became related to contracting and execution exclusively.

The two pairs of educations and professions show similarities in development (between physicians and architects, and surgeons and technologists) with the architects following physicians regarding time for academic recognition in Denmark. The initial idea of our comparison was that architecture and medicine had something in common, and that surgery and AT, dealing more with 'technical matters' also were comparable in some sense. Since Denmark is such a small country and Britain is within our concern as well, a look at the development of AT there is also relevant.

Position	Approved reason for change	Position	Approved reason for change	Position	Approved reason for change	Position
Since 1992	1992	1920-1992	around 1920	?-1920	?	Medieval period
No posses-sion of own profession. Increasing employment in architect firms	Introduction of AT courses of 4 years at university	Architects do parts of the job and craftsmen and technicians do the rest	Master builders stop practising formal AT in combination with contracting	Still a part activity of the business of the master builder	The guilds lose their privileges. Theoretical education of master builders	Embedded as a part of the handicrafts for building

Figure 1-30: The historical development of AT in Britain

In the development from 1920 till now it can be noticed that AT in Britain has followed a different route from that of AT in Denmark. The technological development in the two countries has, seen from an overall point of view, been rather parallel due to the general high level of information and contact in 20th century Europe. The differences belong to the different educational backgrounds of the people who engaged in AT activities. In both countries one can note a very late breakthrough of technological development away from the technology of the old handicrafts. The following figures 1-30 and 1-31 are meant to ease a comparison.

AT in	1992-2010	1920-1992	Before 1920
Britain	Architects + Technologists + Technicians	Architects + Technicians Master builders + Craftsmen	

AT in	1967-2010	1920-1967	Before 1920
Denmark	Architects + Technologists	Architects + (Technologists) + Master builders Craftsmen	Master builders + Craftsmen

AT embedded in the traditional handicrafts

AT as a science and technology based activity in consultant firms

Figure 1-31: The development of AT from handicraft to technology

A difference not shown in the two national diagrams is that the Danish technologists until 2000 were all trained as craftsmen before their further education to become technologists or in the old days to become master builders. It is still so that nearly 50% of the technologist students have the background of a craftsman before their technology study but as thoroughly discussed the so called ‘handicrafts’ of today are far from the former high level. However, when comparing with surgery one can note a very late development away from the handicrafts.

Surgery in	1842-2010	1736-1842	1543-1736	Before 1543
Denmark	University educated surgeons	Surgeons with recognized exam	Surgeons Barbers	Barber surgeons

Surgery embedded in the traditional handicrafts

Surgery as a science and technology based activity in consultant firms and hospitals

Figure 1-32: Surgery from handicraft to science and technology

Comparing AT with surgery based on figure 1-30 and 1-31 one could claim that AT at the time being is situated where surgery was before and around 1842 regarding technological development and scientific activities. In Denmark surgery became a fully recognized university education in 1842, which has been the case for AT in Britain since 1992 but is still not so in Denmark. It can also be added that surgery has required a master's level since its entrance to university and that AT normally is practiced on the basis of a bachelor's level. Why this difference in a modern rapidly developing world of science and technology?

An attempted answer could be that the handicrafts, traditionally belonging to the body of the building, originally proved so attractive that change was resisted by many people and that the idea of the good old handicrafts still appears appealing to so many. Whereas surgeons 'just' had to repair and maintain the human body and not change it from its original good performance and therefore without public resistance could improve their ability to do so, AT had to apply new 'organs' in new building bodies and sometimes new organs in building bodies looking the very same as the old ones because people tended to prefer the relative beauty of the well known traditional building bodies.

This created a situation with relatively small steps taken to just improve buildings where most people were convinced about the advantage of doing so. The improvements were mainly involving technical installations, new building materials and small attempts to prefabricate building parts, but for different reasons quite many people prefer the traditional old building body to the brand new looking one. It is in fact the same with fine arts like the art of painting where the new abstract painters only slowly become accepted. It was never really realized that AT could improve life for people, whereas surgery, becoming still more advanced, was highly appreciated from the very beginning of modern times.

Now, society faces a series of new requirements to the performance of the building body and that might support a realization of the importance of AT as the right balanced technical design involving all possible requirements to improve the life of people. Like a breakthrough within research activities promoted surgery from a position second to medicine the same might happen for AT in relation to AD. Also the international trend of placing AT in universities will probably cause a change to the same placement of AT in Denmark and then the door will open to the field of research.

1.6 Discussion

1.6.1 Summary

Literature has provided us with many aspects with regard to the profession of architectural technology and its rise within the profession of architecture. First, we have considered the history and have noticed that in the medieval period both architectural design and architectural technology were embedded in the building handicrafts. We saw how architectural design with regard to more important buildings stepped out and became an independent profession from the renaissance with a beginning in Northern Italy that spread to the rest of Europe.

As long as the disciplines were embedded in the handicrafts they were not recognized as separate activities but one must assume that the production of drawings was seen as an activity different from the execution of the work in the workshop, which was again different from the work at the building site. It could be diagrammatically illustrated as can be seen in figure 1-32.

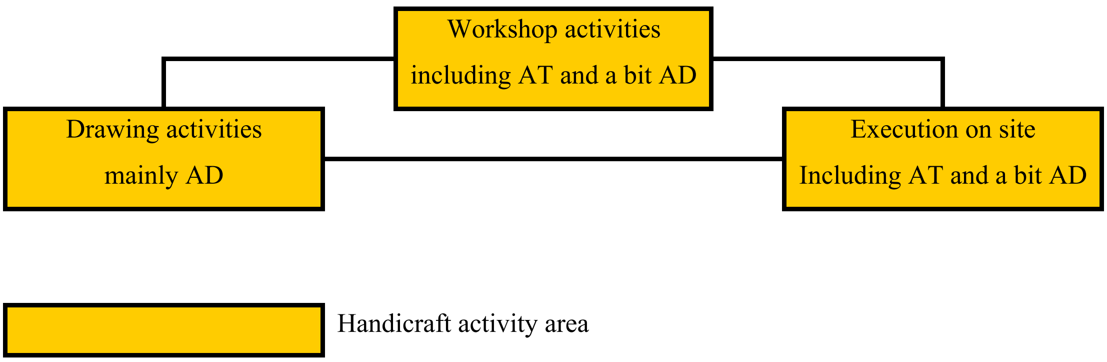


Figure 1-33: Activities embedded in the handicrafts in the medieval period

From the renaissance and onwards to the mid 20th century the drawing activities concerning architectural design constituted the architectural business as we have seen whereas the architectural technology activity remained an unnoticed part of the habits of the handicrafts. This is pictured in figure 1-34.

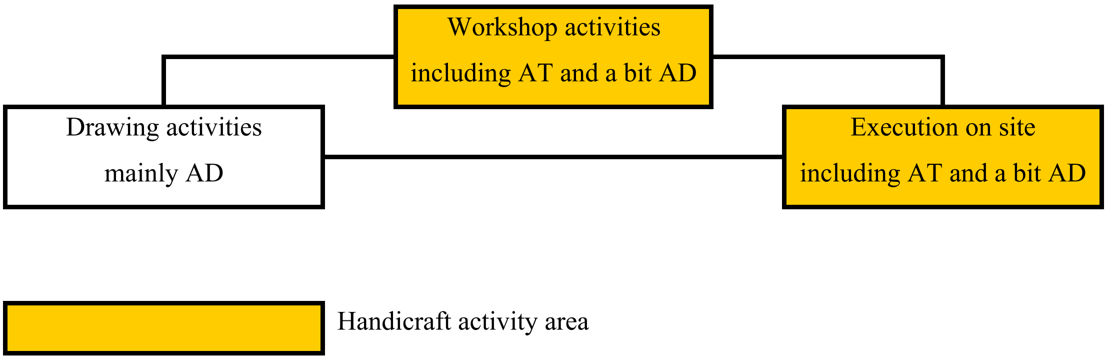


Figure 1-34: The handicraft activity from renaissance to mid 20th century

Now the situation has developed to what is pictured in figure 1-35:

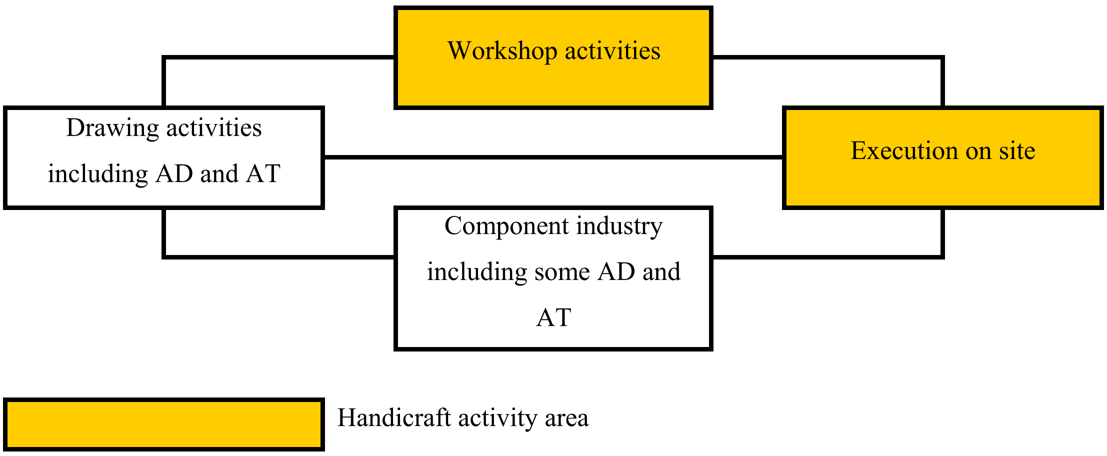


Figure 1-35: The handicraft activity area of today

A change can be noticed in the activities within the drawing office, from a relatively narrow AD activity when artists like painters and sculptors first took the role of the architect in the renaissance, over the educated architect with his roots in the handicrafts, to today's comprehensive area of responsibility including both AD and AT in relation to quite new materials and techniques with very little relation to the old handicrafts.

It has become clear that the drawing office is not (yet) really recognising AT as a new area of activities that deserves a separate education, even if it is well known in the industry that AT-specialists become graduated in an increasing number. That this has to do with the profiling of professions is quite obvious. A clear tendency to simply identify the architect profession with the area of responsibility of the architect business was also noticed due to tradition and the naming of the profession and the business. Thus people from outside the industry will tend to see an architect as a professional who covers all the area of responsibility of the architects business – helped by some assistants naturally. There is no common suspicion that architects are not qualified within all the technicalities of a building. That architects are not eager to correct this mistake is no surprise, considering the investigation in how professions constitute themselves (chapter1.3.3).

It can be noticed that AT outside Denmark now is a subject covered by university educations at honours degree level and this alone points at a position more important than that of an assistant. A comparison with surgery showed an original position in society in the medieval period where both AT and surgery activities were embedded in handicrafts and it showed how AT remained there for a long time while surgery began a research based development into the highest possible position of a profession. AT-research is first in its beginning now because of the ignorance of the industry itself, presumably due to the fact that fame here traditionally was linked to art and design and not to technical inventions.

The technical area has been considered belonging to engineers since the first industrial activities and it is not until now society is faced with the consequences of its lack of attention to the coherent technical design. Surprisingly, it was never realised to be demanding to the same extent as all the old handicrafts themselves. But it is not just replacing the technical implications of the single handicraft; it attempts to replace the implications of all of them together in one coordinated and balanced activity. The production activities covered by consultant engineers tend to be new and related to installations and advanced structural systems, whereas most important decisions from the traditional handicrafts went into the drawing office of the architect.

It was noticed that today's theoretical education of architects is no longer than it traditionally was, and if AT-specialists are not made responsible for the invading AT-activities there is a situation where people without appropriate theoretical training are taking the responsibility for this very important part of a building project. This being the case, it is fair to suspect that a change to more use of AT-specialists will mean a serious improvement of the technical quality of buildings.

It is not known how well informed professionals will respond to questions about all this if directly asked. We only know that AT is never mentioned as an activity in its own right in the writings from architects and architect organizations. Lately employed architects in Denmark have seen AT-specialists as competitors, but it can be noticed that employer's organizations are cooperating with the organizations of technologists in both the UK and Denmark.

1.6.2 The literature and the hypotheses

Before further investigations a look at the hypotheses and what literature had to indicate about them seems appropriate. The first hypothesis was:

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

The first part of hypothesis 1 states: "***Architectural Technology is an activity which was embedded historically in the old handicrafts ...***"

Did the literature say anything about this? Yes, but only indirectly. It is not really seen this way before because AT by its very nature is a rather different activity in its working environment and its comprehensive production of drawings and documents from the exercise of the old handicrafts. The fact that it is a new way of making the kind of decisions that belongs to the here called constructive space hasn't really been noticed. The literature says directly that the old handicrafts are gone and that they embedded most, if not all, of the more technical solutions for the majority of buildings in Europe before the mid of the last century. This is also in line with the personal experiences of the author.

The last part of hypothesis 1 says that AT "***now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.***"

The identified literature strongly states that new materials and new technologies have caused an extra burden to the drawing offices and the resulting work is called AT. Within architectural literature we find AT mentioned as an activity belonging to the drawing office but not that it belongs to another profession than the one of the architects. What is accepted in architectural literature is AT's historical relation to the handicrafts but rather far back in time. The clear identification of AT as something originally belonging directly to the handicrafts can't be found. Thus the literature supports the hypothesis well; except for the idea that AT came from the handicrafts. It is as if no connection between the handicraft solution and the new technology solution to the same kinds of technical problems is recognised or thought about. Therefore, it is not really questioned if somebody else than the architect should take the responsibility for AT, as the master builders did it in the old days.

How is it then with hypothesis 2?

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

Literature clearly shows the existence of the discipline but doesn't really tend to see it as a *"profession in its own right"* partly because it is also practised by educated architects. On the other hand, it is clearly indicated that there is an increasing number of architectural technologists employed in the drawing offices and that they naturally do the AT job there. So, the question is then if the technologists are seen as useful assistants or as fully qualified professionals and whether they live up to the given reputation or image as we earlier put it. Looking at the quality of the education of architectural technologists then becomes important along with the opinion of professionals.

In the chapter about professions we noticed that education was seen as one of the prime indicators of professional recognition. The fact that Britain has made the subject the core of a new university education provides a substantial indicator but not enough for us to conclude a profession in its own right. By the help of literature the formal educational environment became noticed but how qualified the studies within the educations are is still to be investigated. The reputation of the practitioners was also seen as an important indicator along with a number of other factors which can be found at page 94.

Subsequently, it would be appropriate to undertake study of how professionals regard AT in relation to the old handicrafts and to achieve clear information on how they see the position of the AT-profession. It is also noticeable that more information about the contents of the educations to be compared will be necessary in order to reach a conclusion on the hypotheses and what has been discussed in general.

Simple logic contemplation about the type of questions the handicrafts traditionally gave an answer to leads to the conclusion that many of the same principal questions are still asked and sought for answers to within the frame of new technologies and materials. By looking at the content of the educations and by asking respondents to reply to questions that link to the content of the handicrafts we might get the connection confirmed.

2 The Research Methodology

Four questions to answer

Initial status

Methods

Aims and practical considerations

Tailoring the methods

Study overview

2.1 Four questions to answer

The hypotheses tested within this research have been informed by the literature review, to the extent that those topics which require primary data collection have been clarified, namely the areas of training, education and the professional design team. Therefore it is useful at this stage to reflect again on the hypotheses themselves:

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

Taken together, the hypotheses tend to enquire about the position of AT in industry and society and to understand how this may develop. So the literature review dealt with a number of approaches and topics:

- Personal experiences of a professional (Preface pp. 13-24)
- The relation to the handicrafts (Literature review pp. 37-48)
- The relation to the master builder (Literature review pp. 49-56)
- The relation to the architect (Literature review pp.57-86)
- The relation to the general idea of a profession (Literature review pp. 87-128)
- The profession similarities and differences to surgery and medicine (Literature review pp.129-136)

This has given valuable and sufficient information about the history of AT along with a certain awareness about the extent to which society recognises AT as a profession today. What was not known and was necessary to gain further insight on in order to reach the aim and test the second hypothesis were answers to the following questions:

1. How do the educational curricula of architects and architectural technologists relate?
2. How does the content of AT-education relate to required AT-skills?
3. How do construction professionals see the relevance of AT as a separate education?
4. How do construction professionals see the relationship between AD and AT?

To gain clarity it is necessary to address a range of respondent groups. The research method can be illustrated by figure 2-1 showing how the results of the investigations to acquire answers to the four questions are meant to picture the position of AT in society and within the drawing office of today.

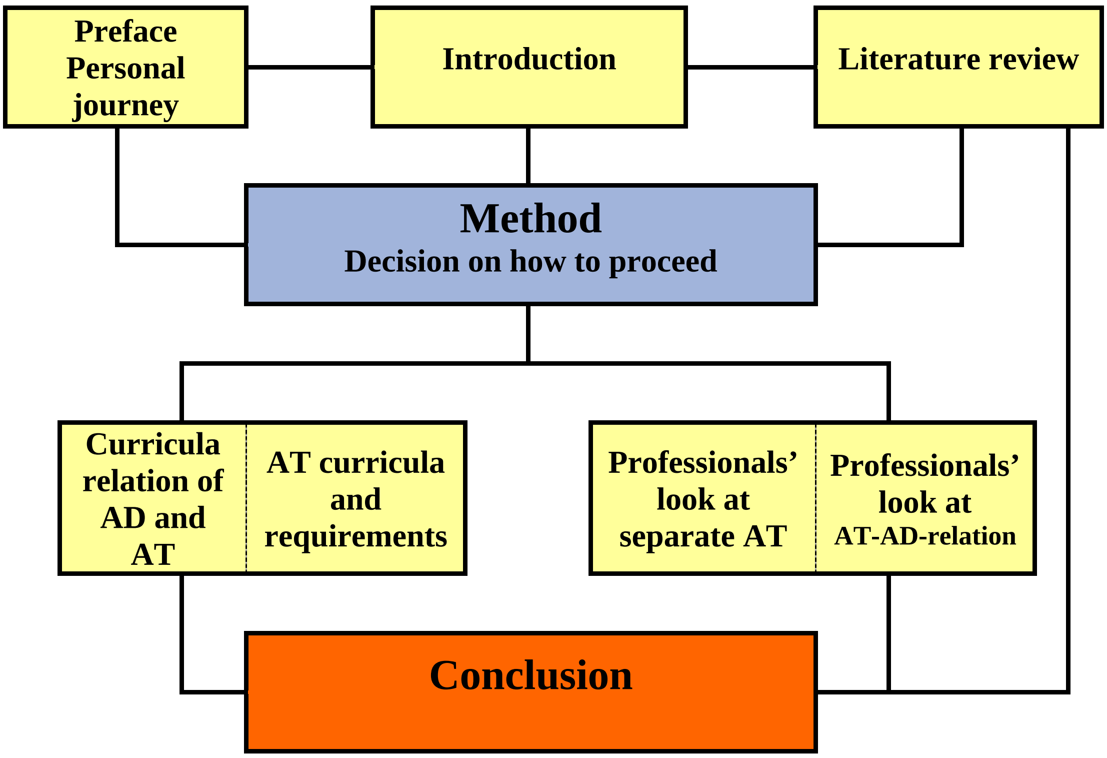


Figure 2-1: Method diagram showing data collection content

However, figure 2-1 is picturing the desired content of the data collection when it is finished, it doesn't illustrate how to get to such result.

2.2 Initial status

Before the search for the further necessary data samples begins a view over the status of the whole investigation might be appropriate. A lot of information from a number of sources has been collected among what quantitative data are provided by a new statistic use of information from literature. So what is achieved?

1. First the life story of the author, with a reference to Plummer (1982), was used to produce two hypotheses. This personal experience description is in line with the recommendations of Herbert Blumer (1962) who argues "*that sociologists must immerse themselves in the area of life they seek to investigate*". Without being a sociologist but an architect and a lecturer of architectural technology the author can claim to have done so, much further than any sociologist would have been able to.

2. Next architecture, architectural technology, craftsmanship and the role of the master builder have been defined by the means of scientific literature and have given a certain indication of the relationship between AT and the drawing and information activity of the traditional master builder.

3. Furthermore, the means of literature and statistics based on existing data etc. have shown a close relationship between craftsmanship and most of the traditional architectural training until the Second World War.

4. Literature has also given a clear indication of how relatively far behind the status of the surgeon the architectural technologist must be seen with the eyes of informed people. Despite the fact that the discipline is old, the profession as such is new and barely recognised by society.

Collection of both quantitative data and qualitative data to get on with the investigation has been scheduled and it could be asked why both are done?

The answer is that it might be possible to collect quantitative data about more simple facts, but not about everything important to obtain knowledge about. Some of the concerns appear so complicated that it would be hard to get anyone to give an answer to the comprehensive questionnaires that surely would be needed for the purpose. Balance is necessary; so one have to see how far it is possible to go with the questionnaire tool and then try to produce the rest of the desired information by other means. As stated by Goldman (1986 p. 3): "*So the evaluation of epistemic procedures, methods, processes, or arrangements must appeal to truth-conduciveness, an objective standard of assessment.*" Along with carefully selected epistemological approaches to secure as objective conclusions as possible it also seems necessary to apply steps in the direction of a new ontology to be able to express ideas precisely (Dancy 2001 p. 1, McGuinness et al. 2000). The main subject has been ignored to the extent that it has already been necessary to define well known terms more detailed or to use them in a more narrow sense to be able to express ideas and findings sufficiently and most likely it may prove necessary to go further in that direction to conclude the thesis (McGuinness et al. 2000).

Quantitative data are sometimes considered the most reliable, probably because they look more like the measure results natural scientists normally produce (Marshall et al. 1988). But leaning towards Atkinson (1978) it could be claimed that it is more a question about what one is looking for that should decide the method to use than the psychological reliability of methods where people are trapped by the logic of the math and will tend to doubt the written or spoken word (Bryman 1988).

2.3 Methods

When selecting an appropriate methodology for research, a number of approaches can be considered as fit for purpose (Haralambos and Holborn 2007 pp. 786-853):

- What can be extracted from literature (Walliman 2005 p. 274)
- Questionnaires to selected groups (Haralambos and Holborn 2007 pp. 803-845)
- Interviews (for example focus groups) (Walliman 2005 p. 284)

Bryman (2001) points at the possibility of using two strategies to get different aspects of a subject to be investigated enlightened. This might prove useful here where we could get quantitative data from questionnaires debated by interviewing people with a professional insight to get a qualified interpretation of the meaning of the data. The idea of "triangulation" and/or using "combined methods" as an approach appears promising as a method to provide the desired understanding of the phenomena this thesis has already been circling around at length (Haralambos and Holborn 2007 p. 846). But first there is a need to specify what to study.

Therefore, considering the four issues to be addressed, it is necessary to identify exactly what to know and, afterwards, where the useful knowledge may reside.

2.3.1 Educational curricula of AD and AT

That AD (architectural design) is a core area of architectural education is evident and not to be discussed here. However, what might be the situation within AT is a potentially complex matter requiring study. There is a need to identify what the technical design work is in the understanding of the drawing office and then see to what extend it is a part of the education of architects (McGuinnes et al. 2000, Klausen, Michelsen and Posselt 2008 p. 351).

It is argued that an abstraction of practice within AD, which can be used to structure the enquiry, is that of the phase model. Architectural organisations themselves claim to be responsible for, and utilise, the 'phase model' or 'stage model' which is a shared tool in both UK and Denmark.

However, to see to what extent the technical design work is a part of the education one could look in curricula or ask relevant groups familiar with the content of the education about it. The latter can be achieved through use of a **questionnaire** addressed to students or graduates. The possibility of directly sampling from lecturing staff should be considered, although it could be argued that the knowledge and the ability of the graduates remain central to the research. This consideration points towards the newly graduated as the group most likely to be able to give an answer to questions about the content of their education.

2.3.2 AT curricula and AT-skills

AT curricula and AT skills are defined by the area of activities to be undertaken in the drawing office and the content of education of architectural technologists. The first part will be the same activity regarding the phase model as mentioned in 2.3.1 and the content of the education of technologists can likewise be found by addressing a group of relevant graduates.

2.3.3 Professional groups

The research addressed the issue of how relevant professional bodies regard the role and expertise of the AT. The notion of their activities being something equivalent to what the master builders did earlier was investigated further. If they are really in charge of the technical part of the project work they can truly be said to fill some of the gap left by the crafts and the master builders.

This approach is not meant to say that anyone in a superior position has aimed to let the two educations share the responsibility of qualifying for the activities in the architect's drawing office. This has probably not happened anywhere. No, it is just meant to say that the educations in fact might share the coverage of the area. It is not known to what extent this is true and it is therefore important to uncover the facts about this. If the educations with a reasonable overlapping share the area of responsibilities it could be due to an awareness of the actual needs in combination with the result of the different mindsets already discussed.

The investigation could again take the form of professionals debating the results from questionnaires sent to both groups of graduates. It might also be interesting to know what the professionals think about the educational coverage of the area. Their opinion about what architecture is covering in Denmark is already available (Hougaard 2007) but equivalent information about the architectural technologists is lacking. The same can be said about the situation in UK where only the RIBA report (2005) gives certain information. Therefore, a 'focus group' debating the findings from the questionnaire was deemed to be an appropriate tool to get information about what the industry experiences in this regard, as this allowed for open debate of the core issues, and recognized that there was a need to have an open debate among the professional bodies, with representative members.

2.4 Aims and practical considerations

2.4.1 Aims

The described research methods are in use within various branches of the social sciences in which the approaches taken in this research are common. It is also important to recognise that prior knowledge of the discipline areas of architecture and architectural technology is essential to recognise and support the context for the work (Haralambos and Holeborn 2008 pp. 787-853). The research also finds itself rooted in a comprehensive historical view of the constituent disciplines, including the collection of secondary information from those art historians who have concentrated on architecture and the history of building.

If the hypotheses are tested and found to be true the methods provide the basis for a new and higher level of awareness and consciousness within the business of architecture and might turn the opinion of for example people who consider the technologists as competitors to the architects (Hougaard 2007).

Until the mid 1960s carpenters and joiners did not compete. Both crafts were dealing with wood as their basic material but they had their clearly limited areas within the construction industry. Originally there might not have been two crafts but only one craft dealing with wood. But as the industry developed some proved better at the more detailed small scale and fine work that became the joiner's area whereas others proved better at the geometrically more demanding but rougher work that became the area of the carpenter. In the end it was the rather different tools and the geometry skills that parted the two construction crafts dealing with wood.

This metaphor is of course not covering the situation of architects and architectural technologists perfectly, but it points at principle reasons for the parting of a profession into two. There were two factors: 1.different tools and 2.different techniques. It proved simply less efficient for society to keep all of it within one single handicraft; it had become too much for one person to be good at it all. Now this is gone again; it has again become one craft or should we say business for skilled workers. Why is that? Simply because what before made it complicated and too much for one single business is gone. Where did it go? Did society begin to require less complicated buildings? No, the business simply went to somebody else.

To whom did it go? – Obviously much of it went to the manufacturing industry and quite as obvious much also went to the desk within the drawing office to be drawn, described, and specified, this way replacing the implications of the old handicrafts of carpentry and joinery. But there were other handicrafts involved weren't there? Yes, there were; there were the crafts of the masons, plasterers, plumbers, bricklayers, blacksmiths, painters and thatches among others. All of this became simplified in workshops and on building sites, when the more demanding activities went partly to the manufacturing industry and partly to the desk of the drawing office. The latter thing, due to the fact that thousands of new materials are taken into use and brand new designs are introduced. This is saying that the work in the drawing office has become still more complicated and still more technically demanding. When that happened to woodwork it went from one to two or even more professions, and now it looks like it is time to recognise a new profession within the profession of architecture in order to serve society the best possible way within the field.

Serving society the best way is of course an important issue and there is no guarantee that things will turn out that way because it requires a level of awareness that barely exists. It is a serious risk that it would lower the quality of the buildings the architects and the technologists are going to cooperate about, if they are running independent businesses instead of remaining inside an overall business of architecture. The separations of all the kinds of engineering have more or less proven this at an earlier stage as mentioned. Fortunately new 3D tools and BIM (Building Information Modelling) requirements call for closer cooperation between all parties and might improve the quality; but the closer people who are supposed to cooperate are positioned the easier their cooperation will become.

2.4.2 Practical considerations

A questionnaire addressed to newly graduated architecture and architectural technology professionals was employed to obtain data from both the UK and Denmark. So that sums up to be 4 sets of data to be compared: architects to technologists and UK to Denmark.

Now the question is how to get in contact with such four groups of recently graduated people and if the access in principle can be the same in the UK and Denmark, because despite all similarities there are also significant cultural differences to overcome. To secure consistency of the collected data and that they can be compared to give qualified results it would be best if the four groups could be addressed the very same way. This means the same questionnaire to be handled the very same way and perhaps even sent to them the same way.

When the questionnaire is designed, which will be discussed in the chapter about the experience of graduates, it becomes a question how to get in contact with the respondents? Should it be by ordinary mail or by e-mail? Both mail methods provides problems and one can only expect a low percentage of answers because people nowadays are so used to get all kinds of requests for participation in surveys and receive opinionaires about almost everything. So, how is enough response secured? – The simple answer is that it can't be secured. One just has to try to convince the newly graduated people that their reply could prove important to their own future.

The desired knowledge from the graduates is not their opinion about anything but what they have gone through during their education. This probably means that the necessary number of respondents could be much fewer due to the fact that they might more or less have gone through the same in their institutions and that is the only thing they are asked about.

If it proved possible to get the organisations to address their newly graduated members on behalf of the research at hand it would be perfect because the organisations have the addresses and because their recommendation and support probably would impress the respondents much more than the researcher would be able to do alone. Another good thing about such a contact to the organisations is that it might make them curious about the final findings thus indirectly establishing attention to the project from some key role players in the industry.

With regard to the rest of the wanted data, the qualitative data, it would be appropriate to establish a focus group of rather qualified professionals from different positions primarily to discuss the data collected from the graduates to have them interpreted in a correct way and secondarily to debate the other issues to get enlightened. Getting quantitative data from both UK and Denmark might cause a need for two national focus groups one from each country to discuss and debate because familiarity with the local conditions must be mandatory to all participants. To get some well-respected professional key persons to participate would be ideal.

To run a focus group of UK professionals will naturally require a meeting somewhere in UK and the highest concentration of the wanted kind of people can probably be found in the London area. For Denmark the same conclusion can be made, namely that the most appropriate place to run a focus group would be in Copenhagen for the very same reasons. So, this is then what to do.

2.5 Tailoring the methods

2.5.1 Survey of graduates

The questionnaire is of course crucial to the whole project. How can the questions be asked in a way that will make the respondents give answer to the overall question about what they have gone through during their education as architects, respectively architectural technologists? Especially, how can they be asked in a way that will show not only some headlines that in one university might mean one thing and in another one something else, but a way that will also give a precise picture of what they have obtained as students? Also, how a questionnaire to architects and technologists can be presented in a manner both groups will interpret the same way?

The answer to this is of course to find a means all will understand and interpret the very same way. Does such a means exist and does it also bridge the cultural differences between UK and Denmark? – Yes, indeed. – And that would be the RIBA phase model. The model is in use all over the UK and the Danish version is so close to the British one that one can rely on it to be understood very well in both countries and by both architects and architectural technologists in both places. This is the assumption, and none of the good advisors of this project in Aberdeen or anyone else who have heard about it have contradicted the idea. It is also assumed that the replies will indicate any discrepancies if such occur.

The only worry about the use of the phase model might be the risk that newly graduated architects have not been familiarised with it during their studies because of the assumed concentration on the initial phases only. However, the titles of each phase are more or less self explanatory and should not require more justification for professionals to understand. The model is shown below so the reader can make a personal judgement about this argument.[39]

[39] That the model doesn't consider for example the common 'design and built' organisation directly does not mean that the professional activities embedded in the stages are not required within such project organisations. Thus it can show the very nature of all taught and trained activities.

Figure 2-2 shows the new 2007 version and instead of phases it is talking about stages, which shouldn't be a problem. But because the group of graduates to be addressed can be assumed to be more familiar with the former version it might be preferable to use that one in order to avoid confusion and because the differences don't matter for the purpose where a relatively rough estimate is wanted. The letter names are kept and an almost self explanatory wording can still be noticed in the new version.

How exactly can this model be used? If a graduate is asked about to what degree he or she has been occupied with load bearing structures it is important to know what stages or phases the activities belonged to, to know what character the studies had. In the concept phase the activity has only been a choice amongst different principles based on pure design and appearance ideas and has normally been without any more technical considerations, but if it has involved the next stages it might have been of a far more technical nature. The stages or phases can be used to see what character the studies of the individual have had and afterwards the four groups of professionals to be addressed can be compared and it can be seen to what extent they have been dealing with the more technical part of the activities belonging to the drawing office.

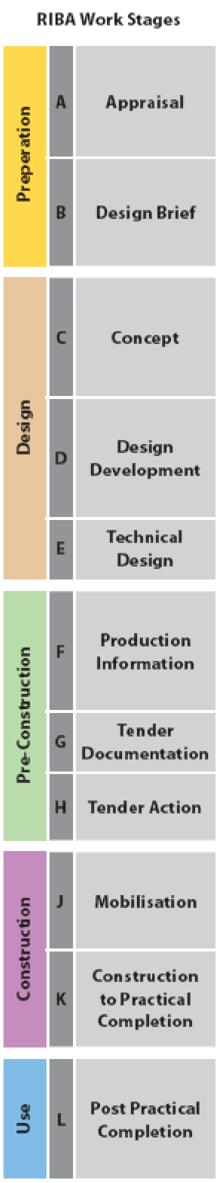


Figure 2-2: The RIBA stage model

But more than the phase model is needed to see what people have been doing because there are so many part activities going on within each phase and there might even be activities that don't belong directly to any phase like for example history of architecture and architectural theory etc.

Here problems might occur because different universities tend to put different titles on the same activities and vice versa use the same titles for different activities. This is the kind of problem Ali Alai faced during his thesis work titled "Knowledge Requirements in Architecture" (Alai 1998 pp. 72-73)

About this problem Alai says: *"Subject courses have different characteristics. Some of them may be considered as those used (directly or indirectly) in design e.g. history of architecture or construction and some as those which are required for other reasons e.g. architectural practice. In order to be more precise about materials taught, we need to extract the items of each subject course. A total number of 1362 items of knowledge was derived from the subject syllabuses of fourteen schools of architecture."* Later on he continues: *"Different expressions have been used by teachers for explaining the contents of items of knowledge. An item listed in a course syllabus may cover a whole lecture or a part of it. This actually depends on the structure of the course. Teachers may assemble similar material into quite different course structures. Therefore the terms (both words and phrases) used to describe these items and the ways in which they are assembled, can vary among different teachers."*
(Alai 1998 pp. 72-73)

Alai was using the syllabuses of the schools and it seems as an impossible route to follow when addressing graduates from so many different schools. So, what can be done? - If all relevant items are grouped in relatively few main groups and clear names are given to these groups so that all professionals will easily understand to what group a study activity will belong it might be possible to surpass these problems, so to speak. Is it possible to do so? Wouldn't there be too many groups bearing the 1362 items of Alai in mind? No, probably not. The questionnaire shouldn't be too comprehensive if a reasonable number of graduates are expected to respond and considering that the phase model is already introduced, a maximum of ten groups of items or areas of study activities should be identified and used.

Another thought: As when designing a building, the studies might not just add item to item because it is such a complicated thing in the minds of people. No, a standard study will get back to a theme again and again in order to establish a still higher level of understanding and ability. It can be concluded that similar named activities, going on in the first semester and in the eighth semester, represent rather different levels of insight and resulting abilities. This leads to the idea of using the year of study to indicate this.

As a result of these considerations it is relevant to ask graduates about their study activities within a maximum of **ten overall subjects** and ask when in their **period of studies** it took place and also **what phases** in the phase model the activities related to. It could get rather complicated and there is a need to be very careful not to overdo this questionnaire thus causing too few responses.

Bearing in mind the main goal to make a clear but not necessarily very detailed comparison, it would be an aim to make the whole thing so accessible that it doesn't take more than around 20 minutes to fill in the form.

It is a well known procedure within research to test for example questionnaires in a pilot test before sending them to the real group of respondents. All the above mentioned complications considered it appears necessary to do so with a draft questionnaire.

Perhaps the graphic design of the questionnaire could also contribute positively to the accessibility of it. This will also automatically be tested by the pilot addressees, and if they are people with whom there could be a dialog afterwards, chances of a good result are fair.

2.5.2 The focus group

The focus group was, as the reader will remember, meant to debate the **quantitative datasets** from the graduates and also, to the extent possible, to consider other matters regarding the hypotheses as mentioned above. That was about the learning environments and the resulting **mindsets** within the two or more correctly four kinds of educations to deal with. Furthermore, there was the question about **informal training** going on in the drawing office, if the technologists are tending to **fill a gap left by the craftsmen or master builders** and whether society would profit from giving the AT profession a relatively stronger position in the designing process.

So the question is now how such a focus group should be put together. Of course all participants must have a substantial professional background but of course a background of teaching would also be desirable. Perhaps even a political background from the involved professional bodies would be valuable to get some of the more subtle questions regarding the professional position in society considered.

A list of what to debate could look like this:

1. **Content of education (the datasets)**
2. **Extent and character of informal training in drawing offices**
3. **Whether the technologists partly make the type of decisions the craftsmen made**
4. **If it would be appropriate with a stronger position to the technologists**
5. **The mindsets of the two kinds of professionals**

The qualified people for such a discussion could be people from the two kinds of education, people representing the professional organisations and representatives from the management of larger drawing offices. If two from each category were invited it would sum to 2 from architectural education, 2 from education of technologists, 2 from architects association, 2 from the AT association and 2 from drawing office management. In total 10 persons. Inviting two from each category might cover a situation where one gets ill or for other reasons might not be able to attend.

10 persons in a focus group is said to be slightly too many to establish the best possible social environment for a debate whereas 6 – 8 persons is being considered a better number when wishing to involve everybody in the debate. So if 10 professionals are invited then maybe eight will show up and there will most likely be at least one representative from each of the above mentioned categories.

The invited participants will all be interested in the topics to discuss and will more or less share the same profession or the neighbouring profession within building design. This is in line with the recommendations of Morgan (2006) who claim that in such a group the conversation will go easier and that the participants might stimulate each other to exchange ideas without need of support from the interviewer. It can be hoped that the focus group interviews will turn out that way.

A number of individual interviews would be an alternative but this would obviously miss the extra quality of the participants influencing each other and qualifying each other's opinions by argumentation and different points of view. The aim is to get as informed and qualified an opinion from each participant as possible. To get to that point it could be secured that the participants get all relevant information about the questionnaire responses and some supplement that will introduce the other aspects to be discussed. Also, it could be an advantage to give the participants the opportunity to control and react to the report from the meeting to be sure that all agree to the conclusion of the focus group even if one or two don't really share the opinion fully.

2.6 Study overview

As a means for the further tests of the hypotheses three studies have been suggested and it is supposed that they along with what already is achieved from literature can lead to a well based conclusion. Then the whole thesis work can be seen as it is illustrated in the diagram below:

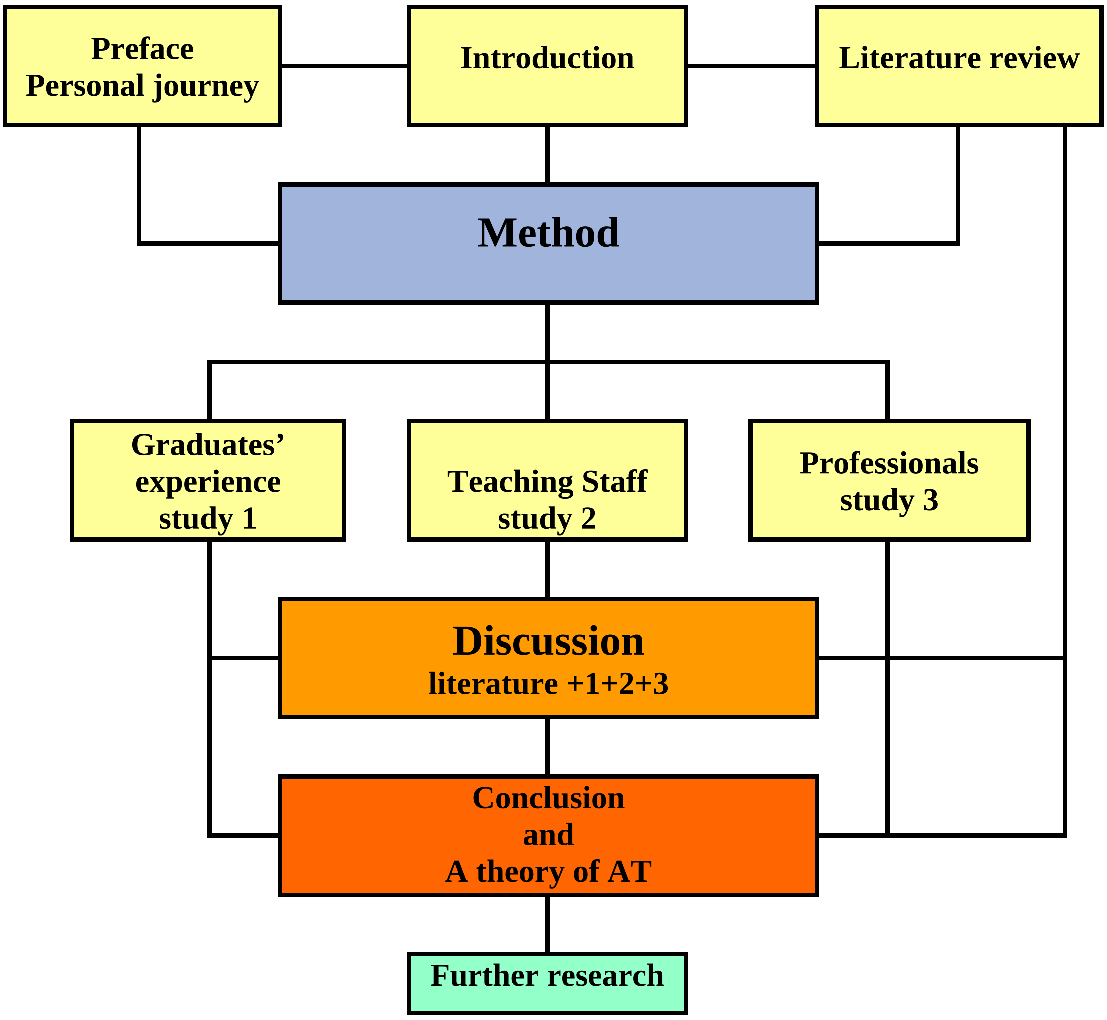


Figure 2-3: Diagram of whole study

As can be seen it is also forecasted that the conclusion will provide a good basis for a description of an overall theory of AT and that it is possible to outline further research to undertake within AT based on the theory.

3 Study 1 - the Experience of Graduates

The design of the questionnaire for graduates

Problems and barriers

The collection of data in Denmark

The collection of data in the UK

Quantitative data analyses

Conclusions

3.1 The design of a questionnaire for graduates

The questionnaire carried a number of requirements, and it was judged desirable to use a clear and visual approach to deal with the complex subject of educational curricula and educational content. There was also a wish to utilise the structure of the RIBA phase model, connected with which the study was formulated using a maximum of ten main subjects to cover everything relevant to the content of the educations.

The two elements either have been shown or are easily accessible but the latter will require more consideration. When a list of ten areas is drafted it needs to be tested to clarify if it is covering all what is relevant or not. A list of potentially relevant subjects was drawn up, and afterwards presented to experienced professionals among staff members of Copenhagen School of Design and Technology. Their backgrounds were those of technologists and architects. The outcome of their comments was the establishment of a list of thirty headlines to cover everything relevant to this project about building design:

Themes for theory and practice:

1. Data collection/registration 2. History of architecture 3. Architectural theory 4. The phase model 5. Drafting technique 6. Drawing technique 7. 2D drawing technique 8. 3D modelling 9. Model building 10. Geo-technique	11. Statics 12. Load bearing systems 13. Technical installations 14. Building physics 15. Standard constructions 16. Key junctions 17. Design Management 18. Construction management 19. Building information management 20. Law and regulations	21. Teamwork 22. Presentation technique 23. Economy 24. Ecology 25. Refurbishment and restoration 26. Traditional craftsmanship 27. Building material science 28. Colour 29. Light 30. Texture

Figure 3-1: List of relevant subjects in relation to the phase model[40]

[40] That the design activity itself is not explicitely mentioned in the list is because it as a headline deals with most of the above mentioned subjects as part activities. Together they constitute the design process and the respondents are asked to include all their study activities in their response to the questionnaire.

The list was a result of an e-mail dialogue with experienced colleagues who responded to draft lists and added missing subjects to my first listing. The aim was to cover all relevant to the phase model at a consistent level of detailing. However, thirty subjects would have led to respondent burden within the survey, so the topics were grouped so as to provide “headlines” which could cover them all. Also this overall listing was checked with colleagues to be sure it was understandable and could be seen to cover the 30 subjects.

The result of this process was that the constituent list became encapsulated under the following ten main subject areas:

1. Building material science
2. Collection/registration of data, wishes and requirements
3. History of architecture and architectural theory
4. Management and management tools
5. Visualisation and visualisation techniques
6. Engineering techniques such as Statics, installations etc
7. Technical design like standard constructions, key junctions and building physics
8. Economy, value and business
9. Ecology and sustainability
10. Light, colour and texture

In this context searching for an overall picture for a comparison it is better with overall subjects to induce the right overall view in the respondents.

Now, the problem was how to present the three components to respond to for the addressees. To make ten questions, related to the time invested in the subject, in which year of studies it took place and in relation to what phase of the phase model it happened, should be attempted. This is rather complicated and therefore it became a challenge to make a graphic design that could enable the respondents to overview all of it. A draft version of a questionnaire was designed and as mentioned above the older version of the phase model was preferred because it might be the one most of the respondents graduating before 2009 would be familiar with. This 1999 version looks as can be seen here:

REVISIONS OF TERMINOLOGY ISSUED BY **RIBA** (Royal Institution of British Architects)		
Traditional terminology	Old Plan of Work terminology	Revised 99 terminology
	Stage/phase	Stage/phase
Briefing (Contract/program)	A Inspection B Feasibility	A Appraisal B Strategic Briefing (program)
Design	C Outline Proposals D Scheme Design E Detail Design	C Outline Proposals, OP D Detailed Proposals, DP E Final Proposals, FP
Working drawings	F Production Information G Bills of Quantities H tender Action	F Production Information G Tender Documentation H Tender Action
Contract	J Project Planning K Operations on site L Completion M Feedback	J Mobilization K Construction to Practical Completion L After Practical Completion

Figure 3-2: Former RIBA phase model to be used for the questionnaire design

The design based on this model and the different considerations came to look like this:

5. Visualisation and visualisation techniques

During my studies, I dealt with this subject to the following extent:

Please tick study year(s), percentage(s) of year and phase(s):

A	Year of study	B ▼ Percentage of available time per year														C Appraisal	Strategic briefing	Outline proposal	Detailed proposal	Final proposal	Production information	Tender documentation	Tender action	Mobilization	Construction to practical completion	After practical completion
	▼	5	10	15	20	25	30	35	40	50	60	70	80	90	100	A	B	C	D	E	F	G	H	J	K	L
1	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
2	☒	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
3	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐
4	☒	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
5	☒	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Figure 3-3: Graphic design of question 5

Here, the idea is that the respondent tick in the A, B and C area for each year of study thus marking for example that in the first year of studies he or she spent 15% of the studies on visualisation and visualisation techniques and that this activity was related to phase B and C of the phase model. It would somehow be smart if the year ticking went automatically when ticking in the B area about percentage. Later on the technical possibilities for doing so will be investigated. The schedule presented here is just a word processing program schedule but the ticking activity works if the whole document is protected.

A questionnaire with an introduction to all ten subjects was made (and can be found by the use of the link given at page 173). A test of its workability was undertaken in a reference group who responded that it took approximately the estimated 20 minutes to fill it in, which also finally was found a reasonable amount of minutes to ask respondents to invest. No one argued that they did not understand the questions or how to fill in but submission was a problem because the word processing design was made as if just to push a button, which unfortunately did not work that way at this stage.

So the design worked but it required a more advanced computer program if not to be handled as an ordinary file to attach to an e-mail and sent back to the addresser, which procedure most likely would limit the number of respondents significantly. What would work among teachers willing to be helpful to a colleague might prove not to do so amongst people from outside.

3.2 Problems and barriers

3.2.1 The digital tool development

The above mentioned was now just one of a number of problems related to the practical handling of the questionnaire. There was also a need to decide whom to address, how to establish access to these people, and if all should be addressed at the same time or if the four groups should be taken one at a time.

To solve the problem about the digital design of the questionnaire it was investigated if any of the available programs for digital handling of questionnaires and the desired statistic treatment of the data could handle the complicated design of a schedule to allow coordination of year, percentage and the information about relevant phase. The answer to this was NO! So, now it was a choice between a simplification of the questions and the development of a tailored tool.

The tailored tool solution was chosen and an IT scientist was hired to make a design that could both use the above shown schedule and deliver the kind of statistic data handling needed. As can be imagined all this took time and money as well, but the cooperation with the scientist was pleasant and he managed to make the questionnaire tool work exactly as desired. The tool had to exist in both Danish and an English version and had to work exactly the same way in the two countries. A website was created, a domain name was bought (architecturaltechnology.dk) and the links for the respondents to use were issued.

Regarding the four groups it was considered that the desired knowledge is related to the content of the educations of the recent years and does not regard the history we have already been dealt with thoroughly. Therefore, it was decided to concentrate on graduates from after the turn of the millennium and up to the time of issuing the questionnaire, which took place in the spring of 2009. It was also desired to address all UK and all Danish graduates from the period and in order to do so a contact was first made to the Danish organisations of architectural technologists

(Konstruktørforeningen) to ask for their help to get in contact with the graduates who are their members.

3.2.2 Konstruktørforeningen

It was anticipated that Konstruktørforeningen would be positive and helpful but there was a concern about their rightful behaviour according to the Data Protection Act both to secure legal procedures and not to annoy members. Because of frequent e-mail contact asking members to do this and that, which probably already was felt to be at the limit by some members, the whole matter was somewhat delicate. Konstruktørforeningen did not feel able to let the author address their members directly. It was desired to get first the Danish technologists to answer, then the Danish architects and subsequently to repeat the procedure in UK. This would bring in the data in a way so they would be a little easier to handle due to the way the data collection tool was designed. Not that it would be a serious problem if some few architects for example became mixed with technologists, because in the statistics, the tool would automatically make a distinction between the four groups. The problem was more when access to the individual data was wanted, that it could become less appropriate than if the succession in which the data was collected was clearly in four separate groups.

The worries of Konstruktørforeningen meant that it could not be expected or planned to get back to the addressees in case only a few would respond in the first place, so it was important to address the graduates in the most appealing way. The professional body wanted the wording to balance with the idea that members already a bit annoyed should not feel any pressure to obey to the request thus getting even more annoyed with their organisation.

Of course there was also the advantage of the organisation making the request instead of somebody doing so on their own initiative. This would automatically induce the feeling that the outcome of the replies would be within their personal interests as professionals. The simple fact that the project is about the profession of all the addressees would hopefully prove sufficiently convincing.

3.2.3 Arkitektforbundet

The Danish Arkitektforbundet who organise all architect employees is the organisation to go to in order to get the similar type of access to architect graduates. Arkitektforbundet has been shareholder in the research project referred to a number of times (Hougaard 2007) and have proved to be interested in the question about content of education. In the report the technologists are considered being competitors to the architects so there was a worry about what position the organisation would take to the question about supporting the planned investigation.

In fact the organisation was very accommodating and gave the same kind of indirect e-mail contact to graduates as KF had done. The e-mails were sent when the answers from the Danish technologists had stopped running in. After a period of one week answers became scarce and after two weeks they totally stopped – so was the experience. The Danish questionnaire was of course in Danish but apart from that exactly designed as the British one in English. The link is shown on page 173.

3.2.4 CIAT

Since British conditions are less familiar to the author than Danish- there was a certain worry if the British associations would react to a request for help the same way as the Danish ones. Perhaps the willingness of the UK organisations should have been checked before the collection of any data in order to secure that the data could be collected precisely the same way both places. In fact the uncertainty was more about the RIBA than the CIAT because CIAT representatives had participated in the conference on AT we held in Copenhagen in 2008 where good connections with CIAT representatives were established. The author also had the opportunity to address the annual meeting for AT course leaders in December 2008 in London and had reasons to believe that CIAT would try to be helpful and also would be able to see how they could benefit from the research results.

So the CIAT contact went well and the questionnaire was mailed to graduates the very same way as in Denmark. This took place right after the data from the Danish architects were collected.

3.2.5 RIBA

How RIBA would react to the same request was much more uncertain because there had been no contact in advance and they might feel that the project was aiming to support competitors. But also here the people I contacted were accommodating and obviously as helpful as they felt possible. RIBA faced the same problem as mentioned about the Danish KF-organisation and did not feel they could just send an e-mail asking to fill our questionnaire to everyone because of the risk of annoying members. But the staff felt that some announcements in different electronic news magazines they distribute to members would do the same. In fact, RIBA staff members put a lot of effort into the matter and even did so in several turns. Therefore, it would be really hard to expect more help from RIBA than was actually given.

For both the RIBA and the CIAT data there was the uncertainty about how the addressees would react. Would people reply to the request or would they just ignore it. It was not expected that British professionals would be very different from Danish ones but maybe they, being members of a nation ten times the size of the Danish, would be much more exposed to this kind of requests and therefore feel less inclined to give the desired response.

3.2.6 Considerations on data validity

It could also be questioned if the planned way to ask would be especially appealing to people with special preferences in which case we would not get the experience of the group they are supposed to represent but only the experience of a subgroup in disguise. That might be a possibility but it would be very difficult to secure completely against such a risk. Fortunately there is no need to fear such a problem here, because they are not asked about their opinion of anything but only what they remember. It is not likely that a group of people with a slightly special psychological mindset, that welcome questionnaires more than others, would remember any different than the average of the addressees would do, in case they would put the same stress on giving adequate answers. So, there is no reason to suspect any falsification of data caused by such an effect of the means of communication.

On the next page one can see the initial part of the questionnaire attempting to give the respondent the necessary information about the questionnaire and how to fill it in. The whole questionnaire can be seen if following the link at page 173.

Research project

About education content and qualification achievement

Dear architect or architectural technologist

As a part of a PhD-project, this survey is undertaken in collaboration with The Robert Gordon University in Aberdeen in Scotland, the Copenhagen Trade Academy and the organisations of architects and technologists.

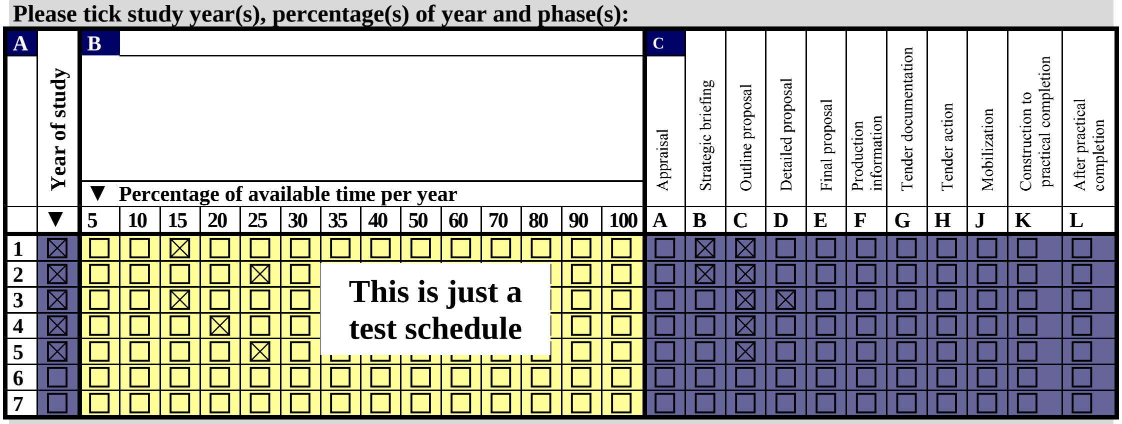
The project aims to uncover the extent to which education in schools of architecture and schools of architectural technology in UK and Denmark cover the traditional areas of responsibility of the architect firms regarding building related activities. – Industrial design, landscaping and urban design are not to be considered here.

If your basic education is related to building design and/or the technologies involved in this professional area, your answers to the following 10 questions will be valuable to the quality of the investigation and perhaps to the future educations for the area.

The questionnaire

Below, you will find 10 statements about 10 professional areas to comment on by checking three kinds of boxes about A year of studies, B percentage of available time used and C to what phase of the architectural phase model the activity belonged. Your comments should be about what you remember you have been doing during your time at school only. Periods of practise in companies are not to be included. The estimated response time is one quarter of an hour.

A comment to one of the ten statements could for example look as shown below, if the respondent remembers visualisation theory and exercise to have been going on in all semesters and estimates its time consumption to have been between 15 and 25% and mainly to have been in use in the phases B to D:



5. Visualisation and visualisation techniques
During my studies, I dealt with this subject to the following extent:
Please tick study year(s), percentage(s) of year and phase(s):

A	Year of study	B ▼ Percentage of available time per year														C Appraisal	Strategic briefing	Outline proposal	Detailed proposal	Final proposal	Production information	Tender documentation	Tender action	Mobilization	Construction to practical completion	After practical completion
	▼	5	10	15	20	25	30	35	40	50	60	70	80	90	100	A	B	C	D	E	F	G	H	J	K	L
1	☒			☒													☒	☒								
2	☒					☒											☒	☒								
3	☒			☒														☒	☒							
4	☒				☒													☒								
5	☒					☒												☒								
6																										
7																										

This, I believe, is as simple as possible if the data is to show a realistic picture of the nature of an activity, as remembered. The year column indicates how experienced you were when the activity took place. The time used columns indicate the extent of and/or how deep the activity went, and the phase columns tell about what specific nature the activity might have had. Do not fill in where there has been no activity. By filling in the schedules, you participate in visualising how the educations cover the area of the profession, if something is missing, and to what extent this is the case.

Figure 3-4: The initial part of the questionnaire

As can be seen the respondents will have to give answer to each of the ten main subjects by ticking two or three times for each year of study. That could maximum be 21 ticks per subject if the given maximum of seven years is wholly spent. That is of course relatively many estimates and to help the respondent the schedule has a red bottom-line informing about the consumption of time per year during the progress thus enabling the respondent to go back and correct in order not to exceed the maximum of 100% per year. If this happens the respondent will automatically be asked to go back and correct when trying to submit. The reader might have the possibility to test the questionnaire by using the following link at the web:

http://www.architecturaltechnology.dk/?lang=en

The link will remain open throughout 2011.

Figure 3-5: Link to the questionnaire

When submission by the push of a button was made the respondent got the information that submission was successful.

Now the submitted data was available at a special part of the webpage to which only the researcher had access for the good reason that anonymity for the individual was promised. These pages are valuable because they inform about how much the data varies from individual to individual, thus giving the idea, if possible, of what a typical graduate has gone through.

The assumption about this is that the average data of all respondents of a group would also be very much like what the most individuals have experienced themselves. It was also assumed that variations would be more significant in the UK than in Denmark due to the much higher number of institutions involved there, but that this would be modified to a reasonable extent by the fact that the professional bodies are accrediting the courses regularly. So also in The UK it was anticipated to find a fair consistency in the datasets from the individuals. If so, it would be possible to talk about an 'average graduate' regarding subjects passed and know for sure that such ones really exists in large numbers.

Fortunately these specific data indicate that assuming so was justified. There are differences but they can be interpreted more as the result of some respondents being more careful when filling in the questionnaire than others than they can be seen as the average result of very different experiences.

Another factor causing differences would of course be that one respondent might simply remember a course better than another would. Someone might even tend to forget about it because it did not make so much of an impression. This means that the real differences in what people have experienced would be less than what the individual data shows. Literally taken, the data show what each individual can recall within the limited time of answering and it can't be taken for much more than just a rough estimate. But a relatively rough estimate is also enough for the purpose, given the differences between the four groups are significant enough. It will therefore be interesting to see to what extend this is the case when all four datasets are collected. It will both be interesting to compare within each of the countries and later on also to do so between the countries.

3.3 The collection of data in Denmark

3.3.1 Danish architectural technologists' data

The part data collection from Danish technologists turned out to be the most successful as to number of participants. 55 AT-graduates from the period 2000 to 2008 both years inclusive gave their response. It could also be noticed that all the Danish schools of AT were represented and all turned out to be very satisfactory.

In line with what we just discussed above, it might be appropriate to show the response of a typical AT-graduate from one of the Danish schools:

name	dan/eng	ark/kons	school	graduation
Ddddd Ddddddd	Danish	Technologist	Erhvervsakademiet København - Stevnsgade	2004

Mærke	Spørgsmål nr.	år	procent	a	b	c	d	e	f	g	h	j	k	l
	1	1	12.50%				X	X	X					
	1	2	15.00%				X	X	X					
	1	3	15.00%				X	X	X					
	1	4	7.50%				X	X	X					
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	2	1	10.00%	X	X	X								
	2	2	5.00%	X	X	X								
	2	3	10.00%	X	X	X								
	2	4	2.50%	X	X	X								
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	3	1	7.50%			X								
	3	2	5.00%			X								
	3	3	5.00%			X								
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	4	1	2.50%						X	X	X	X	X	X
	4	2	5.00%						X	X	X	X	X	X

	4	3	5.00%						X	X	X	X	X	X
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	5	1	17.50%			X	X							
	5	2	10.00%			X	X							
	5	3	10.00%			X	X							
	5	4	5.00%			X	X							
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	6	1	12.50%				X	X	X					
	6	2	15.00%				X	X	X					
	6	3	15.00%				X	X	X					
	6	4	10.00%				X	X	X					
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	7	1	15.00%				X	X	X	X				
	7	2	20.00%				X	X	X	X			X	
	7	3	17.50%				X	X	X	X			X	
	7	4	12.50%				X	X	X	X				
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	8	1	7.50%			X	X	X						
	8	2	15.00%				X	X	X	X	X	X	X	X
	8	3	15.00%					X	X	X	X	X	X	X
	8	4	10.00%					X	X	X	X	X	X	X
Mærke	**Spørgsmål nr.**	**år**	**procent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	10	1	15.00%		X	X	X							
	10	2	10.00%		X	X	X							
	10	3	7.50%			X	X							
	10	4	2.50%			X	X							

Figure 3-6: Data from a Danish technologist

It can be noticed that this individual did not participate in activities regarding subject 9 at all. Subject nine was: “Ecology and sustainability”, which is a fairly relevant area at the time being and probably becomes increasingly important in the future. Apart from that, activities within all other subjects can be noticed and most interesting that there have been activities in all phases but with a stress on phase c, d, e and f.

Now there is a need to see how this is in line with the results from the whole group of Danish architectural technologists.

<table>
<tr><td>Priorities of phases Total sum of phase divided by length of education 3,5 years</td><td>5.96%</td><td>5.21%</td><td>12.19%</td><td>21.31%</td><td>19.07%</td><td>11.39%</td><td>3.62%</td><td>1.95%</td><td>1.14%</td><td>2.61%</td><td>1.05%</td></tr>
<tr><td>Phases</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>j</td><td>k</td><td>l</td></tr>
<tr><td>Centre of gravity</td><td colspan="11">▲
The centre of gravity is where we find an equal number on both sides. The sum of the numbers in the 11 phases divided with 2, which gives 42.75 %. The position is found by subtracting the sum of the phases a + b + c from 42.75 and dividing the result 19.39 with the value of phase d, which gives 0.91.
It is calculated to be 0.91 in phase d.
Giving all phases the value 1 means that we have a centre of gravity in the position 3.91 for the whole group. By calculating this for each individual (54) we can calculate the variance and the standard deviation:

Variance: $V(X) = E([X - E(X)]^2)$
$V(X) = \sum(X - 3.91)^2 \text{ x} 1/54 = \mathbf{0.3}$

Standard deviation: $\sigma(X) = \sqrt{V(X)}$
$\sigma(X) = \sqrt{0.3} = \mathbf{0.55}$</td></tr>
</table>

Figure 3-7: Phase sum results from Danish technologists

The individual results from the randomly chosen respondent fit very well with the average results from all Danish AT-respondents and it can be noticed that the centre of gravity in the activity distribution is placed at the end of phase **d,** which is very much as anticipated. The anticipation is very well qualified by the amount of years I have been dealing with this specific education as lecturer.

In the Appendix II, where all the sum results can be seen, one can also notice that the general participation in subject 9 is very low bordering to almost nothing.

3.3.2 Danish architects' data

44 Danish architect graduates responded to the questionnaire, which was again a satisfactory result to be considered significant when considering what they are in fact asked about. Looking at the answers from the individuals they certainly differ but only within very narrow limits. There is a remarkable consistency which also underpins the validity of the data. Here is a randomly chosen reply from a Danish architect graduate:

name	dan/eng	ark/kons	school	graduation
D Dd	Danish	Architect	Kunstakademiets Arkitektskole	2005

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	1	1	10.00%	X	X									
	1	2	10.00%	X	X									
	1	3	10.00%	X	X									
	1	4	10.00%	X	X									
	1	5	10.00%	X	X									
	1	6	10.00%	X	X									

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	2	1	10.00%	X	X	X								
	2	2	15.00%	X	X	X								
	2	3	10.00%	X	X	X								
	2	4	10.00%	X	X	X								
	2	5	10.00%	X	X	X								
	2	6	10.00%	X	X	X								

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	3	2	10.00%	X										
	3	4	10.00%	X										

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	5	1	50.00%	X	X	X								

	5	2	50.00%	X	X	X								
	5	3	80.00%	X	X	X								
	5	4	40.00%	X	X									
	5	5	80.00%	X	X	X								
	5	6	80.00%	X	X	X								
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	9	4	30.00%	X	X	X								
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	10	2	15.00%	X										

Figure 3-8: Data from an individual Danish architect

This graduate is one of the 25% of the respondents from Denmark who only dealt with the first 3 phases in the phase model. It can also be noticed that he did not remember to have participated in anything regarding subject 4, 6, 7 and 8 which is regarded more or less the core of the AT profession. The example is in fact more to the extreme than anticipated so there is a need to compare with the sum results from all 44 graduates.

Priorities of phases Total sum of phase divided by length of education 5 years	**27.07%**	**18.76%**	**23.6%**	**11.49%**	**1.73%**	**2.26%**	**0.01%**	**0.01%**	**0.04%**	**0.49%**	**0.42%**
Phases	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
Centre of gravity	The centre of gravity is where we find an equal number on both sides. The sum of the numbers in the 11 phases divided with 2, which gives 42.94 %. The position is found by subtracting the value of the a-phase from 42.94 and dividing the result 15.87 with the value of phase b, which gives 0.85. **It is calculated to be 0.85 in phase b.** Giving all phases the value 1 means that we have a centre of gravity in the position **1.85** for the whole group. By calculating this for each individual (44) we can calculate the **variance** and the **standard deviation**: **Variance**: $V(X) = E([X - E(X)]^2)$ $V(X) = \sum(X - 1.85)^2 \times 1/44 =$ **0.74** **Standard deviation**: $\sigma(X) = \sqrt{V(X)}$ $\sigma(X) = \sqrt{0.74} =$ **0.86**										

Figure 3-9: Phase sum results from Danish architects

By looking at the sum data set from Danish architects one can notice that even if some remember to have done something within the above mentioned subjects 4, 6, 7 and 8 it is not so much and it can't be claimed that the randomly chosen architect respondent is being very much off side the average. The centre of gravity in relation to the phases is at the very end of phase **b**, which is also a little surprising. It could have been expected to be in the very middle of phase **c.** This difference is rather significant because so much of the architects core work in fact belongs to phase **c,** but so was the result to rely on in the further argumentation.

Contrary to the individual dataset the sum sheet shows a certain study activity in phase **d**, which was also anticipated. So the surprise lies alone in the balance in the first three phases. Otherwise the results from Denmark were no surprise.

3.3.3 Comparison of Danish architects' and technologists' data

On the next page we find the sum data sets from Denmark arranged by subject and with the technologists right below the architects, thus allowing us to make a comparison. Let us discuss them and compare them subject by subject.

The percentages are all percentages of one year of studies. They are calculated as the total average percentage divided with 5 respectively 3,5 years of theoretical study, which in itself gives an uncertainty due to the fact that especially architect students tend to use more time than the norm and are more free to select their subjects than the technologists are.

1 Building material science		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	55.9%	16.8	15.3	16.9	4.8	0.7	1.4				1	0.1
Danish technologists	41.1%	3.5	2.6	5.3	9.7	8,8	5.7	2.2	1	0.7	0.9	0.7

Figure 3-10: Danish data about subject 1

We can notice that architect students spend more time on building materials but that it is the kind of material concern that lies in the very first phases which again indicates the different areas of interest or different mindsets.

Building materials tend to be a concern both within the architectonic and the constructive space as talked about and discussed on page 118.

2 Collection/registration of data, wishes and requirements		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	86.3%	32.2	28.2	17.1	6.1	1.2	1.3				0.2	
Danish technologists	37.6%	2.8	4.9	7.6	9.7	6	2.7	1.2	1.6	0.4	0.5	0.2

Figure 3-11: Danish data about subject 2

The architects spend much more time than the technologists dealing with this subject and that is no surprise. Again a different centre of gravity for the two datasets can be noticed and they give a further confirmation of what was suspected initially. Looking at the phases where the activities are going on one must suspect that it is different sorts of information the two professions tend to concentrate on.

3 History of architecture and architectural theory		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	53.8%	32.7	13.7	5.9	0.8	0.5						0.2
Danish technologists	14.1%	2.9	2.0	5.1	3.3	0.3	0.2				0.3	

Figure 3-12: Danish data about subject 3

The subject 3 data show what could have been anticipated. This subject, as it is accessible in literature, is mainly about the architectonic space, simply because very few historians have been interested in communicating about the constructive space. As a consequence there are very few drawings to be found in historical archives that show anything about this space.

So it is not that this wouldn't have been very interesting to some professionals and that it wouldn't have been taught today, but relevant information is simply lacking.

Perhaps it could still be found and collected to a form where it could be distributed for the benefit of the AT profession as a basis for a study of the history of architectural technology.

4 Management and management tools		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	5.5%	2.4	1.8	0.9	0.2		0.2					
Danish technologists	20.3%	2.6	1.3	1	2.6	3.3	2	1.5	1.2	1.2	2.5	1.1

Figure 3-13: Danish data about subject 4

Figure 3-13 shows the opposite picture with technologists spending more time on the subject but also in line with our previous findings with a certain emphasis on the later phases.

5 Visualisation and visualisation techniques		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	94.0%	16.3	17.1	34.3	22.6	1	2.7					
Danish technologists	23.5%	1.4	1.5	6.7	7.7	4	1.5	0.4	0.2		0.1	

Figure 3-14: Danish data about subject 5

Not surprisingly the architects use one full year on this subject (5) and they are, not surprisingly, concentrating on the first phases. Here the concern about the architectonic space is at its peak.

6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	17.8%	4.9	2.2	6	3	0.7	1					
Danish technologists	49.7%	1.6	0.8	4.5	14.6	17.5	7.6	1.4	0.6	0.2	0.9	0.1

Figure 3-15: Danish data about subject 6

The technologists are spending much more time on subject 6 and the phases show that the time is spent in the technically demanding phases, whereas the architects are concentrating their activities in the initial phases where it is about choice of principles – the very overall considerations. The subject affects both kinds of spaces but in general the constructive space mostly.

7 Technical design like standard constructions, key junctions and building physics		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	22.6%	6.1	2	5.7	4.6	1.9	2.3					
Danish technologists	66.6%	2.3	1.2	6.1	18.3	19.3	14.1	1.8	0.5	0.4	2.1	0.5

Figure 3-16: Danish data about subject 7

Subject 7 was more than any of the others supposed to mark the difference between the two professions and a clear difference can be noticed and with the same tendencies regarding the phases as seen above. This subject tends to affect the constructive space mainly.

8 Economy, value and business		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	3.4%	0.7	0.8	0.5								1.4
Danish technologists	31.6%	1.3	1.3	2.6	4.5	6	5.3	3.9	2.7	1.1	1.9	1

Figure 3-17: Danish data about subject 8

Obviously Danish architect students pay no interest in economy and value. We must suspect that they do it indirectly by wanting their designs to be as precious as possible but no more direct activities are going on. Even in the initial phases the technologists do more within subject 8 than the architects do.

9 Ecology and sustainability		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	19.7%	5.2	5.2	6	2.8	0.4	0.1					
Danish technologists	5.5%	1.1	0.9	0.9	1.1	0.8	0.5	0.2				

Figure 3-18: Danish data about subject 9

Regarding subject 9 it can be noticed that some architect students pay it a certain attention and that the technologists do next to nothing within this increasingly important area. Presumably much more attention will be paid from both groups in the future.

10 Light, colour and texture		A	B	C	D	E	F	G	H	J	K	L
Danish architects	67.8%	18.3	7.5	24.7	12.5	2.4	2.4					
Danish technologists	10.7%	1.3	1.7	3	3.2	0.8	0.7					

Figure 3-19: Danish data about subject 10

It is not a surprise that the architects are much more occupied with the area of subject 10 than the technologists are because it affects the architectonic space to a very high degree. When looking at the datasets above and below, one has to bear in mind that the percentages refer to one year of studies. Thus, the technologists in comparison with the architects spend a relatively higher percentage of their whole study than the year-percentages indicate if this aspect of comparison should be considered.

If, for any reasons, such a comparison was desired one would have to multiply all the AT percentages with (5:3.5) = 1.43. This would make some sense each time one thinks about how relatively occupied people are with one specific subject, because the time available for the technologists is only 3.5 years in comparison with the 5 years for the architects.

This also reminds us of the question about how concentrated a study is by nature. But it might be very hard to get more knowledge about this aspect because some subjects might require time for digestion whereas other subjects are more about understanding or not understanding. In general it is fair to say that the whole area covered by the study of architecture requires more time to be fully consumed because of its subtle nature. Building physics is something very concrete, whereas all the emotional implications of shaping a space when considering light, colour and texture require experience and consumption time. As a matter of fact we owe it to the reader to mention that a study year is 2 x 20 weeks for the technologists but probably less for the architects. But at least some of the remaining time (?) might be for digestion?

Now it would be appropriate to look at all the subjects at the same time and see if we can add anything:

1 Building material science		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	55.9%	16.8	15.3	16.9	4.8	0.7	1.4				1	0.1
Danish technologists	41.1%	3.5	2.6	5.3	9.7	8.8	5.7	2.2	1	0.7	0.9	0.7
2 Collection/registration of data, wishes and requirements		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	86.3%	32.2	28.2	17.1	6.1	1.2	1.3				0.2	
Danish technologists	37.6%	2.8	4.9	7.6	9.7	6	2.7	1.2	1.6	0.4	0.5	0.2
3 History of architecture and architectural theory		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	53.8%	32.7	13.7	5.9	0.8	0.5						0.2
Danish technologists	14.1%	2.9	2.0	5.1	3.3	0.3	0.2				0.3	
4 Management and management tools		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	5.5%	2.4	1.8	0.9	0.2		0.2					
Danish technologists	20.3%	2.6	1.3	1	2.6	3.3	2	1.5	1.2	1.2	2.5	1.1
5 Visualisation and visualisation techniques		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	94.0%	16.3	17.1	34.3	22.6	1	2.7					
Danish technologists	23.5%	1.4	1.5	6.7	7.7	4	1.5	0.4	0.2		0.1	
6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	17.8%	4.9	2.2	6	3	0.7	1					
Danish technologists	49.7%	1.6	0.8	4.5	14.6	17.5	7.6	1.4	0.6	0.2	0.9	0.1
7 Technical design like standard constructions, key junctions and building physics		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	22.6%	6.1	2	5.7	4.6	1.9	2.3					
Danish technologists	66.6%	2.3	1.2	6.1	18.3	19.3	14.1	1.8	0.5	0.4	2.1	0.5
8 Economy, value and business		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	3.4%	0.7	0.8	0.5								1.4
Danish technologists	31.6%	1.3	1.3	2.6	4.5	6	5.3	3.9	2.7	1.1	1.9	1
9 Ecology and sustainability		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	19.7%	5.2	5.2	6	2.8	0.4	0.1					
Danish technologists	5.5%	1.1	0.9	0.9	1.1	0.8	0.5	0.2				
10 Light, colour and texture		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
Danish architects	67.8%	18.3	7.5	24.7	12.5	2.4	2.4					
Danish technologists	10.7%	1.3	1.7	3	3.2	0.8	0.7					

Figure 3-20: Sum sheet of all Danish data

Looking at the subject overview (Figure 3-20) one should notice where the darker areas are, because they show where the majority of the activities were taking place. This picture strongly underpins the hypothesis and the differences between the educations are even more significant than anticipated.

Now, it becomes interesting to see how it is in UK and later on to compare it with the Danish data.

3.4 The collection of Data in the UK

3.4.1 British architectural technologists' data

CIAT sent an email to a relatively large group of graduates but the number of respondents was relatively low. It added up to 20 respondents, but a look at the data makes their replies appear rather convincing as to their consistency despite the number of schools attended by the respondents. In fact, they came from 14 universities from all over UK.

Receiving only a third of the number returned by Danish AT-respondents leads to the conclusion that this method of e-mailing clearly is less successful in the UK than it is in Denmark. Maybe this is because people get much more of the sort in UK and therefore are more tired of it. Theory of a colleague is that people in the UK simply don't use personal computers so much, but I am not sure of that.

Of course the data are less certain because of the limited number of participants but anyhow, 20 memories pointing at more or less the same appear rather convincing and that is in fact the case.

As with the Danish datasets an initial look at one typical British AT-response would support consistency:

name	dan/eng	ark/kons	school	graduation
Bbbbb Bbbbbbbbbbbbbb	British	technologistr	Sheffeild Hallam University	2006

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	1	1	20.00%	X	X	X	X	X						
	1	2	20.00%	X	X	X	X	X						
	1	4	15.00%	X	X	X	X	X						
Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l

	2	2	20.00%	X	X	X	X	X						
	2	4	20.00%	X	X	X	X	X						
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	3	1	5.00%	X	X									X
	3	2	10.00%	X	X									X
	3	4	5.00%	X	X									X
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	4	4	5.00%	X	X	X	X	X	X	X	X	X	X	X
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	5	1	5.00%	X	X	X	X	X						
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	6	1	20.00%	X	X	X	X	X						
				a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	7	1	20.00%				X	X						
	7	2	20.00%	X	X	X	X	X						
	7	3	100.00%				X	X	X	X	X	X	X	X
	7	4	25.00%	X	X	X	X	X						
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	8	4	5.00%		X	X								
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	9	1	20.00%	X	X	X	X	X					X	X
	9	2	20.00%	X	X	X	X	X					X	X
	9	4	20.00%	X	X	X	X	X					X	X
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	10	1	10.00%	X	X	X	X	X						
	10	2	10.00%	X	X	X	X	X						
	10	4	5.00%	X	X	X	X	X						

Figure 3-21: Data from a British technologist

The most remarkable observation is that this student spent the whole third year on subject 7, which has been pointed out earlier as the core of the AT profession. In comparison with the Danish technologist a reasonable concern about subject 9 "Ecology and sustainability" can be noticed whereas the Danish individual did not remember to have participated in anything associated with that headline.

Now a look at how this randomly chosen individual fits in with the whole group of British technologists.

<table>
<tr><td>Priorities of phases Total sum of phase divided by length of education 3,5 years</td><td>19.06%</td><td>10.14%</td><td>12.8%</td><td>9.7%</td><td>8.87%</td><td>11.86%</td><td>2.45%</td><td>0.93%</td><td>1.83%</td><td>7.17%</td><td>2.89%</td></tr>
<tr><td>Phases</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>j</td><td>k</td><td>l</td></tr>
<tr><td>Centre of gravity</td><td colspan="11">The centre of gravity is where we find an equal number on both sides. The sum of the numbers in the 11 phases divided with 2, which gives 43.49 %. The position is found by subtracting the sum of the phases a + b + c from 43.49 and dividing the result 2.21 with the value of phase d, which gives 0.23.
It is calculated to be 0.23 in phase d.
Giving all phases the value 1 means that we have a centre of gravity in the position 3.23 for the whole group. By calculating this for each individual (20) we can calculate the variance and the standard deviation:

Variance: $V(X) = E([X - E(X)]^2)$
$V(X) = \sum(X - 3.23)^2 \times 1/20 = \mathbf{1.45}$

Standard deviation: $\sigma(X) = \sqrt{V(X)}$
$\sigma(X) = \sqrt{1.45} = \mathbf{1.2}$</td></tr>
</table>

Figure 3-22: Phase sum results from British technologists

The results are well in accordance with what was found in the individual dataset and what should be noticed here is the relatively high emphasis on the initial phase **a**, which indicates a certain overlap with the architectural profession. This is also in line with the expectations based on the experiences achieved during visits to UK universities over the last 15 years. The author has been in contact with the AT education to a degree that should give good knowledge about what to expect. Unfortunately the same can't be said about the architectural education in Britain and the results from that could therefore easily become a surprise.

3.4.2 British architects' data

As earlier mentioned it was not possible to send e-mails directly to architect graduate members of RIBA due to the organisation's communication politic. That made it necessary to rely on the indirect announcement request for replies and the result of that was only 7 valid responses. This low number of course increases the concern about the validity of the sum data but again, since people are just asked what they remember and not what they think about something, the data will still produce a fair indicator of tendencies.

Fortunately, there will be an opportunity later to debate all the data with a highly professional group of people with the relevant qualifications to make a judgement about the data's validity.

Like before, we will begin with a look at a randomly chosen architect respondent's data:

name	dan/eng	ark/kons	name of school	graduation
Bbb Bbbb	British	Architect	Edinburgh College of Art, Heriot Watt University	2001

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	1	1	5.00%	X	X	X	X	X						
	1	2	5.00%	X	X	X	X	X						
	1	3	10.00%	X	X	X	X	X						
	1	5	15.00%	X	X	X	X	X	X					
	1	6	15.00%	X	X	X	X	X						
Mark	**question**	**year**	**percent**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
	2	1	20.00%	X	X	X	X							
	2	2	20.00%	X	X	X	X							
	2	3	20.00%	X	X	X	X							
	2	5	30.00%	X	X	X	X							
	2	6	15.00%	X	X	X	X							

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	3	1	5.00%	X	X	X								
	3	2	5.00%	X	X	X								
	3	3	5.00%	X	X	X								
	3	5	5.00%	X	X	X								
	3	6	5.00%	X	X	X								

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	5	1	30.00%			X	X	X						
	5	2	30.00%			X	X	X						
	5	3	30.00%			X	X	X						
	5	5	10.00%			X	X	X						
	5	6	15.00%			X	X	X						

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	6	1	15.00%			X	X							
	6	2	15.00%			X	X							
	6	3	15.00%			X	X							
	6	5	20.00%			X	X							
	6	6	15.00%			X	X							

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	7	1	10.00%				X	X						
	7	2	10.00%				X	X						
	7	3	10.00%				X	X						
	7	5	15.00%				X	X						
	7	6	10.00%				X	X						

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	9	1	5.00%	X	X	X	X							
	9	2	5.00%	X	X	X	X							
	9	3	5.00%	X	X	X	X							

Mark	question	year	percent	a	b	c	d	e	f	g	h	j	k	l
	10	1	10.00%			X	X	X						
	10	2	10.00%			X	X	X						
	10	3	5.00%			X	X	X						
	10	5	5.00%			X	X	X						
	10	6	10.00%			X	X							

Figure 3-23: Data from an individual British architect

There is no information about year 4, which might mean that the student was spending the year practicing in an architect's office. There is no activity within subject 8 "Economy, value and business" which is equivalent to the results from the Danish architect individual discussed on page 178, but contrary to those results there are a lot of activities in the phases **d** and **e** here. This is indicating much more work in what is considered the core area of the technologist. Now a look at the results that derive from all of the small group of British architects:

<table>
<tr><td>Priorities of phases Total sum of phase divided by length of education 5 years</td><td>16.26%</td><td>12.97%</td><td>19.3%</td><td>23.16%</td><td>15.91%</td><td>8.06%</td><td>2.37%</td><td>2.66%</td><td>1.53%</td><td>1.71%</td><td>1.43%</td></tr>
<tr><td>Phases</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>j</td><td>k</td><td>l</td></tr>
<tr><td>Centre of gravity</td><td colspan="11">The centre of gravity is where we find an equal number on both sides. The sum of the numbers in the 11 phases divided with 2, which gives 52.49 %. The position is found by subtracting the sum of the phases a + b + c from 52.49 and dividing the result 3.96 with the value of phase d, which gives 0.17.
It is calculated to be 0.17 in phase d.
Giving all phases the value 1 means that we have a centre of gravity in the position 3.17 for the whole group. By calculating this for each individual (7) we can calculate the variance and the standard deviation:

Variance: $V(X) = E([X – E(X)]^2)$
$V(X) = \sum(X – 3.17)^2 \times 1/7$ = 0.56

Standard deviation: $\sigma(X) = \sqrt{V(X)}$
$\sigma(X) = \sqrt{0.56}$ = 0.75</td></tr>
</table>

Figure 3-24: Phase sum results from British architects[41]

[41] The sum of all the phases is here 105 % due to the division with 5 which most likely should have been 6 if we look at the information of the majority of respondents.

The high percentage sum is probably due to the RIBA stage 3 activities which make it a little uncertain exactly how many years to calculate with. If 6 years of study are presupposed instead, the result looks like this:

Priorities of phases Total sum of phase divided by length of education 6 years	13.55%	10.81%	16.08%	19.30%	13.26%	6.72%	1.98%	2.22%	1.28%	1.43%	1.19%
Phases	a	b	c	d	e	f	g	h	j	k	l
Centre of gravity	The centre of gravity is of course in the very same position as in the schedule above as all the percentages are multiplied with the same factor: 5/6										

Figure 3-25: Corrected phase sum results from British architects

Precise percentages are not so important here. What really matters is the distribution over the different phases and it can be noticed that all the phases, from phase **a.** to phase **f.,** are considered within the education. This again could be linked to the RIBA requirements especially for stage 3. It is certainly different from the situation of the Danish architects and looks much more like the British technologists. Let us therefore make a comparison between AT education and education of architecture in Britain as it was done for Denmark.

3.4.3 Comparison of British architects and technologists

Like with the Danish data there will initially be a comparison of architects and technologists by consideration of each of the ten subjects:

1 Building material science		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.5%	7.2	12.7	22.6	18.4	15.2	10.4					
British technologists	51.8%	10.9	7.6	5.6	7.8	3.8	9	1.3	0.2	0.8	3.8	1

Figure 3-26: British data about subject 1

It looks as if British architects are more occupied with building materials than British technologists during their studies and it is only the distribution over the phases that here indicates different characteristics of the types of occupation. It is a surprise that it is the technologists who have the highest score in phase A. Both occupations are supposed to be very concerned about materials but not for the same reasons and since phase A mainly deals with the architectural performance of the building the architects were supposed to be much more preoccupied with this. For the same reason it is no surprise that the architects are more engaged in phase B and C but the fact that they are much more concerned in phase D and E is certainly a surprise.

The question is therefore if this is due to unreliable data or because the phase model doesn't show the overall character of the type of occupation precisely enough despite what was anticipated. The Danish data left no doubt about the reliability of the phase model. Perhaps the British situation is more subtle and requires more questioning in depth or perhaps it can be concluded that the technologist education in the UK is simply a secondary architect education? – This question will need a debate with a group of people with deeper insight on the matter.

2 Collection/registration of data, wishes and requirements		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	74.4%	17.8	17.8	20.7	12.5	2.1	1.7	0.2	0.2	0.6	0.6	0.2
British technologists	31.7%	6.2	5.3	7.4	2.2	4.3	3.3	0.9	0.5	0.2	1.3	0.1

Figure 3-27: British data about subject 2

It is not a surprise that architects during their studies have been more active within subject 2 but it is a little surprising and in line with the considerations above that this also embraces phase D to the extent it does.

3 History of architecture and architectural theory		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.7%	36.4	10.7	13	13.4	5.5	2.5					5.2
British technologists	21.7%	11.6	1.8	2.6	0.3	3.6	0.3					1.5

Figure 3-28: British data about subject 3

The figures for subject 3 are no surprise but the activities in phase D, E and F are not as expected. A possible explanation for all the mentioned surprises regarding the phase indications could of course be less familiarity with the phase model. If that is the case only the sum figure is reliable.

4 Management and management tools		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	76.6%	8.8	5.9	4	5.4	8.2	7.6	9.1	9.4	7.5	8.6	2.1
British technologists	38.0%	5.9	4.3	4.1	1.6	1.9	2.6	3.2	1.4	3.4	5.8	3.8

Figure 3-29: British data about subject 4

Again, the use of the phase model is surprising and for the same reasons.

5 Visualisation and visualisation techniques		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	78.3%	0.5	5.7	20.8	28.8	19.6	2.9					
British technologists	39.9%	7.3	2.3	8.5	5.5	6.4	6.6			0.7	2.5	0.1

Figure 3-30: British data about subject 5

Again, the use of the phases makes one suspect that the respondents are less familiar with the phase model but the sum percentages are no surprise.

6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	31.7%		0.3	10	11.5	4.6	5.3					
British technologists	25.4%	6.9	3.1	3.6	1.1	1.4	5.5			0.7	3.1	

Figure 3-31: British data about subject 6

One must wonder why the technologists are not more occupied with subject 6 and especially the occupation in the phases D and E is a big surprise.

7 Technical design like standard constructions, key junctions and building physics		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	41.7%			0.6	15.5	15.5	5.9	2.5	1.7			
British technologists	62.2%	6.5	1.9	6.4	12.4	8.2	12.4	2	1.3	0.9	8	2.2

Figure 3-32: British data about subject 7

It is somewhat unexpected that the technologists already deal with subject 7 in phase A, but certain reasons for that are imaginable. It is absolutely no surprise that the technologists are more active within this subject and one might have expected greater discrepancy to the architects.

8 Economy, value and business		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.7%	5.3	2.9	2.6	4.5	2.9	2.6	2.1	2.1	0.9	0.9	0.9
British technologists	15.4%	5.4	3	2.1	0.4	0.8	0.2	0.2		2.2	0.7	0.4

Figure 3-33: British data about subject 8

It is surprising that the architects are more occupied with this subject than the technologists are. The preoccupation of the architects can be understood by a foreigner but the very little attention of the technologists is hard to explain.

9 Ecology and sustainability		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.4%	3.9	6	4.1	7.9	3.9	1.6					
British technologists	20.3%	6.2	3.9	2.1	2.1	1.2	2.1	1			0.9	0.8

Figure 3-34: British data about subject 9

A comment here could be that the activities in phase B and C appear relatively limited because it is in the overall design of the building the most important decisions regarding subject 9 are taken in the drawing office.

10 Light, colour and texture		A	B	C	D	E	F	G	H	J	K	L
British architects	47.2%	4.2	5.5	10.5	14.3	11.2	1.5					
British technologists	8.8%	3.3	1.4	1.1	1.5	0.9	0.5				0.1	

Figure 3-35: British data about subject 10

Everything regarding subject 10 appears as anticipated according to the hypothesis.

Now again a look at the total picture will prove appropriate for a conclusive comparison of the two educations. Thinking of both the above given information and the data to see in the sum schedule below one have to bear in mind that the percentages are directly taken from the respondents and that they as can be seen in the individual examples were given as percentages of a study year and then distributed over an number of phases. The calculation tool then made the distribution even, meaning that 15% to be distributed over 3 phases automatically would give 5% to each, which is of course a rather rough but necessary way to do it not to occupy the respondents too much. So the phase data are rather rough and some of the interpretations above might be overdone.

1 Building material science		A	B	C	D	E	F	G	H	J	K	L
British architects	86.5%	7.2	12.7	22.6	18.4	15.2	10.4					
British technologists	51.8%	10.9	7.6	5.6	7.8	3.8	9	1.3	0.2	0.8	3.8	1
2 Collection/registration of data, wishes and requirements		A	B	C	D	E	F	G	H	J	K	L
British architects	74.4%	17.8	17.8	20.7	12.5	2.1	1.7	0.2	0.2	0.6	0.6	0.2
British technologists	31.7%	6.2	5.3	7.4	2.2	4.3	3.3	0.9	0.5	0.2	1.3	0.1
3 History of architecture and architectural theory		A	B	C	D	E	F	G	H	J	K	L
British architects	86.7%	36.4	10.7	13	13.4	5.5	2.5					5.2
British technologists	21.7%	11.6	1.8	2.6	0.3	3.6	0.3					1.5
4 Management and management tools		A	B	C	D	E	F	G	H	J	K	L
British architects	76.6%	8.8	5.9	4	5.4	8.2	7.6	9.1	9.4	7.5	8.6	2.1
British technologists	38.0%	5.9	4.3	4.1	1.6	1.9	2.6	3.2	1.4	3.4	5.8	3.8
5 Visualisation and visualisation techniques		A	B	C	D	E	F	G	H	J	K	L
British architects	78.3%	0.5	5.7	20.8	28.8	19.6	2.9					
British technologists	39.9%	7.3	2.3	8.5	5.5	6.4	6.6			0.7	2.5	0.1

6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	31.7%		0.3	10	11.5	4.6	5.3					
British technologists	25.4%	6.9	3.1	3.6	1.1	1.4	5.5			0.7	3.1	
7 Technical design like standard constructions, key junctions and building physics		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	41.7%			0.6	15.5	15.5	5.9	2.5	1.7			
British technologists	62.2%	6.5	1.9	6.4	12.4	8.2	12.4	2	1.3	0.9	8	2.2
8 Economy, value and business		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.7%	5.3	2.9	2.6	4.5	2.9	2.6	2.1	2.1	0.9	0.9	0.9
British technologists	15.4%	5.4	3	2.1	0.4	0.8	0.2	0.2		2.2	0.7	0.4
9 Ecology and sustainability		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.4%	3.9	6	4.1	7.9	3.9	1.6					
British technologists	20.3%	6.2	3.9	2.1	2.1	1.2	2.1	1			0.9	0.8
10 Light, colour and texture		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	47.2%	4.2	5.5	10.5	14.3	11.2	1.5					
British technologists	8.8%	3.3	1.4	1.1	1.5	0.9	0.5				0.1	

Figure 3-36: Sum sheet of all British data

Looking over the sum sheet above it can be noticed what could also be shown this way:

Subject	1	2	3	4	5	6	7	8	9	10
Architects	86.5	74.4	86.7	76.6	78.3	31.7	41.7	27.7	27.4	47.2
Technologists	51.8	31.7	21.7	38.0	39.9	25.4	62.2	15.4	20.3	8.8

Figure 3-37: Given sum percentages in Britain

The numbers in the schedule clearly indicate that the architects are far ahead in 6 of the 10 subjects and that there is only one subject where the technologists have the lead. But until now it has been taken for granted that the two groups think about precisely the same when they answer and that a percentage for an architect means exactly the same as one for a technologist but perhaps it is not necessarily so?

3.5 Quantitative data analysis

A factor to look at before going further in an in-depth data analysis is the fact that the respondents could consume up to a maximum of 100% of a year when ticking off the list but that it for practical reasons was not possible to force them to use all the 100%. This means that the average consumption per year for all the groups is around 85% which doesn't matter as long as it is about the same for all four groups. It is necessary to check that and adjust if it is not the case.

It was possible to spread the information over 7 years and that was done by the groups of architects but most significantly by the group of British architects. Not that they have used full seven years for all subjects but more likely it sums to 6 years.

People were asked to estimate how much time they had spent on each of the subjects while attempting to put all their study activities into the 10 areas. This means that the majority have underestimated by just indicating the use of 85% of available time. Assuming that the respondents intended to do what they were asked to do namely cover a 100% of their time with their ticking one could calculate what the result would have been if they had been successful in doing so. But that would only prove relevant in case of a certain discrepancy between the groups at this point. Therefore, an investigation by looking at the data from each group should be undertaken.

The data to be found above for 3.5 years of study for Danish architectural technologists give a total percentage of 85.50%. To bring that up to the desired 100% would require a multiplication of all percentages with a factor (100:85.5) = 1.17

The 5 years of study for Danish architects show a total percentage of 85.88% and the factor to bring that up to a 100% would be (100:85.88) = 1.16

The 3.5 years for British technologists gave the sum percentage of 89.25% which gives a factor of (100:89.25) = 1.12

The 5 years for British architects show a total percentage of 105% which indicate that the right divisor would not be 5 but rather 6 years of theory? 6 years would give a percentage of 87.5% of yearly utilisation and a factor of (100:87.5) = 1.14

Since it might differ from university to university exactly how many years of study they require and considering the complications of the stage 3 requirements of RIBA an uncertainty remains about the degree to which the British architect respondents have utilized the time available. Therefore, it would be a blind shot to try to use any factor for the architects and since the other factors are very alike it is wise to rely on the figures collected and do so exactly the way they are.

A comparison of all 4 datasets to point out the differences between the two countries is still missing. That will be done following the same procedure as with the individual countries.

1 Building material science		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.5%	7.2	12.7	22.6	18.4	15.2	10.4					
Danish architects	55.9%	16.8	15.3	16.9	4.8	0.7	1.4				1	0.1
British technologists	51.8%	10.9	7.6	5.6	7.8	3.8	9	1.3	0.2	0.8	3.8	1
Danish technologists	41.1%	3.5	2.6	5.3	9.7	8.8	5.7	2.2	1	0.7	0.9	0.7

Figure 3-38: All datasets about subject 1

It can be noticed that architects in both countries are spending more time dealing with building materials than the technologists and it can also be seen that the British architects are doing so in the phases D, E and F thus not supporting the hypotheses to cover Britain. For Denmark the hypotheses are supported by the fact that the architects concentrate on the three first phases.

2 Collection/registration of data, wishes and requirements		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	74.4%	17.8	17.8	20.7	12.5	2.1	1.7	0.2	0.2	0.6	0.6	0.2
Danish architects	86.3%	32.2	28.2	17.1	6.1	1.2	1.3				0.2	
British technologists	31.7%	6.2	5.3	7.4	2.2	4.3	3.3	0.9	0.5	0.2	1.3	0.1
Danish technologists	37.6%	2.8	4.9	7.6	9.7	6	2.7	1.2	1.6	0.4	0.5	0.2

Figure 3-39: All datasets about subject 2

It is expected that the architects have been more active within subject 2 than the technologists, but again the British architects are more active in the later phases than anticipated. It is also noticeable that the Danish architects put much more effort into the two first phases than their British counterparts.

This indicates rather different characteristics of the two architect educations as also shown by the placement of the centers of gravity within the phases of the two educations as shown in the small schedules previously shown (figures 3-9 and 3-24).

3 History of architecture and architectural theory		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.7%	36.4	10.7	13	13.4	5.5	2.5					5.2
Danish architects	53.8%	32.7	13.7	5.9	0.8	0.5						0.2
British technologists	21.7%	11.6	1.8	2.6	0.3	3.6	0.3					1.5
Danish technologists	14.1%	2.9	2.0	5.1	3.3	0.3	0.2				0.3	

Figure 3-40: All datasets about subject 3

There are no surprises in the distribution of activities here except that British architects claim to deal a lot with history and theory related to phase D which means the very technical part of the work.

4 Management and management tools		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	76.6%	8.8	5.9	4	5.4	8.2	7.6	9.1	9.4	7.5	8.6	2.1
Danish architects	5.5%	2.4	1.8	0.9	0.2		0.2					
British technologists	38.0%	5.9	4.3	4.1	1.6	1.9	2.6	3.2	1.4	3.4	5.8	3.8
Danish technologists	20.3%	2.6	1.3	1	2.6	3.3	2	1.5	1.2	1.2	2.5	1.1

Figure 3-41: All datasets about subject 4

As can be seen in this figure Danish architects are not active here at all, whereas British architects put a lot of effort into the subject. British technologists also do more here than their Danish counterparts.

5 Visualisation and visualisation techniques		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	78.3%	0.5	5.7	20.8	28,8	19.6	2.9					
Danish architects	94.0%	16.3	17.1	34.3	22,6	1	2.7					
British technologists	39.9%	7.3	2.3	8.5	5,5	6.4	6.6			0.7	2.5	0.1
Danish technologists	23.5%	1.4	1.5	6.7	7,7	4	1.5	0.4	0.2		0.1	

Figure 3-42: All datasets about subject 5

Clearly, the Danish architects have the lead within this subject and their efforts are related to the first phases. It was not expected that British technologists are more active in the initial phases than the British architects are. Looking at these data leads one to suspect that the Danish education of architects is much more art related than the British one is and that the British technologist education tends to look like a short term architect education.

6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	31.7%		0.3	10	11.5	4.6	5.3					
Danish architects	17.8%	4.9	2.2	6	3	0.7	1					
British technologists	25.4%	6.9	3.1	3.6	1.1	1.4	5.5			0.7	3.1	
Danish technologists	49.7%	1.6	0.8	4.5	14.6	17.5	7.6	1.4	0.6	0.2	0.9	0.1

Figure 3-43: All datasets about subject 6

Within subject 6 the Danish technologists are leading and British architects are number two. Especially the activities of the British architects in phase D point at a high concern about technicalities, but not so much in relation to the architectonic space as to the constructive space. There is an obvious need to find out if this is a right interpretation of the data.

7 Technical design like standard constructions, key junctions and building physics		A	B	C	D	E	F	G	H	J	K	L
British architects	41.7%			0.6	15.5	15.5	5.9	2.5	1.7			
Danish architects	22.6%	6.1	2	5.7	4.6	1.9	2.3					
British technologists	62.2%	6.5	1.9	6.4	12.4	8.2	12.4	2	1.3	0.9	8	2.2
Danish technologists	66.6%	2.3	1.2	6.1	18.3	19.3	14.1	1.8	0.5	0.4	2.1	0.5

Figure 3-44: All datasets about subject 7

Within subject 7 the technologists of both countries are clearly in the front which is very well in line with the hypotheses but the British architects are rather active in phase D and E where the detailed technical part is designed.

The activities of the British architects points at a certain engagement in architectural technology, and this subject tends to be the core of the activities related to the constructive space. They even appear to be more active than the British technologists in phase D and E, which is really a surprise.

8 Economy, value and business		A	B	C	D	E	F	G	H	J	K	L
British architects	27.7%	5.3	2.9	2.6	4.5	2.9	2.6	2.1	2.1	0.9	0.9	0.9
Danish architects	3.4%	0.7	0.8	0.5								1.4
British technologists	15.4%	5.4	3	2.1	0.4	0.8	0.2	0.2		2.2	0.7	0.4
Danish technologists	31.6%	1.3	1.3	2.6	4.5	6	5.3	3.9	2.7	1.1	1.9	1

Figure 3-45: All datasets about subject 8

Within subject 8 the Danish architects do nothing and surprisingly the Danish technologists and the British architects do twice as much as the British technologists.

9 Ecology and sustainability		A	B	C	D	E	F	G	H	J	K	L
British architects	27.4%	3.9	6	4.1	7.9	3.9	1.6					
Danish architects	19.7%	5.2	5.2	6	2.8	0.4	0.1					
British technologists	20.3%	6.2	3.9	2.1	2.1	1.2	2.1	1			0.9	0.8
Danish technologists	5.5%	1.1	0.9	0.9	1.1	0.8	0.5	0.2				

Figure 3-46: All datasets about subject 9

The Danish technologists do surprisingly little within subject 9 and might need to improve a lot if they want to live up to the state of the art at this increasingly important point.

10 Light, colour and texture		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	47.2%	4.2	5.5	10.5	14.3	11.2	1.5					
Danish architects	67.8%	18.3	7.5	24.7	12.5	2.4	2.4					
British technologists	8.8%	3.3	1.4	1.1	1.5	0.9	0.5				0.1	
Danish technologists	10.7%	1.3	1.7	3	3.2	0.8	0.7					

Figure 3-47: All datasets about subject 10

This is very much as anticipated especially when speaking about Danish architects. The British architects appear again less occupied with the architectonic space and more with the constructive than the Danish architects. This can be seen in phase A, C and E.

Below are all the data now discussed so what do they tell taken as a whole?

1 Building material science		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.5%	7.2	12.7	22.6	18.4	15.2	10.4					
Danish architects	55.9%	16.8	15.3	16.9	4.8	0.7	1.4				1	0.1
British technologists	51.8%	10.9	7.6	5.6	7.8	3.8	9	1.3	0.2	0.8	3.8	1
Danish technologists	41.1%	3.5	2.6	5.3	9.7	8.8	5.7	2.2	1	0.7	0.9	0.7
2 Collection/registration of data, wishes and requirements		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	74.4%	17.8	17.8	20.7	12.5	2.1	1.7	0.2	0.2	0.6	0.6	0.2
Danish architects	86.3%	32.2	28.2	17.1	6.1	1.2	1.3				0.2	
British technologists	31.7%	6.2	5.3	7.4	2.2	4.3	3.3	0.9	0.5	0.2	1.3	0.1
Danish technologists	37.6%	2.8	4.9	7.6	9.7	6	2.7	1.2	1.6	0.4	0.5	0.2
3 History of architecture and architectural theory		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.7%	36.4	10.7	13	13.4	5.5	2.5					5.2
Danish architects	53.8%	32.7	13.7	5.9	0.8	0.5						0.2
British technologists	21.7%	11.6	1.8	2.6	0.3	3.6	0.3					1.5
Danish technologists	14.1%	2.9	2.0	5.1	3.3	0.3	0.2				0.3	
4 Management and		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**

management tools												
British architects	76.6%	8.8	5.9	4	5.4	8.2	7.6	9.1	9.4	7.5	8.6	2.1
Danish architects	5.5%	2.4	1.8	0.9	0.2		0.2					
British technologists	38.0%	5.9	4.3	4.1	1.6	1.9	2.6	3.2	1.4	3.4	5.8	3.8
Danish technologists	20.3%	2.6	1.3	1	2.6	3.3	2	1.5	1.2	1.2	2.5	1.1
5 Visualisation and visualisation techniques		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	78.3%	0.5	5.7	20.8	28.8	19.6	2.9					
Danish architects	94.0%	16.3	17.1	34.3	22.6	1	2.7					
British technologists	39.9%	7.3	2.3	8.5	5.5	6.4	6.6			0.7	2.5	0.1
Danish technologists	23.5%	1.4	1.5	6.7	7.7	4	1.5	0.4	0.2		0.1	
6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	31.7%		0.3	10	11.5	4.6	5.3					
Danish architects	17.8%	4.9	2.2	6	3	0.7	1					
British technologists	25.4%	6.9	3.1	3.6	1.1	1.4	5.5			0.7	3.1	
Danish technologists	49.7%	1.6	0.8	4.5	14.6	17.5	7.6	1.4	0.6	0.2	0.9	0.1
7 Technical design like standard constructions, key junctions and building physics		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	41.7%			0.6	15.5	15.5	5.9	2.5	1.7			
Danish architects	22.6%	6.1	2	5.7	4.6	1.9	2.3					
British technologists	62.2%	6.5	1.9	6.4	12.4	8.2	12.4	2	1.3	0.9	8	2.2
Danish technologists	66.6%	2.3	1.2	6.1	18.3	19.3	14.1	1.8	0.5	0.4	2.1	0.5
8 Economy, value and business		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.7%	5.3	2.9	2.6	4.5	2.9	2.6	2.1	2.1	0.9	0.9	0.9
Danish architects	3.4%	0.7	0.8	0.5								1.4
British technologists	15.4%	5.4	3	2.1	0.4	0.8	0.2	0.2		2.2	0.7	0.4
Danish technologists	31.6%	1.3	1.3	2.6	4.5	6	5.3	3.9	2.7	1.1	1.9	1
9 Ecology and sustainability		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.4%	3.9	6	4.1	7.9	3.9	1.6					
Danish architects	19.7%	5.2	5.2	6	2.8	0.4	0.1					
British technologists	20.3%	6.2	3.9	2.1	2.1	1.2	2.1	1			0.9	0.8
Danish technologists	5.5%	1.1	0.9	0.9	1.1	0.8	0.5	0.2				
10 Light, colour and texture		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	47.2%	4.2	5.5	10.5	14.3	11.2	1.5					
Danish architects	67.8%	18.3	7.5	24.7	12.5	2.4	2.4					
British technologists	8.8%	3.3	1.4	1.1	1.5	0.9	0.5				0.1	
Danish technologists	10.7%	1.3	1.7	3	3.2	0.8	0.7					

All numbers shown in the schedule are percentages of a study year

Figure 3-48: Sum sheet for all quantitative data

Looking at all the above shown data and what have already been investigated within them, a significant difference between the British and the Danish education of architects can now be concluded.

The two British educations don't look very different at first glance.[42] The most noticeable differences can be found within the subjects, where subject 3, 5, 7 and 10 to a certain extent indicate a difference in the character of the two educations; a difference in character that goes in the expected direction but doesn't prove that the business of architecture should really need the technologist to do a part of the project work. The architects have done more than the technologists within subject 1, 4, 6, 8 and 9, which could indicate quite as good a technical basis as the one of the technologists given that people tend to do the same kind of work within the same phases. But that is perhaps not the case?

Maybe it would be a help to make a full view by putting the sums of each subject and each phase into a schedule.

Subject	1	2	3	4	5	6	7	8	9	10
British										
Architects	86.5	74.4	86.7	76.6	78.3	31.7	41.7	27.7	27.4	47.2
Technologists	51.8	31.7	21.7	38.0	39.9	25.4	62.2	15.4	20.3	8.8
Danish										
Architects	55.9	86.3	53.8	5.5	94.0	17.8	22.6	3.4	19.7	67.8
Technologists	41.1	37.6	14.1	20.3	23.5	49.7	66.6	31.6	5.5	10.7

Figure 3-49: Sums per subject (percent of a year of study)

42 The author is aware that the professional bodies and the UK Quality Assurance Agency (QAA) have given standards for the professionals and that these tend to suggest the same.

Phase	a	b	c	d	e	f	g	h	j	k	l
British											
Architects	84	70	109	132	89	42	14	13	9	10	8
Technologists	70	35	43	35	32	42	9	3	7	26	10
Danish											
Architects	135	94	118	57	9	11				3	2
Technologists	21	18	43	75	67	40	23	7	4	9	4

Figure 3-50: Sums per phase (percent of a year of study)

Looking at the phase schedule it can be noticed how the two British educations roughly have the same equal distribution over the phases. The technologist education is reduced because of fewer years of study and it can even be seen that the architects put more stress on the phases d and e than the technologists and that the technologists are more engaged in phase **a** than in any other phase. This is really a surprise.

When comparing the two Danish educations one finds them significantly different, both when looking at the subjects and at the phases.

It is obvious that Danish architects during their education concentrate on function and on design with relation to the artistic part of the work and not on the constructive space to any noticeable extent. Likewise Danish technologists concentrate on the constructive space and only do a little in the initial phases.

As for the Danish educations, there would have been no need to collect more data to conclude in relation to the hypotheses but now an uncertainty about the two British educations is left. The British data suggest a difference also found in the Danish data but they are far from being as clear and significant as the Danish data are.

A conclusion on the basis of the British data right now, would be that the educations are rather alike but with a tendency for architects to deal with art and design or the architectural space and for the technologists to deal a bit more with the constructive space. But we need to be sure there is nothing more to add or if certain tendencies are not revealed in a clear way in the data. Of course it could also be good to interview people who are familiar with the Danish situation about their opinion of our Danish quantitative data. Perhaps something is forgotten in the way of questioning, something that would change the present view of the educations?

To find out about this, the datasets will be discussed by professionals in both Britain and in Denmark to see which qualitative data that would produce and how they can contribute to our understanding.

3.6 Conclusions

3.6.1 General considerations

The data from Denmark show that the education of architects only deals with the first phases in the phase model and it is very obvious that it only deals with architectural design (AD). The data about the education of technologists show a significant emphasis on the phases dealing with the technical demanding part of the design work (AT). However, both educations also dealt a bit with the phases belonging to the core area of the other education.

The latter situation was much more significant in the data from the UK where the indicators of a difference in the educational focus were very weak. Different possible explanations were pointed out but we are left with the impression that they are in fact far less different than the Danish are. It can be concluded that both the subject and the phase coverage could indicate the same kind of education with the only difference being the length of the educations. This being the case one could also conclude that if a significant difference exists between the two educations, apart from the duration of them, then the chosen tool hasn't been efficient enough to uncover it. A number of possible solutions could be mentioned but there is certainly a need to have a group of well informed professionals to discuss it in order to figure out if something of importance is not uncovered.

What could it be? It might be possible that the architect education when dealing with the very same subjects within the very same phase as the technologist education simply does it in another way; that the viewpoints are rather different so the architects for example look at technical details from an aesthetic point of view whereas the technologists are concentrating on the technical performance. This might be the case but even so, one is left with the suspicion that there are too much overlapping between the British educations to make the professional profile differences clear enough for the best possible service to society.

Architects in both the UK and in Denmark, as well as everywhere else, have to deal with the aesthetic implications of all phases and all subjects and architectural technologists have to deal with the technical performance implications of all phases and all subjects. Thus a certain overlapping in phase- and subject occupation between the two professional areas is necessary. The only question left to answer is: how much overlapping?

In Denmark, the answer can be noticed to be: "Not so much overlapping", in the UK, it is "Very much overlapping". Therefore, it is relevant to debate these different answers both places to be sure whether the balance practiced is the best possible or corrections should be made.

For the progress of the thesis the uncertainty caused by the British data puts an extra stress on the importance of the focus group debates.

3.6.2 Conclusions regarding the hypotheses

What exactly was achieved from this study with regard to the two hypotheses? Hypothesis one:

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

The results above show quite clearly that the different subjects of the AT education as it is today in Denmark and the UK covers today's version of all the principal technical solutions that formerly were embedded in the handicrafts. It can also be noted that an increasing number of AT-professionals graduate from a considerable number of universities, which indicates a need in the industry that wasn't there before. The data also show relative consensus about the content of the courses and that they tend to cover the whole RIBA stage model.

The results of study 1 also show that architects in UK become educated to deal with AT-activities to a certain extent which indicates a need for architects to possess an insight on AT-matters.

All this indicates that the responsibility of the drawing office really includes AT as it can already be seen in the RIBA stage model and that education really mirrors that fact.

The last half part of hypothesis 1: that AT "***after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office"*** is strongly indicated by the data.

Hypothesis two:

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

In Denmark the AT-education stands out from the education of architects whereas the data from UK appears less convincing. In UK it looks more like a tendency than an obvious difference according to the collected data.

In the UK the duration of the education and its university placement is comparable with most other respected newer university educations possessing a status that supports the idea of the hypothesis. But the problem is that the contents of the courses appear rather similar.

In Denmark no other educations cover the AT area than that of the constructing architects (ATs, bygningskonstruktoerer). The problem here is that the education, despite the fact that it gives a bachelors degree, do not belong to a university but to a lower ranking institution. This could be interpreted as if the technologists are just seen as a kind of assistants and it would be interesting to see if that is the case.

In general, it must be said that the indications of data support mentioned here tends to be a little indirect and might require more direct support to be fully covering the hypotheses. Therefore, further studies to state the ideas more directly appear appropriate.

4 Study 2 - Teaching Staff

Initial test – opinion of teaching staff

Study 2 and the hypotheses

4.1 Initial test - opinion of teaching staff

The reader has already got enough information to conclude that the profession of architecture in general is seen as superior to the one of architectural technology. It has been stressed that AT is an activity now belonging to the business of architecture as a more or less integrated part of the project work in the drawing office. And a beginning development in the direction of making it a separate independent business in its own right has not been suggested, even if some technologists might have had that kind of thoughts and some tendencies in that direction can be noticed. The superiority of architecture still appears quite clear.

So, two perspectives can be noted: 1 the perspective of society as a whole recognising the business of architecture as synonymous with the profession of architecture and 2 the insider perspective aware of the limitations of the architectural education and the properties of the AT education. Some could consider the latter just being a kind of bias in the head of the author and to overcome that suspicion a little investigation within the educational sector of the business should prove adequate. The pages 94 - 97 appointed 10 topics to investigate in order to estimate the position of a profession, and if professionals who are dealing with the educations could be asked to express their opinion in relation to these topics a rather qualified judgement might be achieved.

As member of the teaching staff the author assume that such a survey will show that staff members who are dealing with the two educations will tend to rank the AT profession much higher than society in general do, simply because of their more informed insight. As accounted for above architecture is seen as one of the “higher professions” whereas AT tends not to be seen at all, but when noticed, it is often seen as one of the lower professions like teachers, nurses etc. (Haralambos and Holborn 2007 p. 47)

4.1.1 Profession estimation questionnaires and results

A questionnaire asking about the mentioned ten topics were sent to staff members at the School of Design and Technology in Copenhagen. Below the questionnaire and after that the collected datasets can be seen.

Staff members are kindly requested to provide responses to the following topics regarding the professions of Architecture and Architectural Technology. **The aim is to obtain data regarding what staff members think about the level of the two professions as they appear right now. –** Recognising weak points is the first step to improvement.

First you are asked to give an **estimate of the importance of each of the ten topics** on a scale from 1 to 10 – 10 being the highest. All could have 10 or all could be different – what do you think?

Second, on a scale from 1 to 10, where within the topic area would you **place the profession in comparison with professions in general** if 10 is highest and 1 is lowest?

1. Level of skills and knowledge

This is both about the level of culture and the level of special knowledge and ability the members of the profession possess in relation to all other professions.

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10☐

2. Level of formal education

This is about the length and or/level of the required education – again in relation to other professions.

3. Level of organisation

About how the profile of the professional body is

4. Level of respectability

About the reputation of the profession in society

5. Level of exclusivity

The extent to which the profession require special basic personal abilities that not everyone possess

6. Clients' social ranking

Socially high ranking clients tend to have a positive influence at the reputation of a profession

7. Level of professional body control

The extent to which the professional body control the abilities and the behaviour of the members

8. Level of indeterminacy of knowledge and skills

This is about the degree to which the members of the profession can act individually and independently

9. Level of legitimacy

About laws and legislation recognising the profession and giving it a say

10. Level of income and fees

Again an estimate in relation to other professions

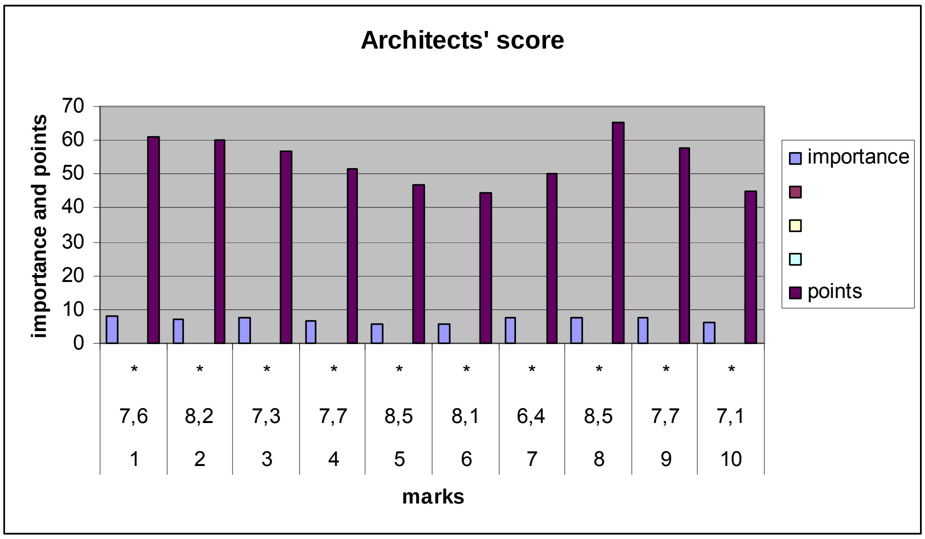
Figure 4-1: Questionnaire about level of profession

11 of approximately 30 possible respondents possessing the architect or the technologist background gave conditional response to the questionnaire thus representing a response rate of 33%. As can be seen the respondents are asked to give their estimate of the importance of each of the 10 topics. This is due to the fact that literature is not giving such an estimate and it was thought more qualified that the respondents made the estimate rather than the author, because they might at feel that some of the topics are less relevant to a total estimate than others and because that consideration might also influence the specific rating marks they would give to a topic for one of the professions.

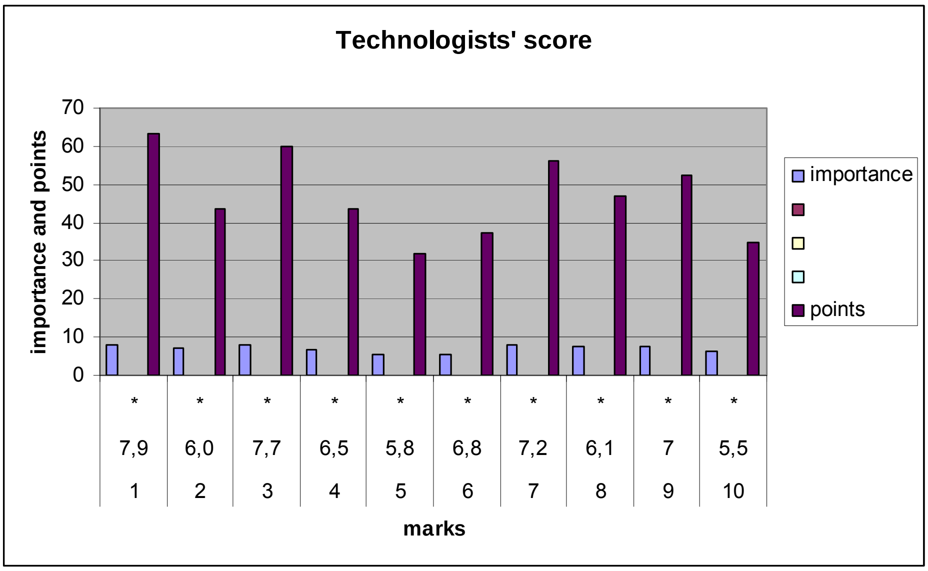
The result of the Danish survey is here:

The ten topics			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**		
	11 answers													
	Average marks - individual topics													All topics
	Importance		8.0	7.3	7.8	6.7	5.5	5.5	7.8	7.7	7,5	6.3		7.02
	Architect		7.6	8.2	7.3	7.7	8.5	8.1	6.4	8.5	7.7	7.1		7.71
	Technologist		7.9	6.0	7.7	6.5	5.8	6.8	7.2	6.1	7.0	5.5		6.65

Calculation of resulting final mark for the two professions							
Architect							
topic	mark		importance		points		
1	7.6	*	8		60.8		
2	8.2	*	7.3		59.86		
3	7.3	*	7.8		56.94		
4	7.7	*	6.7		51.59		
5	8.5	*	5.5		46.75		
6	8.1	*	5.5		44.55		
7	6.4	*	7.8		49.92		
8	8.5	*	7.7		65.45		
9	7.7	*	7.5		57.75		
10	7.1	*	6.3		44.73		
Points	max. Points		701	Points achieved	538.3	Resulting mark	**7.68**
Technologist							
topic	mark		importance		points		
1	7.9	*	8		63.2		
2	6.0	*	7.3		43.8		
3	7.7	*	7.8		60.06		
4	6.5	*	6.7		43.55		
5	5.8	*	5.5		31.9		
6	6.8	*	5.5		37.4		
7	7.2	*	7.8		56.16		
8	6.1	*	7.7		46.97		
9	7	*	7.5		52.5		
10	5.5	*	6.3		34.65		
Points	max. Points		701	Points achieved	470.2	Resulting mark	**6.71**



Mark 7.68



Mark 6.71

Figure 4-2: Results from the Danish questionnaire about level of profession

Notice that the score of the technologists is higher than the score of the architects for topic 1 and 3, which is surprising. Especially, it is surprising that topic 3 gets such a high score for the technologists and such a relatively low one for the architects.

The Danish data are underpinning the assumption in showing a surprisingly small difference in the marks for the two professions. 7.68 to architecture and 6.71 to architectural technology makes a relatively small difference taking into consideration that the education of architects is a 5- year master degree going on in a research institution in comparison with a 3½ year bachelor degree from a lower ranking non research institution. Likewise, it is also a professional organisation with a long and estimated tradition compared to a mere union organisation with little if any professional influence in society.

How can this be explained? – A number of factors can be at play:

1. The respondents are all occupied in the technologist education and are therefore more or less giving marks to the product of own efforts.

2. The respondents are in their daily life occupied with teaching technology and know a lot about that and tend to lack relevant contact with the professional

implications within architecture and then overestimate the value of the work of the technologist.

3. The course given to the technologists is considered more concentrated and heavy loaded than the course of architecture, which only the architect respondents would really know about.

4. The importance of the organisational differences that might favour the architect is not appreciated due to the special Danish tradition and to the fact that the service given to the individual member by their organisation is seen to be in favour of the technologist union.

All this might be more or less right but, four of the respondents are architects, as can be seen, and they are also very positive about the technologist position and show very high consideration for their body of knowledge and skills, perhaps due to their own hard work with the education. Anyhow, they are all much more positive than a skimming of the surface of the two professions would justify, thus indicating that the AT profession is highly underestimated by society. If this group of professionals believed architects were capable of all the same disciplines as the technologists and to the same extent as they are, and that they on top were mastering all the work it takes to make a design concept, then the data should have been quite different. The very small difference more than indicates that they respect that the technologists have their own professional area and that that area is important to society.

Keith Macdonald (1997) stressed that the establishment of a profession is a continuous and also rather complicated thing. It simply takes time and it can be noticed that the AT profession has begun the process in Denmark and now seems to be a little further in the UK both with regard to their organisation and with regard to the educational institutions, but in both places much more has to be done to reach the higher professional level of the architects.

4.2 Study 2 and the hypotheses

How is all this in line with the hypotheses? It was intended to provide more insight on the degree of correctness of hypothesis 2:

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

Te people who know the AT-education in Denmark best, namely the people who teach the students and are personally familiar with the education of architects as well, are in no doubt about the result of the AT-education being of high value to society and deserving a professional ranking very close to the one of the architects.

It is evident that society in general is only scarcely aware of the role of architectural technologists, but that situation can't last long given the staff members are right. In Denmark two factors that both support the development in the direction of more public recognition can be noticed.

The first and basic factor is that the number of architectural technologists is growing and the other is that they increasingly use their own title instead of calling themselves "architects" which, as earlier described, has been the traditional habit. As a result the AT-profession more often becomes mentioned and referred to in the Danish media now. In week 21-22, 2010 there was a discussion in Radio Denmark about the unjustness claimed by the nurses on grounds of being generally paid less than for example 'architectural technologists' and diploma engineers do when they are employed by the State of Denmark. The argument of the nurses, being that the length of the educations and the stage of the educational institutions are alike, indicates other circumstances, namely a tendency to appreciate professions with a technique and science basis more than the so called "softer" professional areas. The newspaper Information brought an article the 2nd of May 2010 about the education of school teachers where a more research based education of the teachers dealing with the natural sciences leaving the rest of the teachers in their present situation is suggested.

Society tends to appreciate science and technique more than the humanities and social sciences, perhaps because those activities tend to contribute more directly to the economic and material level than the others. The historical survey showed that a wealthy society will tend to appreciate art very much and the fact that a professional activity can result in fame of course increases the prestige of the whole profession. The prestige of the AT-profession obviously derives from its technique and science basis and the prestige of the architectural profession derives mainly from its fine art basis as accounted for in the literature review pp. 57-86. The reader's attention is called to the fact that the education of architecture in Denmark belongs to the Royal Academy of Fine Art.

As indicated, it can be claimed that the group of people responding to the questionnaire has a personal interest: That the result of their professional efforts has as high a prestige in society as possible and that their answers are influenced by wishful thinking. One can't be sure whether their personal possession of another and somehow competing profession has balanced such feelings with the wish to possess a superior profession oneself. Therefore, the reliability of the data from this study could be questioned and should not stand alone as testimony for the second hypothesis.

5 Study 3 – Professional Groups

Problems and practical arrangements

The collection of data in the UK

The collection of data in Denmark

Reflections on the hypotheses

5.1 Problems and practical arrangements

It has already been debated what was desired to do in each country namely to establish focus groups in both London and Copenhagen to debate the quantitative data from study 1, and now the study has shown that such an activity is even more necessary than earlier anticipated.

It is not so easy to arrange for a group of highly professional people representing different sectors of interest to meet and debate how to interpret quantitative data like those at hand. The kind of people wanted to participate are normally very busy and occupied with many important matters on behalf of their organisations. But it didn't turn out to be so difficult because the invited individuals immediately became interested in the research project and wanted to contribute with their expertise. Thus it was managed to arrange a group to meet in London by the 16th of October 2009 to debate the data and another one to meet in Copenhagen at the 23rd of October.

The London Group	The Copenhagen Group
The RIBA director of research and development	A secretary of AF (Architects Association)
The CIAT director of education	The chairman of KF
A professor of Architecture from the University of Westminster	The director of international of KF
The course leader of AT from the University of Westminster	A lecturer from the School of Architecture of the Royal Academy of Fine Art
A lecturer of AT from the University of Westminster	A study leader from the School of Architecture of the Royal Academy of Fine Art
The head of department of architecture and planning at Sheffield Hallam University	A process lecturer (architect) of AT of the School of Design and technology
The managing director of DEGW	A process lecturer (architectural technologist) of AT of the School of Design and technology
A director of John Robertson Architects	A director of JJW architects
A partner of PLH architects	

Figure 5-1: The focus groups in London and Copenhagen[43]

[43] The full list with names can be seen in appendix IV

The two groups of people who agreed to participate appeared very satisfactory regarding professional backgrounds and organisational level in the institutions or companies they represented. It was important that the opinions of the group members would afterwards be considered at expert level because of the subtle character of the topics to be discussed.

The London meeting was arranged to take place in a room in the Headquarters of RIBA and it can be noticed that not all participants came from London itself but some had quite a distance to travel, for example from Sheffield, to get to the meeting address. As observer at the London meeting Professor Richard Laing of the Robert Gordon University participated and he had to travel all the way from Aberdeen to London. Because of all these resources now invested it became extra important that the debate at the meeting went well and the findings became relatively clear.

Naturally, the Copenhagen meeting was easier to arrange for a Danish citizen and like in the UK all the organisations asked to participate responded positively from the very beginning. The meeting was held at one of the addresses of The Copenhagen School of Design and Technology.

It is worth stressing that the organisations themselves appointed the representatives. This elevates the responses given to a more authoritative level than what a more personal view angle from randomly appointed individuals might have produced. Where the chief executives participated themselves they would of course automatically have the viewpoint of their organisation in mind and where the chief executives appointed the representatives it appears reliable that this was done with a certain consideration of the interests of the organisation.

Following the invitation to the focus group meetings it was necessary to send information about the quantitative data to be discussed because it was important that the debate became as qualified and well prepared by all participants as possible. On the next pages the reader can see how the data was presented, thus become better enabled to understand on what basis the debates took place.

5.1.1 Data presentation to the focus groups

It has been a concern of the author to present the collected data in a way that would not direct the debate at the focus group meetings more than what seen from a neutral point of view would be considered as key information in order for the debate to take place.

Therefore the descriptions following the data information have been aimed to stress also what appears surprising and contradicting to the hypotheses and to do so without informing about the hypotheses, thus to avoid them being discussed directly (Walliman 2005 p. 337). The anticipation of the author was that the data themselves would guide the debate in the direction of the hypotheses but it was found necessary to ask directly if the group members saw any necessity in the existence of both types of educations.

As it can be noted on page 232 the groups were asked this question with reference to the fact that the data from Britain do not show clearly that the educations are so different that the existence of both is needed in society. The data was presented in two turns first for the debate in the focus groups and thereafter again in the same shaping but together with the minutes from the meeting to provide the best informed background for the group members filling in of the questionnaire, which can be seen at page 235.

As to the reliability of the data from the focus groups, it is worth bearing in mind what kind of people they consisted of and the possible relative influence of the author chairing the meeting. It is fair to say that the groups consisted of people who due to their level of professional self confidence are not inclined to be easily convinced by weak arguments and whose personal inclinations would not necessarily welcome results underpinning the hypotheses.

Actually, the debates went very well and the strategy to avoid biases of the author from influencing the results, if necessary at all in this situation, proved successful.

Below with a grey background the information given and the summaries of the discussions can be found.

Sketchy analysis of quantitative data for the use of focus groups

The quantitative data collected to give insight on architectural and technological education show what the respondents could remember from their education and nothing else. 10 different areas of professional activities that together, seen from the authors point of view, were supposed to cover all relevant activities, are considered. It is estimated by the respondents when the activity took place and in relation to what phase of the phase model.

The areas or disciplines considered are:

1. Building material science
2. Collection/registration of data, wishes and requirements
3. History of architecture and architectural theory
4. Management and management tools
5. Visualisation and visualisation techniques
6. Engineering techniques such as statics and installations
7. Technical design like standard constructions, key junctions and building physics
8. Economy, value and business
9. Ecology and sustainability
10. Light, colour and texture

Attached are the total of four datasets from the two groups of architects and the two groups of technologists. At the bottom line in each set it is shown where the centre of gravity of the activities of each group is placed in the phase model, and it is highlighted with grey and dark grey where much activity belonging to each of the areas was going on.

Looking at the centre of gravity mark alone it is remarkable that there is only a tiny difference between British architects and British technologists as to what they concentrate on during their educations. At the first glance their educations look pretty similar to the Danish technologists', whereas the activities of Danish architects have their centre of gravity much earlier in the phase model.

Looking at the different professional disciplines one also see another picture:

1 Building material science		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.5%	7.2	12.7	22.6	18.4	15.2	10.4					
Danish architects	55.9%	16.8	15.3	16.9	4.8	0.7	1.4				1	0.1
British technologists	51.8%	10.9	7.6	5.6	7.8	3.8	9	1.3	0.2	0.8	3.8	1
Danish technologists	41.1%	3.5	2.6	5.3	9.7	8.8	5.7	2.2	1	0.7	0.9	0.7
2 Collection/registration of data, wishes and requirements		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	74.4%	17.8	17.8	20.7	12.5	2.1	1.7	0.2	0.2	0.6	0.6	0.2
Danish architects	86.3%	32.2	28.2	17.1	6.1	1.2	1.3				0.2	
British technologists	31.7%	6.2	5.3	7.4	2.2	4.3	3.3	0.9	0.5	0.2	1.3	0.1
Danish technologists	37.6%	2.8	4.9	7.6	9.7	6	2.7	1.2	1.6	0.4	0.5	0.2
3 History of architecture and architectural theory		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	86.7%	36.4	10.7	13	13.4	5.5	2.5					5.2
Danish architects	53.8%	32.7	13.7	5.9	0.8	0.5						0.2
British technologists	21.7%	11.6	1.8	2.6	0.3	3.6	0.3					1.5
Danish technologists	14.1%	2.9	2.0	5.1	3.3	0.3	0.2				0.3	
4 Management and management tools		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	76.6%	8.8	5.9	4	5.4	8.2	7.6	9.1	9.4	7.5	8.6	2.1
Danish architects	5.5%	2.4	1.8	0.9	0.2		0.2					
British technologists	38.0%	5.9	4.3	4.1	1.6	1.9	2.6	3.2	1.4	3.4	5.8	3.8
Danish technologists	20.3%	2.6	1.3	1	2.6	3.3	2	1.5	1.2	1.2	2.5	1.1
5 Visualisation and visualisation techniques		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	78.3%	0.5	5.7	20.8	28.8	19.6	2.9					
Danish architects	94.0%	16.3	17.1	34.3	22.6	1	2.7					
British technologists	39.9%	7.3	2.3	8.5	5.5	6.4	6.6			0.7	2.5	0.1
Danish technologists	23.5%	1.4	1.5	6.7	7.7	4	1.5	0.4	0.2		0.1	
6 Engineering techniques such as statics and installations		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	31.7%		0.3	10	11.5	4.6	5.3					
Danish architects	17.8%	4.9	2.2	6	3	0.7	1					
British technologists	25.4%	6.9	3.1	3.6	1.1	1.4	5.5			0.7	3.1	
Danish technologists	49.7%	1.6	0.8	4.5	14.6	17.5	7.6	1.4	0.6	0.2	0.9	0.1
7 Technical design like standard constructions, key junctions and building physics		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	41.7%			0.6	15.5	15.5	5.9	2.5	1.7			
Danish architects	22.6%	6.1	2	5.7	4.6	1.9	2.3					
British technologists	62.2%	6.5	1.9	6.4	12.4	8.2	12.4	2	1.3	0.9	8	2.2
Danish technologists	66.6%	2.3	1.2	6.1	18.3	19.3	14.1	1.8	0.5	0.4	2.1	0.5

8 Economy, value and business		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.7%	5.3	2.9	2.6	4.5	2.9	2.6	2.1	2.1	0.9	0.9	0.9
Danish architects	3.4%	0.7	0.8	0.5								1.4
British technologists	15.4%	5.4	3	2.1	0.4	0.8	0.2	0.2		2.2	0.7	0.4
Danish technologists	31.6%	1.3	1.3	2.6	4.5	6	5.3	3.9	2.7	1.1	1.9	1
9 Ecology and sustainability		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	27.4%	3.9	6	4.1	7.9	3.9	1.6					
Danish architects	19.7%	5.2	5.2	6	2.8	0.4	0.1					
British technologists	20.3%	6.2	3.9	2.1	2.1	1.2	2.1	1			0.9	0.8
Danish technologists	5.5%	1.1	0.9	0.9	1.1	0.8	0.5	0.2				
10 Light, colour and texture		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**
British architects	47.2%	4.2	5.5	10.5	14.3	11.2	1.5					
Danish architects	67.8%	18.3	7.5	24.7	12.5	2.4	2.4					
British technologists	8.8%	3.3	1.4	1.1	1.5	0.9	0.5				0.1	
Danish technologists	10.7%	1.3	1.7	3	3.2	0.8	0.7					

All numbers shown in the schedule are percentages of a study year

It can be noted that the architects in both the UK and Denmark have spent significantly more time than the technologists on the subject **2**: Collection/registration of data, wishes and requirements, subject **3**: History of architecture and architectural theory, subject **5**: Visualisation and visualisation techniques and subject **10**: Light, colour and texture. We also see that the technologists have spent significantly more time than the architects on subject **7**: Technical design like standard constructions, key junctions and building physics.

One half of the subjects have given a result one would expect. The other subjects deserve more analyses or at least a comment:

Subject 1: Building material science
The author would have expected that the Danish technologists dealt with more theory in this subject, and one could suspect that the activities considered are rather different or seen from rather different points of view. The technologists are probably dealing mostly with the more technical characteristics of materials and the architects with the aesthetical aspects. – What do you think?

Subject 4: Management and management tools
It is really a surprise that British architects and technologists are dealing so much with management and management tools during their education as the numbers indicate. It is hard to think of any explanation apart from the one that British architects pass a far more technically orientated version of the education than the Danish do. – Are you also surprised?

Subject 6: Engineering techniques such as statics and installations
Here it is a surprise that the British technologists deal less with the subject than the British architects. Do you think this is due to rather different ways of working, or is it the very same kind of activities with the technologists less active?

Subject 8: Economy, value and business
Again it is a surprise that the British architects are studying this more than the British technologists.

Subject 9: Ecology and sustainability
Here it is obvious that the Danish technologists ought to do much more during their education.

The collected data tends to show noticeable differences between the British and the Danish educations. The British architect education looks more technically orientated than the Danish and the difference between British architect education and AT education doesn't look as significant as the difference between the two Danish educations does. Of course, cultural differences could cause slightly different responses even when the exact same activity is considered, but that is probably not the main explanation.

As to the duration of the four educations one ought to be aware that a study year for technologists in Denmark is 2 x 20 weeks whereas it in UK is 2 x 15 weeks, as far as the author is informed. In this context the difference is ignored, but we would have to think about it if we wanted to estimate the real quality of the different courses. Here it does not matter so much because we are just concentrating on the main content of the educations.

Niels Barrett, September 2009

Figure 5-2: Data information given to the focus groups

This was the information given to the focus group and it provided the basis for the debate.

5.2 The collection of Data in the UK

The data from the focus group meetings are of course embedded in the reports from the meetings. The report from the London meeting is based on hand recording and audio/video recording as well. It was sent to all participants for approval before being accepted for the thesis and it reads:

Welcome, presentation of participants and introduction

The introduction was very brief but it was emphasised that the meeting was meant to make all participants aware of the opinion of other professionals, thus to qualify the individual filling in of the questionnaire afterwards.

Initially some participants wanted more information about the quantitative data and the aim of the research. Then it was explained that the aim of the project was to describe the relationship between the two kinds of education and their roles within the architect firm. It was said that the quantitative data was about; what the respondents remembered they had been occupied with during their theoretical education; how much time they had spent; when, during their years of study, the time was spent and finally what phase of the phase model the activities had been related to. The last item was in order to indicate the more detailed nature of the activity.

Comparison of the quantitative data and conclusions to be drawn

The differences between the Danish- and the British datasets were debated and the different histories of the technologist educations respectively the education of architects was also noted in differing comments. The British technologist education is relatively new (ca.15 years) whereas the Danish theoretical AT-education has an unbroken history back to the education of the traditional master builder some 150 years ago. The British AT-education was built on or derived from the technician education and is a recent invention.

It was noticed that the answer to the seventh question about standard constructions, key junctions and building physics showed the same significant differences between architects and technologists in both countries. The answers to the other questions could indicate that the content of the AT education apart from question 7 is quite similar to that of architects in UK and this was debated at length.

Different comments stated that despite what the data could indicate there is a difference and it was said that even if they in Sheffield have a course for architects at the very technical end of the scale it is still very different from the technologist course at the same university. A number of comments underpinned that the courses in UK vary quite a bit but it was not indicated that the two courses were alike anywhere. On the contrary it was expressed that we are talking about two different approaches to the discipline of designing a building and two different ways of thinking about a building.

It was mentioned that many with an architectural education end up in quite different businesses and utilise their skills of problem solving there because they prove useful in many contexts. We talk about an “ambiguity” here, which can be seen as one of the advantages of the education.

Conclusion:
The two educations are rather different in both UK and Denmark. The differences in the datasets show a more technical orientated architect education in many aspects in UK but this does not mean that the content is the same as in the technologist education because of two very different approaches. Expressed in a simplified way it could be said that: The architects tend to put an emphasis on art, function and design whereas the technologists tend to see the building as a mere number of technical problems to solve in order to make the building technically sustainable.

The recent development and the possible prospect in an international perspective

At this point a number of ideas were presented:

It was debated how EU and the Bologna Agreement are influencing the educations all over Europe and are pushing the member countries in the same direction.

In mainland Europe we have been forced to adapt the British academic titles simply because of the use of English as the common language. Thus, all the European Countries are now implementing Bachelor- and Master Degree titles instead of the old traditional national Degree names and domains.

An interesting consideration for our subject is that Spain has a "Technical Architect" – education, Ireland now has AT-courses at a number of Universities, that Holland last year began an AT-education and that quite a lot of countries have courses named "architectural engineering" or the like.

A development that has been going on all the time is the continuous growth of the technical challenges within the business of architecture due to new materials, new tools, new technologies, new types of architectural concepts and new client behaviours etc. Especially works with technical specifications has been growing rapidly and is still doing so.

It was briefly debated if it would be possible to prolong the educations to meet increased requirements but that is not on the political agenda right now. So, 3 years for a bachelor degree and 2 more years for a master is what have been decided. It was mentioned that to embrace all the requirements of an architect firm we would rather talk about a theoretical education of 15 years and nobody objected.

It was also mentioned that there is a need for more and further education of young people and that this is wanted by the governments of Europe. Society not only requires well educated professionals to do the needed work but it does also require good educational possibilities for all the people.

Also, in all groups of graduates there will be some ready for further education and personal development and we should meet this need in an appropriate manner.

The need for two educations

This was not debated as long or as directly as hoped, but a number of the above mentioned considerations bring good insight to this topic.

It was stressed that the two educations are rather complementary but that a certain competition could be seen because technologists are setting up their own businesses.

A point of view was that there is basically only one trade, namely the business of building design and it doesn't matter what we call it – all the rest is about specialising within the business.

This is an interesting consideration but we were about to conclude the debate and it was not commented further upon.

Conclusion

Reaching this point the allocated time had been spent, but it was concluded that the debate had covered most of the relevant topics and that some important considerations were shared or at least not objected to.
Therefore all participants should now have the chance to deliver a well reasoned response to the topics of the questionnaire to be sent out shortly.

If there are to be corrections, due to this meeting or the meeting in Copenhagen, they will be made by Niels Barrett before it is sent out in its final version.

End of session

Thank you so much to all participants for a lively debate with many very good ideas and interesting points of view presented and a special thanks to those who travelled a long way to be present. Hopefully we can all profit from the result of this project once it is published sometime in the autumn next year.

Figure 5-3: Report from London focus group

As forecasted the focus group meeting was followed up with a questionnaire for each participant to fill in and return when at home. Not all did so and those who did mainly confirmed the report above.

The result of this part data collection can be seen below:

Questionnaire results from the English focus group
The 12 questions were answered as follows:

Questions	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**		**10**		**11**		**12**	
D or B* – Yes or **N**o	**D**	**B**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**
Respondent																								
AAAAA																								
BBBBBB																								
CCCCCC	-	-		X		X	X		X		X		X			X	X		X		X			X
DDDDDD	-	-	-	-	-	-	-	-	-	-	-	-	X		-	-	X		X		X		X	
EEEEEEE		X		X		X	X		X		X		X		➔	X	X		X		X		X	
FFFFFFFF																								
GGGGGG																								
HHHHHH	X			X		X	X			X	X			?		X	X		X		X			X
IIIIIIIIIII		X		X		X	X		X		X		X		➔	X	X		X		X			X
Number of five	**1**	**2**	**0**	**4**	**0**	**4**	**4**	**0**	**3**	**1**	**4**	**0**	**4**	**?**	**0**	**4**	**5**		**5**		**5**		**2**	**3**

***D** or **B** stands for **D**anish or **B**ritish

Figure 5-4: Result from questionnaire to British focus group members

Unfortunately only 5 out of 9 participants gave an answer to the questionnaire and one of the 5 who answered claimed not to be able to see the relevance of the questions. This was also a little apparent during the focus group meeting where the same person said that all the activities somehow belong to one main activity namely the activity of building design as it is also reported above. Probably no one will deny that and this would also include kinds of engineering and surveying but our concern is about some important details within that main area and to see them requires that one zoom in and try to see the trees for the forest as argued so much in the initial texts of the thesis.

The sum questionnaire from the British group came to look as can be seen below:

Detailed answers about the questions

1. **Comparing the situation in the UK with the one in Denmark, what model appears the best or less bad to you? The Danish? Or the British? ?**
   Please give your comment:
   Hard to say!

2. **Regarding the data from Denmark: Of the two educations only the technologist education deals with almost all the phases of the phase model. Does that mean that we could do without the architects?**
   Yes No X

   If no:
   Is it then because of a different culture within the two educations?
   Yes X No
   Are the architects dealing mainly with art, design and function? Yes X No

   Are the technologists dealing mainly with technology and process?
   Yes X No

   Please give your comment:

3. **Regarding the data from UK: The two educations appear rather similar with only a certain difference as to the technological emphasise. Does that mean that we could do without the technologists?**
   Yes No X

   If no:
   Is it then because of a different nature of the two educations? Yes X No

Are the architects dealing mainly with art, design and function? Yes **X** No

Are the technologists dealing mainly with technology and process?
Yes **X** No

Please give your comment whether the first answer were yes or no:

6. **Is there a different culture within the two different courses in UK?**
Yes X No

If yes:
Is it because architecture tends to be art related and technology isn't?
Yes **X** No
Does that mean that architects aim to do the outstanding designs mainly?
Yes No **?**

Please give your comment:

7. **In the past architects only did the design of buildings, which were meant to be outstanding. The rest was done by master builders. Have the technologists to some extent replaced the master builders' role but within the drawing office?**
Yes X No

Please give your comment:

8. **Has it in UK become a tradition to give architects a kind of informal training in AT in the drawing offices?**
Yes X No

If yes:
Is this training well planned and sufficient for a professional of today?
Yes No X
Does it cause mistakes and documents to redo? **Yes ? No**
Is it the clients who pay the costs of this? **Yes No**
Would it be better to use technologists and let them cooperate with the architects?
Yes No

Please give your comment:

7. Is the Architectural Technology discipline growing within the activity of the drawing office due to new and more complicated techniques and materials?
Yes X No

Please give your comment:

8. Is it possible to educate a person to become both a good architect and a good technologist within a theoretical education of 5 year duration?
Yes No X

If yes:
Is it then an average architect student of today? **Yes No**

Please give your comment:

9. Is it possible to educate a person to become a good designing architect within a theoretical education of 5 year duration?
Yes X No

If yes:
Is it possible to do it within 3 years? **Yes No X**

Please give your comment:

10. Is it possible to educate a person to become a good Architectural Technologist within a theoretical education of 5 year duration?
Yes X No

If yes:
Is it being possible to do it within 3 years? **Yes No**
Is it recommendable to prolong the education to 5 years? **Yes No**

Please give your comment:

11. Is it recommendable that drawing offices employ both Architects and Architectural Technologists?
Yes X No

If yes:

Would it balance the cooperation best if the technologist had an education of the same duration as the architect? **Yes ? No**

Please give your comment:

12. Does the title "Architectural Technologist" give the correct impression of the profession to ordinary people?
Yes No ?

If no:
What name would you suggest? **Technical Architect** (only one suggestion)

Please give your comment:

Figure 5-5: Sum questionnaire from the British focus group

As can be seen there are some of the questions that are not answered fully and this is probably due to the fact that it was not possible to debate all the aspects in depth. The relationship between the old handicrafts and today's architectural technologist was barely debated and the same can be said about the length of the educations. The main point of view and the hypotheses were deliberately not explained in order not to influence the group with anything else than what it itself would find interesting to debate on the ground of the quantitative data presented to it and the questionnaire itself.

5.3 The collection of data in Denmark

One week after the British group met in London the Danish focus group had its meeting in Copenhagen. The two groups had gotten exactly the same kind of information in advance and the report from the Danish group was recorded by hand but like the British report sent to the participants for approval in order to avoid any mistakes. It reads:

Welcome, presentation of participants and introduction

After a brief welcome a presentation round, where the participants described their background, was made. Then the background for the collection of quantitative data was described and it was stressed that the aim of the project was to uncover how the two educations are contributing to fill the needs of the architect businesses. It was also emphasized that it hadn't been a premise that anything should be basically wrong with the contents of the educations but that it could be interesting to see if something should be missing and to compare with the situation abroad.

It was noticed that the collected data are only based on what the respondents spontaneously were able to remember from their theoretical educations and therefore do not provide a precise picture of what they have had presented during their education. Thus the datasets represent what made an impression on them at a certain level and consequently they picture the effect of the educations. The questionnaires were about how much time within 10 subject areas the respondents had been spending given that they together should cover everything relevant. It was also questioned what year of studies the time was spent in and in relation to what phase in the phase model it had taken place.

The main aim of the focus group was described as the allowance of the participants to listen to other professionals' opinions and to test own opinions thus to qualify a mutual opinion about the meaning of the data. The presented sketchy data analyses were meant as a help to do so.

On the 16th of October a similar meeting was held in London. As anticipated the participants did not concentrate so much on Danish conditions but tended to see it all from a mere British point of view. The meeting in London was influenced by the comprehensive experiences of the highly qualified participants and it was possible to see the data in an international perspective which hopefully also would be the case at the Danish meeting.

Comparison of the quantitative data and possible conclusions

While comparing the datasets it was also debated that the AT education in Denmark in contrary to in the UK and the rest of Europe is going on in none research based institutions. The idea that '**research relation'** compared with '**research based education'** should be less qualified in case of educations at bachelors level was debated. The party ended agreeing there is a clear positive effect of the research based element at university level because the lecturers are researchers and can judge and advise on such a basis. The AT education in Denmark is successful in all other respects apart from this lack of academic approach.

It was noticed that the architect education in Denmark is characterized by an academic and art related approach to the task of shaping a building, and it was claimed that it first and foremost are the drawing offices that are responsible for the practical education after graduation. This is sometimes criticized but the group appeared satisfied with the situation to a reasonable extent. It was claimed that a change here would decline the academic professional competence of the architect, the kind of competence the offices will not be able to teach themselves.

It was debated that the fact that a syllabus shows activities that are not remembered by the respondents should lead to considerations about how to stress them better if the intention was for them to be remembered by the students.

The difference between the British and the Danish architect education appears clear enough in the present datasets. The Danish lacks a more technical content for the benefit of an academic artistic concentration on function and shaping of the building. Is this an advantage?

This question was indirectly answered by a number of participants that saw strength in this focus because it allows a very high artistic level when considering the length of the education. Taking in more technical stuff would not allow this level. It was stressed that the artistic way of considering a building is totally different from the more technical concentration on how to put something together and that it would require a much longer education than the available 5 years of theory to attempt to unify the two activities at equal high levels if possible at all.

Even if it was not said directly this debate points at three possible but probably not equally good ways of educating an architect who also master all the technical parts:

1. As traditionally done one can begin with the technical and afterwards add the academic artistic parts.

2. The opposite, beginning with the academic artistic and thereafter add the technical part, could be done.

3. Both parts could be implemented in a paralleled process.

A certain animosity against the first model was sensed even if it was claimed unfortunate that technologists are not given any merit to the architect education. In Denmark a person who wants to possess both sets of capabilities has to study for (3½ + 5) = 8½ years if model number 1 is used. One could probably, if using model 2 get 1-1½ year of merit from the AT education. Thus a broad theoretical architect education of 7 – 7½ year could be arranged, if desired.

Obviously the British model for architectural education is partly a model number 3 and may consequently, if studies are quite as intensive in UK as in DK, be more limited than the Danish when it comes to the academic artistic level whereas it is stronger regarding the technical scientific part. – Is that good or bad? – That depends of course on what the education is going to be used for but in Denmark it is assumed that our model will win more competitions per graduate.

If the mothers and fathers of the present Danish architect education should be trusted the Danish focus must be correct. Here, the theory is that not only are 5 years barely enough to achieve the required academic artistic level but also that more focus on something technical scientific will disturb the achievement of the first part which is so crucial to the education. – So, there is barely time enough for the academic artistic discipline as it is, and not only would parallel studies of something technical scientific take time from this essential part, but it would also diminish the quality of the time actually used with an unsuitable parted "mindset".

The AT-education is according to the presented data and in comparison with the British education lacking sufficient attention to sustainability, but it is known that certain initiatives have been taken to improve that. Apart from this the British and the Danish education appear to be very alike.

It was debated whether the AT-education is overlapping too much with the area of the architect education. Looking at the data it can be noticed that there is a certain activity going on in the first phases of the phase model. The representatives of the education argued that these activities as well as some other activities aim to give an insight on the area of the architect thus to establish an understanding of what is important within an architectural concept. It is necessary to induce respect for the work of the architect by making the students test themselves within the discipline. The philosophy is that this will enhance their ability to cooperate in the drawing office. It was not the opinion of the representatives from the education that these activities are going further than sticking to this aim.

The last development and the possible scenarios seen in an international perspective

The Bologna agreement and the attempts of EU to coordinate and accept educations so that graduates and students can move freely and get acceptance of the achieved qualifications from the home countries were debated.

This has already influenced both Danish educations but the process is far from finished. The Architect school in Copenhagen and the Design school, which originate from the technical school system and have recently got university status, are now about to merge on the initiative of the Ministry of Culture. But even this fusion is probably not the end of the ongoing institutional development of the architect school. It looks more like the beginning.

The architectural technologist education was recently released from the embracement of the technical school system and its opposition to any step in the direction of a sufficient academic environment for the education. The situation of the education is still a distance from the university environment of the similar educations in the other European countries. The education is temporarily placed in a so called "Erhvervsakademi" which is basically meant for short term further educations and not degree educations as it is in fact called. This situation is going to have to change if it is meant to keep its bachelors degree.

According to the law all degree educations should at least be positioned in "Professionshøjskoler" by January 2015 and most likely the education will be relocated to such a place. The bachelor degree is called a "professionsbachelor" or professional bachelor, which is seen as something different from a purely academic bachelor. This is a special Danish invention probably created to avoid hurting the feelings of certain people and to stick to the fact that we now have degree educations imbedded in research environments at universities and other degree educations outside such environments. This cannot be understood outside Denmark and if we don't insist on remaining different in this aspect and educate less well than other countries we will have to change it. It was also mentioned that Denmark is lacking further education possibilities for architectural technologists. It is quite common to continue with a master's degree on top of the bachelor's degree within many fields in Denmark and it is a declared aim that any student with the capacity to do so should be able to continue to the highest degrees.

The general needs for education within the field of the coherent technical design of buildings (AT) were debated and it was mentioned that the technological development makes this field still more demanding. A lot of research is going on in neighbouring disciplines but within this specific field only the project technical tools and means of help are subjects to research. What concerns the disposition of the technical design on behalf of the drawing office is not a field of research. Instead the attention is concentrated on means of communication and cooperation which is in itself is good, but what to communicate and cooperate about also deserves to be subject to thorough research. This is more something technical and scientific than it is the architectonic and functional aspects, which are relatively well covered areas within the discipline of architecture.

Will an education of 3.5 years continue to cover all educational needs within this field? – Or is there a need for post graduate courses and research in the core area of the discipline?

Apparently there was consensus about the view point that the professional area that is covered by the AT-education deserves quite as much attention in Denmark as elsewhere where universities are taking care of the education. This is for instance the UK, Spain, Ireland and Holland.

Consequently, the AT-education in Denmark will not be in its right environment internationally and regarding research and knowledge production until it is situated in universities. How long will the present situation last and how many political barriers must be overcome on the way?

The need for the two educations

The focus group was very much in agreement about a strong need for both educations that they are supplements or complementary to each other and that this from an overall point of view is as it should be.

The quantitative data can be used to see whether the educational intentions of the courses are fulfilled sufficiently and perhaps they can even show if the intentions have been right and if something is missing or prioritised wrongly.

A couple of years ago some people in Holland became aware of the need for a theoretical educational coverage of the needs for technical expertise in the drawing offices. Subsequently, an AT-education was begun parallel to the bachelor education in architecture (architectural engineering) at the Hogeschool van Amsterdam. Ireland has also relatively recently taken similar steps whereas it is more than 15 years since Great Britain realised the needs and now 24 universities offer the education.

When the British education of architects is a bit more technically orientated than the Danish it could partly be due to the fact that the existence of an AT-education is so relatively new. The focus group did not at all express any need for the Danish education of architects to move in a more technical scientific direction and some members from both educations expressed serious dissociation from such an idea.

Without closer investigation it cannot be concluded whether the number of graduates from the two educations fit with the needs, which are rather changing with the fluctuations of the market. It was emphasised that especially the architectural education become utilised in a multiply of contexts where the working method of the architect and the developed ability to overview complex totalities are appreciated. Actually, it is only one third-part of the architects who find their jobs within architect offices. Regarding the architectural technologists the majority stay inside the building industry or in related institutions or businesses but it is only a forth part who directly find a position in architect offices. However, it is probably a significant part that does AT-jobs in other contexts for example in contractors companies where drawing offices are established.

Conclusion

1. The distribution of areas of responsibility between the education of architects and the education of architectural technologists appears satisfactory seen from an overall perspective by the members of the focus group.

2. The Danish education of Architects has to concentrate on art and design at a research based level as it is now done, if these disciplines are to be kept at a suitable high level within a 5-year education.

3. The architectural technologist education in Denmark is not competing with the education of architects but is seeking to be complementary by adding the ability to undertake the coherent technical design on behalf of the drawing offices.

4. The AT-education in Denmark needs to be upgraded with regard to educational environment and post graduate courses to be able to fulfil the future needs of the businesses.

5. The AT-educations in Denmark are significantly behind the equivalent educations abroad within the mentioned respects. Upgrading must be undertaken as soon as possible.

Final words

This interesting debate could have been continued much further but as it can be noticed the focus group managed to consider a great deal of important issues regarding both educations and their relationship. I take the opportunity to thank all participants for their time and engagement and I hope the insight given by the event can prove useful to all involved.

Finally attention is called to the intention of the meeting to qualify the fill in of a questionnaire sent to all participants earlier. The return of the questionnaire is anticipated eagerly.

Niels Barrett
October 2009

Figure 5-6: Report from the Danish focus group meeting[44]

The Danish focus group also got a questionnaire to enable further comments and possible corrections and the results are as follows:

Questionnaire results from the Danish focus group
The 12 questions were answered as follows:

Questions	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**		**10**		**11**		**12**	
D or **B** – **Y**es or **N**o	**D**	**B**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**	**Y**	**N**
Respondent																								
AAAAAA	x			x	-	-	-	-		?	x		x		x		x		x		x		x	
BBBBBBB	x			x		x	x		x		x		x			x	x		x		x			x
CCCCCCC	x			x		x	x		x		x		x		-	-	-	-	x		x		x	
DDDDDD																								
EEEEEEE	x			x		x	x			x	x		-	-		x	x		x		x			x
FFFFFFFF	x			x		x	x			?	x		x			x	x		x		x		x	
GGGGGG		x		x		x	x			?	x		-	-		x	x		x		x		x	
HHHHHH	x			x	-	-	-	-	x		x		x			x	x		x		x		x	
Number of seven	6	1		7	0	5	5	0	3	1	7		5	0	1	5	6	0	7		7		5	2

Figure 5-7: Sum results from the Danish focus group

[44] The report is translated from Danish by the author

The data in the schedule above came from seven of eight possible filled in questionnaires that are summed up in the questionnaire below. Not everyone said exactly the same as can be seen in the schedule and the sum questionnaire places the X where the majority has put it. Where you find a question mark (?) it means that no simple answer is given.

Detailed answers about the questions

1. **Comparing the situation in the UK with the one in Denmark, what model appears the best or less bad to you? The Danish? X Or the British?**

   Please give your comment:

2. **Regarding the data from Denmark: Of the two educations only the technologist education deals with almost all the phases of the phase model. Does that mean that we could do without the architects?**
   Yes No X

   If no:
   Is it then because of a different culture within the two educations?
   Yes X No
   Are the architects dealing mainly with art, design and function? Yes X No

   Are the technologists dealing mainly with technology and process?
   Yes X No

   Please give your comment:

3. **Regarding the data from UK: The two educations appear rather similar with only a certain difference as to the technological emphasise. Does that mean that we could do without the technologists?**
   Yes No X

   If no:
   Is it then because of a different nature of the two educations? Yes X No

   Are the architects dealing mainly with art, design and function? Yes X No

   Are the technologists dealing mainly with technology and process?
   Yes X No

Please give your comment whether the first answer were yes or no:

4. **Is there a different culture within the two different courses in UK?**
Yes X No

If yes:
Is it because architecture tends to be art related and technology isn't?
Yes X No
Does that mean that architects aim to do the outstanding designs mainly?
Yes No

Please give your comment:

5. **In the past architects only did the design of buildings, which were meant to be outstanding. The rest was done by master builders. Have the technologists to some extent replaced the master builders' role but within the drawing office?**
Yes X No

Please give your comment:

6. **Has it in Denmark become a tradition to give architects a kind of informal training in AT in the drawing offices?**
Yes X No

If yes:
Is this training well planned and sufficient for a professional of today?
Yes No X
Does it cause mistakes and documents to redo? **Yes X No**
Is it the clients who pay the costs of this? **Yes No X**
Would it be better to use technologists and let them cooperate with the architects?

Yes X No

Please give your comment:

7. **Is the Architectural Technology discipline growing within the activity of the drawing office due to new and more complicated techniques and materials?**
Yes X No

Please give your comment:

8. **Is it possible to educate a person to become both a good architect and a good technologist within a theoretical education of 5 year duration?**
Yes **No X**
If yes:
Is it then an average architect student of today? **Yes** **No**

Please give your comment:

9. **Is it possible to educate a person to become a good designing architect within a theoretical education of 5 year duration?**
Yes X **No**

If yes:
Is it possible to do it within 3 years? **Yes** **No X**

Please give your comment:

10. **Is it possible to educate a person to become a good Architectural Technologist within a theoretical education of 5 year duration?**
Yes X **No**

If yes:
Is it possible to do it within 3 years? **Yes ?** **No**
Is it recommendable to prolong the education to 5 years? **Yes ?** **No**

Please give your comment:

11. **Is it recommendable that drawing offices employ both Architects and Architectural Technologists?**
Yes X **No**

If yes:
Would it balance the cooperation best if the technologist had an education of the
same duration as the architect? **Yes X** **No**

Please give your comment:

12. **Does the title "Bygningskonstruktør" say the right thing about the profession to ordinary people?**
Yes X **No**

If no:

What name would you suggest?

Please give your comment:

Figure 5-8: Sum questionnaire from the Danish focus group

Even if the written report from the focus group meeting in Denmark is more comprehensive than the British counterpart the debate still left a number of questions un-debated. Therefore, also the Danish report shows uncertainties about some of the more detailed questions.

When the report was sent to the participants, two replied and criticized some of the opinions expressed. To be sure that there was no mistake in relation to what had happened at the focus group meeting and to test the point of view now presented, a meeting with the two participants was arranged.

It was not claimed that the group meeting did not give the background for all details in the report but it was questioned if some of what was said was in fact correct. The mini group meeting became rather useful and satisfactory and ended with consensus about a number of issues. The result showed no need to change anything in the report but gave a clarification of certain positions in the Danish context in relation to the situation abroad and the direction of the changes caused by the Bologna agreement.

5.4 Reflections on the hypotheses

The study aimed to look at both our hypotheses and to go behind the provided quantitative data from study 1 in order to uncover not noticed characteristics of the professions and/or suggest explanations to the data that wasn't recognizable based on the quantitative data alone. It both collected qualitative data, here presented by the reports from the focus group meetings in London and Copenhagen, and quantitative data representing the individual opinions of the focus group members.

Thus the final opinion of the individuals was not only qualified by their previous professional experiences but also by the debate in the focus group. So, what did these highly qualified professionals think about the viewpoints stated in the two hypotheses? Hypothesis 1 sounds:

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

They did not say anything about when the shift happened but they agreed that the discipline of AT has taken over the technical decision making area of responsibility from the old handicrafts because of the use of new technologies as it can be seen in the questionnaire results. The first hypothesis is then in this study well supported apart from the information about when it happened.

What then did the study say about the second hypothesis?

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

The focus group members agreed that today there is a need for both the architects and the architectural technologists in the drawing office. This was a very clear message and the attempts to explain it referred to the rather different nature of the two educations. The difference was seen a result of two different ways of approaching the building design that the two disciplines represent. Thus the uncertainty left by the bare quantitative data from the UK in study 1 was taken away leaving a strong support to the idea of the two mindsets also discussed in the literature review.

As to the length of the two educations it became clear that the focus groups thought that architecture requires at least 5 years whereas there was an uncertainty about the right duration of AT. It was also stated that AT is a growing activity within the drawing office.

6 Discussion

The educational coverage of the phases and subjects

Critique of the research

Architectural design and architectural technology

AD, AT, and the professions

6.1 The educational coverage of the phases and subjects

6.1.1 Drawing office occupation

It is argued, that the work in the drawing office of today requires two mindsets or two different points of view within the integrated design work and the idea became underpinned in the focus group meetings. It is also argued that the two mindsets are mainly about what here is called the architectonic space and the constructive space. The author's rough estimate or assumption of how these two should be sharing the work in the different phases is shown below.

Characteristics of the work of the drawing office

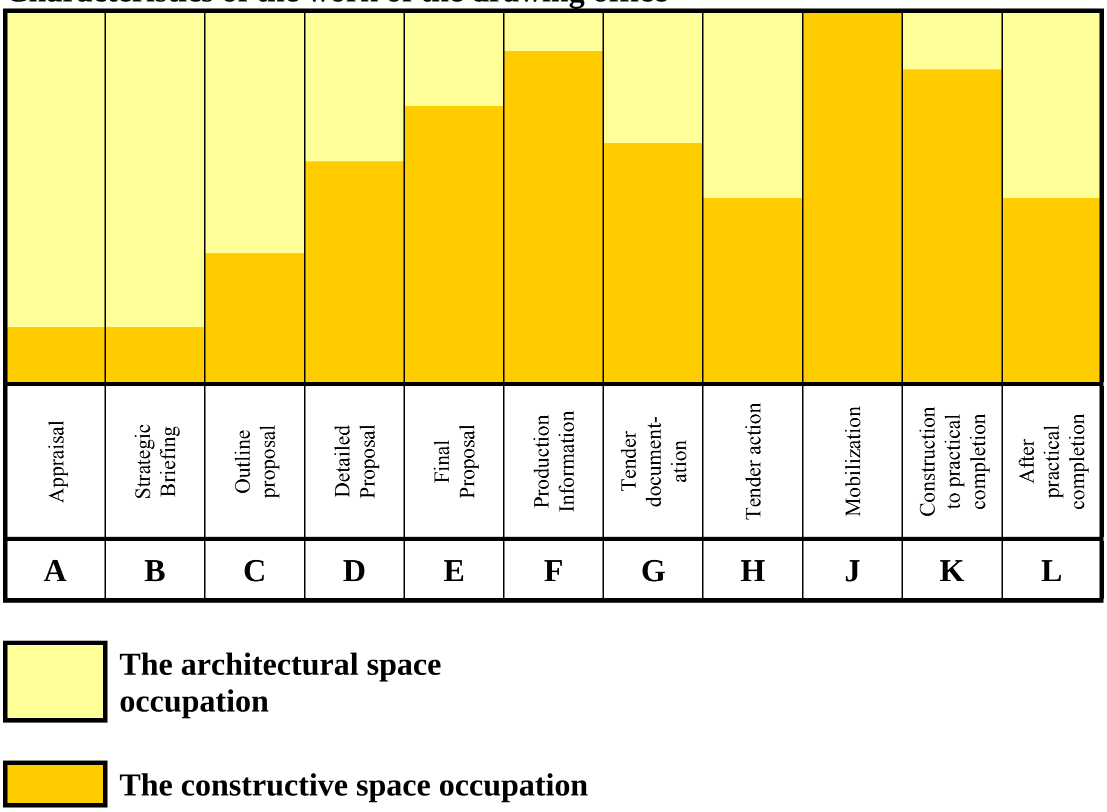


Figure 6-1: Rough estimate of the space occupation within the different phases

A very precise picture can only be made after a building is designed and executed and then only for that specific building and given the drawing office attempt to make such documentation and that has probably never happened. There are no two identical processes. There will be projects where the one occupation proves much more demanding than what is shown here, so what it tells is just the author's experience based idea on the average relative occupation rate of the two types of activities.

The reader could call the shown schedule an assumption or a hypothesis as to his/her liking but we will not get any closer to how exactly an average procedure is at the time being in Britain or in Denmark. However, it gives an idea of how the distribution is and the reader can make his/her own judgement about how precise he or she thinks it is and it would probably be slightly different but it doesn't matter in this context where the aim merely is to present the main idea and then look at the data about education that in fact were collected.

6.1.2 Interpretation of the UK data

How education is occupied with the phases

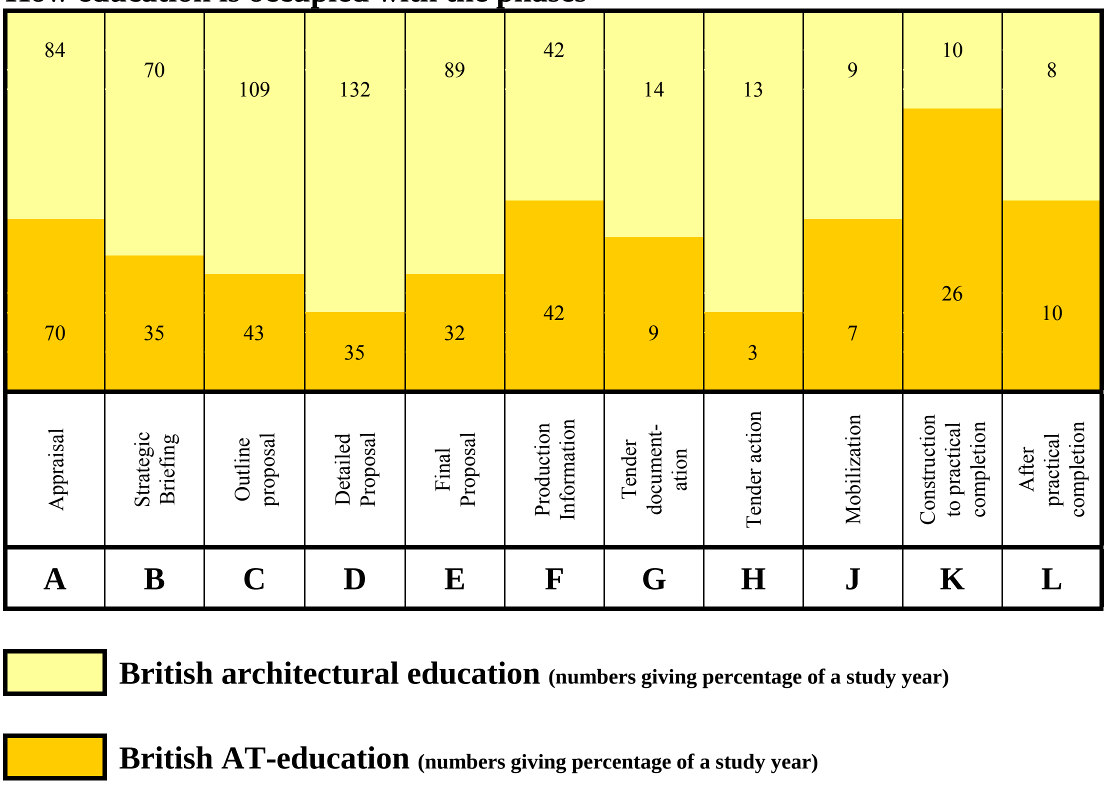


Figure 6-2: The relative educational occupation within the phases in Britain

The schedule creates an interpretation by showing the percentages of one year of study each of the two educations have been spending within each phase. By showing it together in the same columns we indicate what was said by the collected qualitative data for study 3 namely that the two educations represent the two different but necessary approaches within the business of architecture of today.

Implicitly it is said that both disciplines are necessary and it is also implied that they share the responsibility of educating for the specific phase. When comparing with figure 6-1 above we note a certain discrepancy but apart from some surprising facts we have to accept the necessity of a certain overlap to secure the ability to understand the implications of the neighbouring profession in order to secure the good cooperation between the two.

Now it is also apparent that the British architects are forced to get into technology if they want to pass stage 3 of the RIBA schedule and all our respondents are RIBA members.

6.1.3 Interpretation of the Danish data

The Danish quantitative data appear rather different from the British data that became somehow modified by our qualitative data but show quite another distribution of time consumption within the phases than was anticipated. The Danish data show a very clear difference between the two professions with AD mainly dealing with the first phases and AT taking over from phase D and further on.

This is very much in line with the idea of the architects tending to maintain the tradition from the renaissance being the deliverers of the desired aesthetic and artistic attributes to buildings while someone else delivered all the rest. The phase model itself tells about an area of business that also embraces the overall technical design of buildings and our Danish data show the technologists as those educated to do this part and that architects only pay a little educational attention to all that.

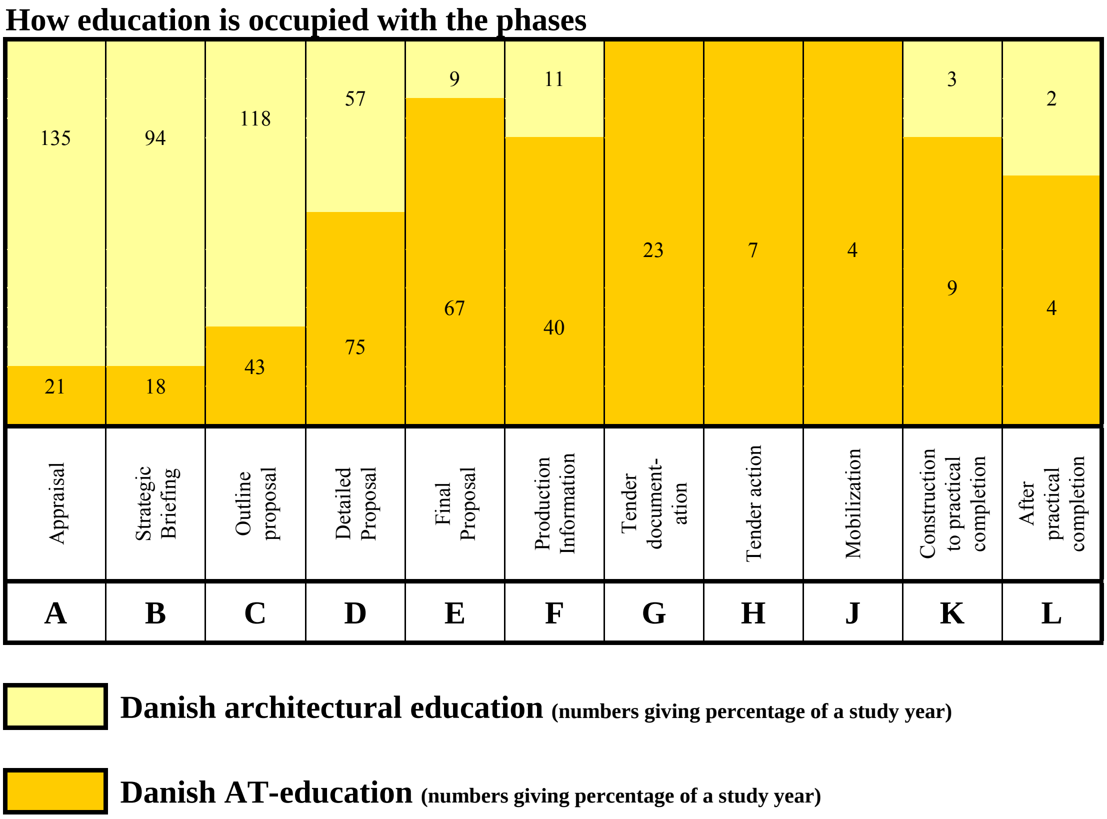


Figure 6-3: The relative educational occupation within the phases in Denmark

Noticing the relative percentages of a study year the two educations allocate to the different phases we could ask if what is here seen is appropriate when the two identified roles of the professions are considered. This question has not been asked before simply because the comparison of the two educations have not been made or considered relevant until now. One could doubt that the right balance is coincidentally found in Denmark. In comparison with UK different sum numbers and a much different distribution of interests for the two professions can be noted.

Who has the better model and is that model ideal? – Hopefully this will be debated in the future and bring us closer to a situation where education in the field of architecture can serve society the best possible way.

6.1.4 Comparison of the two datasets

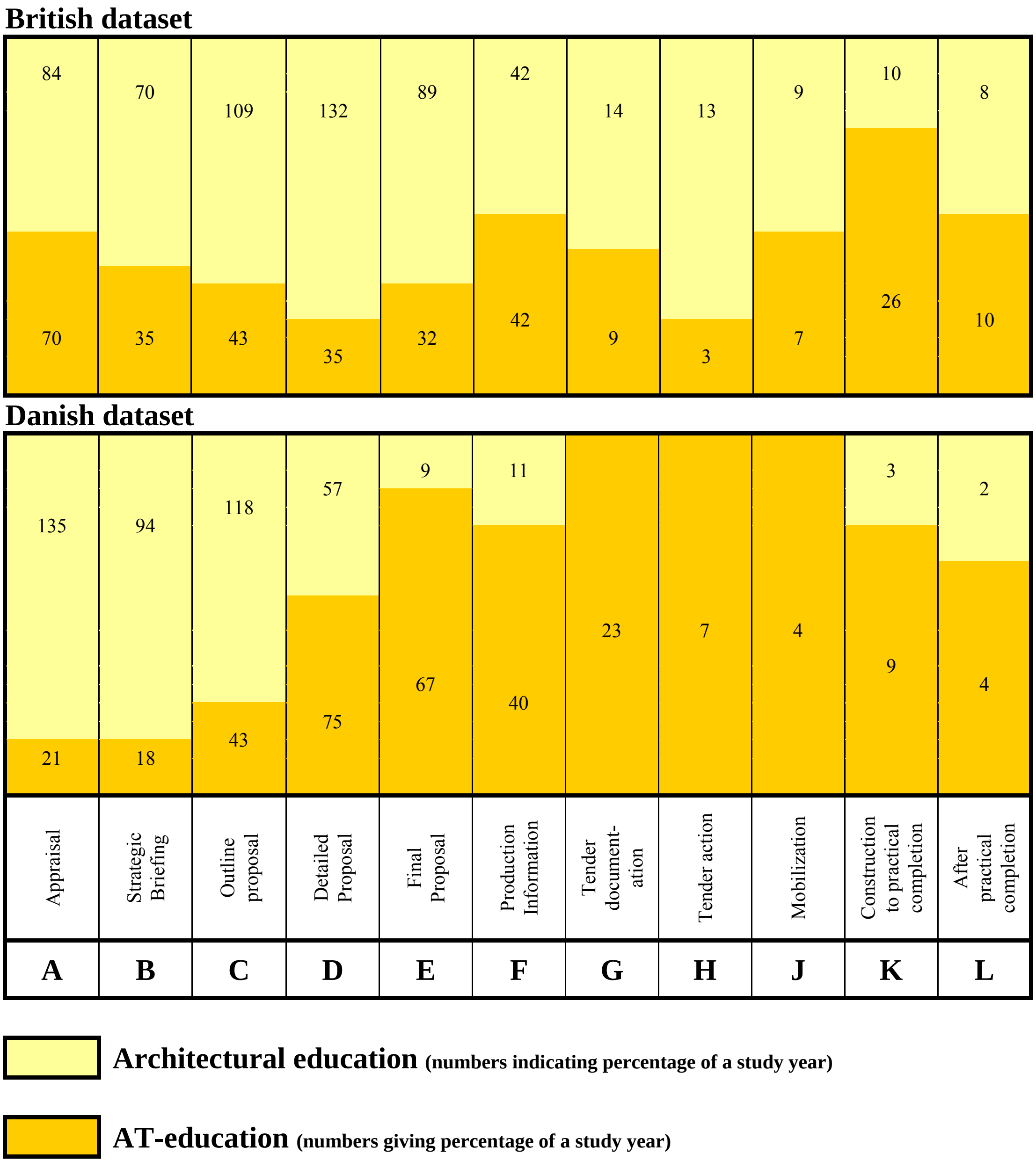


Figure 6-4: Educational occupation within the phases in Britain and Denmark

When comparing the two sets of numbers and educational contribution it is worth noting that apart from the visualised differences between the two educations we also see different national attention to some of the individual phases.

154	105	152	167	121	84	23	16	16	36	18
156	112	161	132	76	51	23	7	4	12	6
Appraisal	Strategic Briefing	Outline proposal	Detailed Proposal	Final Proposal	Production Information	Tender document-ation	Tender action	Mobilization	Construction to practical completion	After practical completion
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**

British sum data

Danish sum data

Figure 6-5: National total attention to the phases in percentage of study year

Here we can note the same attention to the phases A, B, C, D and G and a clear difference within the phases E, H, J, K and L in the favor of Britain. What this precisely means when considering the different mindsets is hard to say based on the collected data but clearly both British educations are paying more attention to these latter phases and Denmark should perhaps now ask if we couldn't profit from more attention to these phases. More awareness of what is going on in the latter phases might also qualify the activities in the initial phases but of course it is a balance to find within the limited resources of the available years of study.

6.2 Critique of the research

6.2.1 The details and the whole

As mentioned in the text about study 3 (p. 232) one of the participants in the London focus group tended to see the whole subject as concentrating on just one side of a whole that basically is one thing namely building design. Everything should be integrated parts of such a design and that was more or less the end of story if the author understood the comments correctly.

It is hard to disagree with that consideration, as long as one want to keep an overall view of all design involved in today's production of buildings. A full integration of everything should be the goal for all participants but is unfortunately far from always the result of the efforts. This is not to say that individual participants deliberately want to deliver not integrative part designs but, as a matter of fact, this is very often what happens due to sub optimization of isolated problem solutions. It can even be said that the industry has developed bad habits by doing so regularly and that this is going on to an extent where it is not even noticed by people anymore. Now the 'error' is anticipated by all participants as a given thing because they have become blind to the phenomenon and tend to assume that it couldn't be any different.

This is very much the case for technical installations, where the participating professionals apparently are satisfied with solutions that technically perform well, even if they ruin the good looks and performance of the architectonic space.

If the indirect objection of the focus group participant to the way this research is approaching a development in the industry is caused by such considerations, the worry is about looking at details instead of the whole design task understandable and justified to a certain extent. The investigations could have begun with the problem of securing a better integration of all design parts for the buildings of the future. It could have been taken from outside in instead from inside out, as it was in fact more or less undertaken. The research has almost exclusively been concentrating on the work of the drawing office or the office of the architects and has not been dealing very much with the role of engineers, surveyors and other specialists who contribute to today's building designs. But this critique is only relevant if it would have caused another and more reliable result of the research to do so.

The research did not aim to look at the problem of everything not being integrated in the building design even if such a research can be seen as a reasonable and highly needed one. The aim was to concentrate on the relationship between architects and architectural technologists and to see what development can be noticed within that relatively limited field. Admittedly, the consequences of AT developing to become a totally independent kind of consultancy area has been considered and the threat this would provide for the creation of buildings, with an even lesser degree of integration of all building parts in one well integrated whole design, has been pointed at.

Thus it is suggested to keep AD and AT inside the same architect consultant company for example with partners representing both kinds of educational backgrounds. It is not discussed how this could be secured but it can be suggested that the professional bodies of the two professions go together and debate how to meet the future in a way that will serve society best.

As a matter of fact the two professionals are the only ones that deal with the building design as a whole and who possess such overall responsibility and therefore their cooperation must be seen as most crucial to the integration of everything into a decent piece of architecture to serve the local environment well.

However, the architect is the professional who is responsible for the architectonic space meeting the requirements regarding the function of the building. This is both all the practical functions enabling the users to stay, move and behave as they please and also all the more emotional requirements pleasing the wandering eyes of the spectators inside and outside the building. Thus, the architect is dealing with all that regards the reasons for making the building in the first place, whereas the technologist is dealing with all the functions of the less visible physical structures and with securing that the, by the architect required, visible physical structures also perform well technically and establish the required level of sustainability both technically and visibly. The fact, that the AT-professional is not alone in the work with the technical performance of the building but have to get support from various engineers and other professionals, doesn't reduce the responsibility for the coherent technical design of the building. It makes it even more challenging to secure that the contribution of all participants become well integrated and meets the requirements of the client and the architect.

6.2.2 The surprise of the British quantitative data

The surprises provided by the British quantitative data are also partly discussed in the study 1 section and it must be admitted that the results from the used questionnaire did not clearly uncover the differences between the two groups of respondents that was claimed so strongly to be there by the focus group. Why it turned out this way was not explained in the focus group, but it was stated that even if the architect students in Sheffield were much occupied with technicalities their whole approach was quite different from that of the technologists.

For the reader of all this it is apparent that the author had anticipated a result more like the Danish with a clear difference in occupation within the different phases of the phase model. It was anticipated that the architects would have been mostly occupied with the initial phases and the technologists with the later phases but the result did not clearly show that.

The author has accepted the results as they are and so did the focus groups. They explained the differences, they so strongly insisted on, with very different approaches to the same subjects; approaches resulting in solutions that are not solving the same kind of problems but problems regarding design and appearance for the architects and technical performance for the technologists. That being the case it creates the suspicion that the phase model, in contrary to what was anticipated, was interpreted slightly different in the UK from what it was in Denmark. Despite the more limited number of British respondents, a convincing consistency in the responses was noted and little doubt is left that the respondents more or less felt the same about their studies and their content and that they approached the questionnaire the same way.

Of course, it is possible that the Danish and British architect courses are much more similar than the data show and that the differences are partly due to a different approach to the questionnaire caused by different national ways of considering questionnaires of the actual kind. Being more familiar with the Danish courses the author is in absolutely no doubt about the reliability of the Danish data, which very well correspond with the anticipations prior to the data collection.

The British result of the questionnaire for the architects leaves a certain minor doubt about its reliability simply because it, seen from the author's point of view, does not correspond very well with a reasonable interpretation of the phase model and the information about the characteristics of the courses that has been available. This is only important if someone would like to use the data in other contexts because here we have supplementary data giving rather trustworthy information for our purpose. However, this could also just be the concern of an over suspicious mind and the simple explanation adapted in the rest of the writing might prove perfectly right.

6.2.3 Why just the UK and Denmark?

This question has to some extent already been answered in the introduction (p. 29) but here at the end of the thesis it might be appropriate to recall the argumentation.

Of course it would have been much more convincing had it been possible to cover all member countries of the European Union or all countries that have signed the Bologna agreement and are now aiming to adjust their educational systems to meet mutual requirements, thus enabling recognition of qualifications both inside and outside universities. Unfortunately, this has not been possible to do within the limitations of this study and therefore it was important to choose countries that could be considered representative for the ongoing development.

Denmark was chosen because it is the home country of the educational institution for AT-professionals to which the author belongs and because it possess the mentioned unbroken tradition of education within AT. Also, Denmark is a small country and can be seen as a representative of the group of small countries in Europe. Small countries have, among other conditions, that in common that their home markets are small and don't give the same background for specialization areas within the industries as the bigger countries do. This is of course influencing their educational systems to possess fewer educations tending to embrace more areas of responsibility within each of them.

Britain could represent the bigger countries and moreover it is without comparison the most influential European country culturally because of the position of English as the commonly used language internationally. This has already caused that all European member countries are about to introduce the British degree system as approved in the Bologna process.

Thus Britain and Denmark appeared the suitable to begin with for this researcher and chances that the research results might prove influential are seen much more convincing via UK than via any other European country for the reasons mentioned above.

These are the reasons for the choice of countries in which to collect data. It can be questioned if results from these two can be seen as representative data for all Europe? To this question the answer must be no! Most of the European countries do not posses AT courses though many might have something a bit similar they are still stuck in their national traditions of how to organize their industries and consequently their educational systems. Considering this, the argument for the choice became that the whole scene is changing during these years and what before was an internal national affair now tends to become dependent on the international market and the development going on there. In this situation all looks towards Britain and the USA but tends to see Britain as the mediator of the American influence along with Britain's own influence within Europe.

There is no doubt that the example of Britain constitutes a serious part of the reasoning behind the establishment of AT-courses in the Republic of Ireland, and these examples might influence other countries to do the same in the future. As mentioned above, Holland has begun an AT-course in Amsterdam recently and this could be seen as a trend like for example facilities management as a now recognized and growing area of activity that has come to mainland Europe from the USA and Britain as a separate discipline to educate for instead of being seen as an area of specialisation within a number of traditional professions.

6.2.4 Why not a specialisation area within architecture?

Yes, why not consider AT a specialisation area within architecture? It could very well be such an area, especially if it had derived from architectural design, which is not fully the case as we have seen.

The field of AD has during the 20th century split up into a number of specialisation areas in the sense that architects began to undertake such areas of specialised activity; so, why not just consider AT as such a newly recognised area of specialisation for architects?

This thesis is not stating whether this should or would be the case in the future but something has been recognised that contradicts such a development. There are at least three factors to consider when searching for an answer to the question of the chapter headline:

1. The activity of AT is not really seen as belonging to AD because it is so technically orientated. Some building professionals see it as an activity bridging between engineering and architectural design.

2. In line with this the AT activity requires another "mindset" than the one the architect typically possess as so thoroughly described here.

3. The initial development now tends to make it a separate education outside architecture and not a specialisation area within it.

The mindset schism between AD and AT has in fact developed along with the addition of new areas of specialisation within architectural design where landscaping, urban design, industrial design and other minor specialisation areas became identified and a search for a common ground for all these areas began. Before this and until the mid 20th century the work of the architect was commonly seen as embracing AT as well – at least the AT to be practised within the drawing office even if it was relatively limited in those days. Moreover, the architects were very familiar with the handicrafts themselves and did not see a schism simply because of their additional handicraft background, which provided them with at least 9 years of professional training instead of today's 5 years of pure theoretical training within AD.

The handicrafts did not induce the mindset of an architect but when the educated craftsman entered the architectural education the architectural mindset followed. There is very little within the historical construction handicrafts that indicate a mindset significantly different from the mindset of the architectural technologist.

The advantage of specialisation is the possibility of going more into the dept with things and establishing expertise; the advantage of embracing everything is the ability to balance everything right, but that is not possible when things get too complicated, which is the case today as it is so thoroughly argued. Therefore it is suggested here that the two different educations are cooperating, like when the drawing office are dealing with projects involving both buildings and landscape where two kinds of architects are cooperating.

Thus, it is not suggested that AT should not be considered as an area for a special architectural education. However, it is not to what most likely will happen, even if certain advantages of such a situation are rather apparent seen from society's point of view.

6.3 Architectural design + architectural technology

6.3.1 The linguistic approach

Based on the historical survey of the thesis it can, by using a mathematical metaphor, without hesitation be claimed that

AD + **Handicrafts** = **Architecture**

The colours used in the equations in this chapter are symbolising how addition of pigment or substance add to the value of the result.

If one replaced "architectural design" with just "architecture" in the equation, which all our sources indirectly tend to do in their writing, because they, probably due to lack of concern, never see it this way at all in their concentration on architectural content, one would lack a term to express the result of the addition or application.

Architecture + **Handicrafts** = **Architecture**

The equation becomes nonsense because adding something as substantial as the old handicrafts to something else doesn't make it disappear. Architecture can't be both the sum of the addition of more elements, which are all worth more than zero, and at the same time just one of the elements. No, the term "architecture" stands for the result of the whole process. Therefore, there is a need to call what the architects are doing "architectural design" or AD.

One comes to realise that architecture traditionally were nothing without the handicrafts. It simply did not exist independently, whereas the handicrafts surely existed very well without architecture. Therefore history also showed a development the other way around and at first it was simply as shown below

Master Craftsmen + **Handicrafts** = **A building**

Subsequently, it was discovered that something more could be added to raise the value of the building and society got

AD + **Master Craftsmen**+ **Handicrafts** = **Architecture**

So what was added was not "architecture" but the kind of art design that would turn the product of the handicrafts into something more than just a building namely a piece of architecture (Pevsner 1973). This extra factor was the design the architects added to the building that would have been erected anyhow. The handicrafts did not exist because of architecture; they were there in their own right and were more essential and literally spoken more substantial than the lofty idea of architecture. No, architecture existed because of the handicrafts but became highly appreciated by people who had realised the existence of more emotional needs than just a roof over the head.

Thus, it was argued that the architects traditionally added something to the technology embedded in the handicrafts and got architecture as a result, but it was also realised that one normally faces uncertainty and perhaps even confusion because of the tendency to equalise architectural design with architecture when the talk is about these things. We need to stop doing so, if we want clear distinctions.

But all this is about the tradition, so what are the realities of today? Surely architectural design is practised and new architecture can be noticed around but how does the latter thing come into being? Not by architectural design alone as realised. Put into an equation the question looks like below

AD + **X** = **today's architecture**

So X – whatever that is – have replaced the handicrafts of the old days. The fact that much of the manual work is now replaced by manufactured components and that the manual work left is made by skilled workers and not real craftsmen as before is so thoroughly accounted for above. It is also seen that today's kind of documentation from the drawing office is tenfold as voluminous as before without causing more education for architects. What is causing all these documents in comparison with before? – Simply the fact that staff on the building site doesn't possess the expertise to make the kind of decisions, that are now described in these documents, as they did in the old days when they were real craftsmen who were trained in the craft tradition and could stay within it.

If society today wants buildings that also possess the qualities that make them pieces of architecture it has to arrange it as in the equation below:

AD + **AT** + **engineers and surveyors** + **manufactured components** + **manual workers** = **architecture**

As can be seen, architectural technology has replaced numerous decisions traditionally made by the craftsmen, who knew very well how to solve all the technical problems of a building to be erected. The technologist will select components and technical solutions to make the building perform well under the influence of nature, climate and human use as did the craftsmen together with the master craftsmen before him. But the activity can't be based on the tradition simply because the tradition is gone and therefore there is a need for a new kind of knowledge and ability and therefore the professional is not a craftsman but an architectural technologist. Moreover – the professional is not working on the building site but in the drawing office with all the needed technical documentation replacing the achievements of traditional craftsmanship.

But how is the relationship between the architectural design discipline and the discipline of architectural technology now they are working in the same drawing office? Aren't they just integrated parts of the very same? Or, if they are still two disciplines like the discipline of the master craftsman and the traditional discipline of the architect, how then do they meet and cooperate?

6.3.2 Dualism and complementarity

"No servant can serve two masters: for either he will hate the one, and love the other; or else he will hold to the one, and despise the other. Ye cannot serve God and mammon." Luke. 16:13 – King James Version.

As seen the industry has two disciplines due to the fact that it has two kinds of activities that require two different mindsets or two different focuses. The possibility of one professional possessing both capabilities is also discussed and it is here the quotation above becomes relevant. Does the quotation from the Bible apply in this context?

Based on the research it can be claimed that professionals with an insight find it relevant for the drawing office to employ both kinds of professionals and it is also known that there are professionals who in fact possess both qualifications. It has not been a direct part of this investigation to uncover to what extent people with both qualifications are directly utilising both of them by doing all the work the two disciplines qualify to do on behalf of their drawing office. The experience based assumption of the author is that this is only going on in small businesses with very few employees. The bigger companies have all found it more efficient to let people do the parts they prove best at, and it is more or less the rule that there are different teams doing different jobs.

Some people are simply more inclined to see the architectonic space and others are attracted by the challenges of the constructive space. So the words about human behaviours of the Bible seem to apply in our context as do the vase psychology of Edgar Rubin.

Our two disciplines in question have some of the same relationship that architectural design and craftsmanship had in the old days. They were both necessary to make architecture and there were members of both disciplines who were capable of practising both disciplines but it became unusual after the renaissance that someone in fact did both. In the medieval period people possessing both capacities were sometimes challenged with such demanding assignments as for example the design of a cathedral. As we have seen the person who did this design belonged to the crafts position but normally only did the design and the surveying work.

The historical development of architectural design and architectural technology can, due to the review and research, be shown in an overview schedule like figure 6-6.

From 1950 to 2010 **2 businesses**		**From the renaissance (1450) to 1950** **2 businesses**		**Medieval period** **1 business**
Modern design and industrial technology + skilled workers		Traditional- and at the end partly modern design but mainly executed by traditional handicraft		Designs – new and old based on the handicrafts
Architectural business	**Contractor businesses**	**Architectural business**	**Handicraft businesses**	**Handicraft businesses**
AD + AT	**execution**	**AD**	**AT + execution**	**AD + AT + execution**

Figure 6-6: The historical change of the position of AD and AT

Within each of the three historical periods the movement to the next situation went smoothly and without sudden changes. Because of this slow process people did not become aware of the change until lately. As noticed, the last change is only recognised partly and the awareness of AT previously being a part of the handicrafts is still mostly lacking, as the architect business tends to see it more as a part of AD, which it in fact never was. It was AD that was originally linked to AT and not the other way around. But as soon as AD again, along with growing wealth in Europe in the end of the medieval period, was recognised as an art discipline in its own right it tended to become an independent business as can be seen in the schedule (figure 6-6), whereas AT remained embedded in the handicrafts.

Today, some large contractor companies possess their own AT offices and sometimes even AD/AT offices but that fact is of less interest to us as we concentrate on the capabilities of the individual professionals due to their training and mindsets.

An important part of AT is to design for execution and it could be said that AT is bridging between AD and execution by securing the build-ability at the same time as respecting the architectural space intentions of the AD-concept along with the good technical performance of the building.

The plan drawing below (Figure 6-7) shows John Wood's plan for Prior Park and it also shows how his focus was on the architectural space leaving a lot of work to the craftsmen. They had to fill the constructive space with their masonry by carefully following a rather large number of rules belonging to their handicraft.

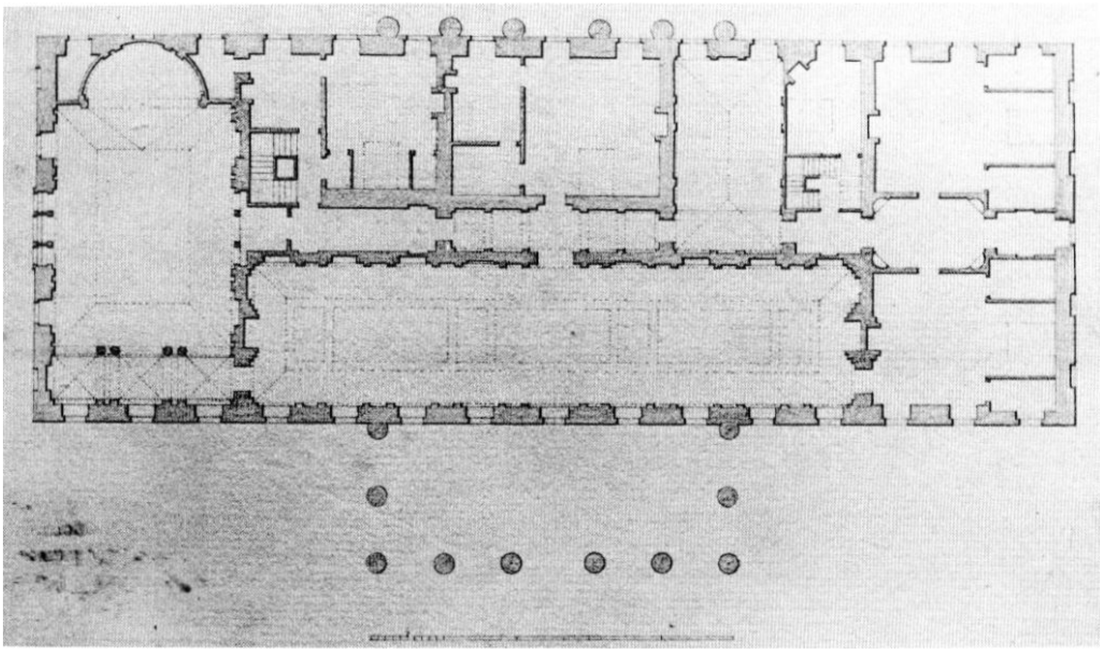


Figure 6-7: Plan drawing for Prior Park by John Wood the elder

The drawing by John Wood was not unusual in its way of communication. It was simply the standard to show a building plan this way and nothing more was needed apart from elevations and sections of the same, technically simple, sort. The rest was decided on the building site.

The plan drawing below (Figure 6-8) is for a building of approximately the same size as John Wood's building but requires probably fifty further drawings to inform the skilled workers and contractors to the same extent as the one above (Figure 6-7) informed the craftsmen in its days.

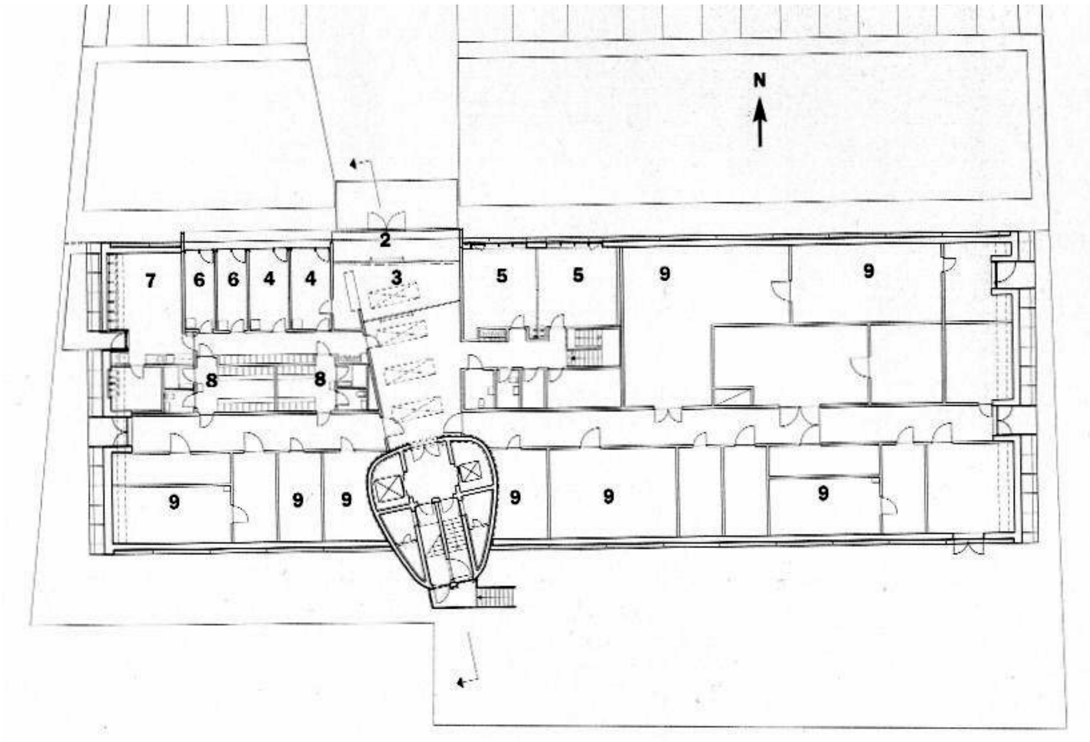


Figure 6-8: New control tower at Copenhagen airport by Vilhelm Lauritzen AS

To what discipline will all these drawings belong? A few more drawings will belong to the AD-discipline but most of them will belong to the AT-discipline. As it could be seen above (Figure 6-1 p. 255) it is attempted to illustrate a typical distribution of work between the two disciplines based on the implications in the different phases of the phase or stage model. We say typical because each individual building will demand its own specific distribution of activities due to circumstances like design complexity, introduction of new materials, introduction of new techniques etc. As illustrated in figure 6-1 the two disciplines go hand in hand but have their eyes fixed on different aspects of the same parts. AD is occupied with consequences for the architectonic space whereas AT is occupied with consequences for the constructive space (Figure 1-23 p. 118).

6.4 AD, AT and the professions

6.4.1 The relationship

Above it is discussed how the two types of professional activities are complementary and necessary in the building design process. It is also seen how they relate to each other as to history and praxis. Furthermore, an insight on how the involved professions in Britain and Denmark are sharing the responsibility of covering the RIBA phase model within education is a result of the data collection. Finally, the ambition of the professional bodies, regarding the coverage of the phase model, is debated. The latter thing can roughly visualised also be shown this way:

Profession	**AD-coverage**	**AT-coverage**
British Architects		
British Technologists		
Danish Architects		
Danish Technologists		

Area of professional responsibility

Figure 6-9: Area of responsibility the professions claim to cover

The British educational data showed a considerable overlapping between the two professions, justifying the area claim from both professions. The Danish data shoved relatively little overlapping, indicating the need for both professions to go together to cover both disciplines sufficiently. When the Danish profession of architects claims to cover AT it is based on very little formal education in AT and the claim is probably reflecting tradition more than reality.

In the Danish Architect offices there might still be a number of elderly architects who have passed both educations and have chosen the identity of the architect as their professional profile (which they always do for obvious reasons). There are still few technologists who choose to study architecture after their AT graduation and they are of course blurring the picture of two separate educations and professions as needed to cover the two disciplines.

Below is a rough sketch of the educational profiles for the two disciplines as they should look, given the present duration in Britain and Denmark. The exercise of the two core areas involves the shown side areas of professional insight as well as it involves common level of knowledge for people with a good school background (Hougaard 2007).

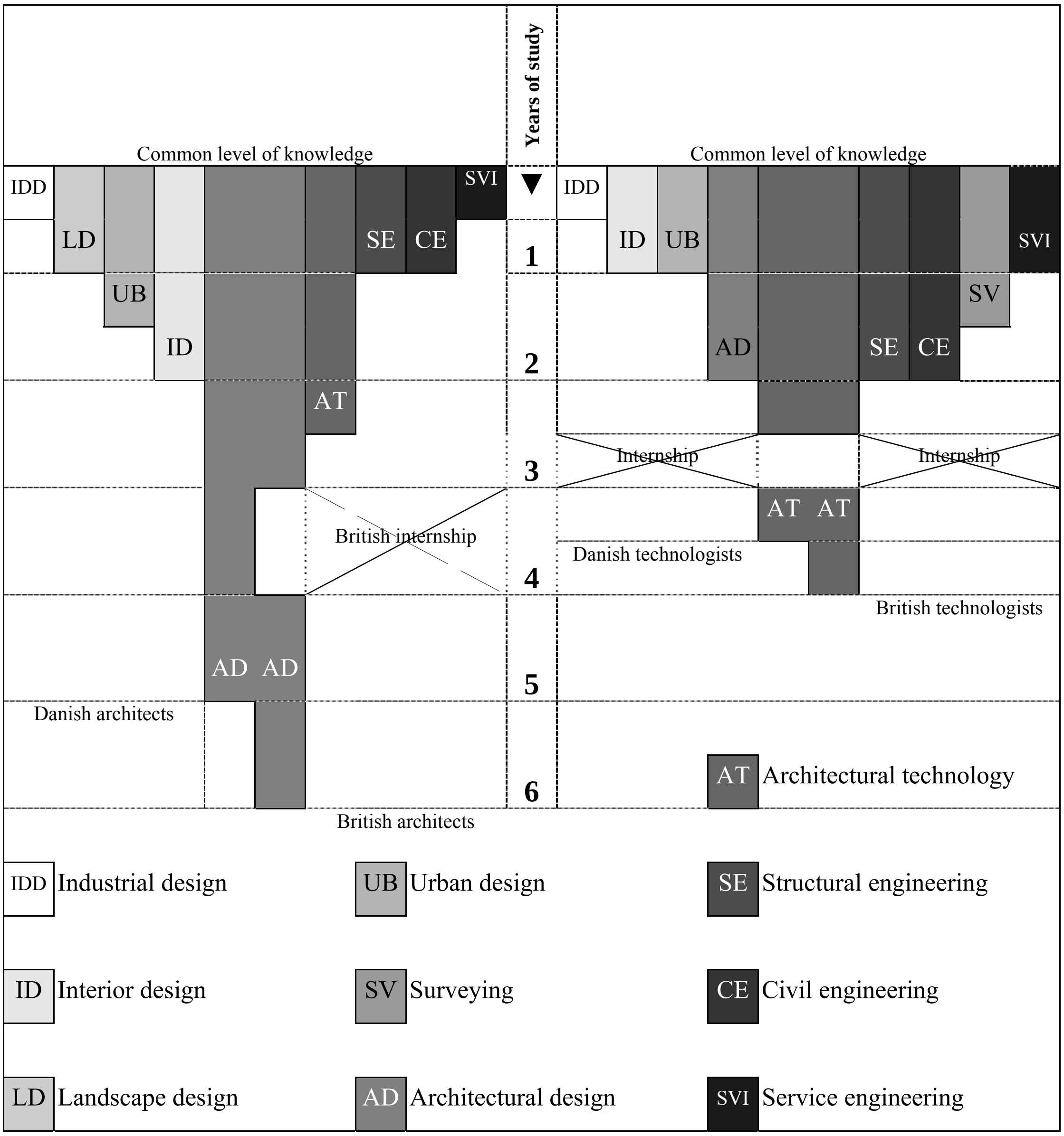


Figure 6-10: Sketchy educational profiles of the two disciplines kept separate

The British architect education contains one year of internship whereas the Danish equivalent is purely theoretical. Both possess 5 years of theoretical studies but the Danish theory can't be based on experiences from an internship. It will then tend to be more theoretical and less praxis orientated, which is very well in line with the data collected from the questionnaires. The British honours degree in architectural technology takes half a year longer than the Danish but offers 3½ x 30 months = 105 months of training whereas the Danish offers 3 x 40 months = 120 months of training. Thus the Danish AT education is offering more theory in its 3½ years of duration than the British in its 4 years of duration, but it could also be stressed that the British education gives more time to contemplation, which might be needed to reach the best learning result. Right now we can't say which model performs best.

The sketches of the two educational profiles are closely linked to the idea of AD and AT being two relatively separated disciplines. In our data it is obvious that the British educations are closely linked to demands and regulations from the professional boards that until now have tended to see the two disciplines as being one single discipline both educations should aim to cover (Bennett 2010). Why this should require two separate educations is a little hard for a foreigner to understand, if the idea of two mindsets or two different points of view is not considered. Therefore, the simple fact that Britain as a newer initiative wants to possess the two educations strongly indicate the need for the two mindsets, one with a focus on AD and the other with a focus on AT.

The Danish educations are not so far from matching the here shown sketches whereas the British, given British students are not considerably brighter than the Danish, which of course is a possibility, but not exactly what the experiences of the author indicate, when they tend to cover both areas equally, automatically will reach a lower level of professionalism within the different parts of the two disciplines (Lawson 2006 p.156). Consequently, the professional profile sketches aim to estimate how the professions should share the necessary abilities and insights the coverage of the RIBA phase model requires. If such a share model becomes accepted there will still be a need for good insight on the neighbouring professional domain in order to ease the successful cooperation between the two to give the best service to society.

The sketch above is rough and the assumptions of the author in favour of the Danish model can be discussed and definitely also ought to be discussed. Unfortunately the data from the focus group in London didn't really cover this question, because of so many other topics to debate. The question is: **Should RIBA and CIAT revise their requirements to the educational system to get closer to the above shown model, because it would suit the industry and society better?**

Another equal relevant question is**: Should the Danish educational system bring AT-education into the university environment, because it would serve the industry and society better?**

Similar questions should be asked in all European countries due to the Bologna agreement and to the other European aims to secure an open internal market within all sectors. The fact that a number of European countries have begun courses within AT indicates that both industry and society calls for it. Everywhere, the barriers lie in the local traditions and local specific ideas on where to place the borderlines of the different professions. However, specialisation within a profession is not a new thing and not something that should really be a surprise to anyone, and the reasons to equalise throughout Europe are increasing (The European Ministers of Education 1999).

In Spain they have since long time ago had so called technical architects possessing their own professional area and own consultancy companies and the picture of professional structures is rather different from country to country. Some national situations might prove better at meeting the challenges than others. Therefore, each country should now look at their educational system and their professional structures regarding building design. Europe is encouraging the member countries to equalise and even their educational systems, thus also indirectly their professions, as it is seen previously. It is of course a political matter what to do, but it is also a matter of informing the political systems with scientific results as a basis for further action.

The thesis has pointed at an ongoing development within the building industry and its consequences for society and made it apparent that the present educational systems and professional structures are not adjusted sufficiently to meet the challenge of development.

7 Conclusions

Original contributions to knowledge

A critical stage

The theory of architectural technology

7.1 Original contribution to knowledge

Based on the literature review and the three studies it is now possible to conclude about the hypotheses and by looking at the pictured coverage from literature and each study it can be noted what all in all was achieved.

The main original contributions from the research concern a deep understanding of how that emergence has been realised, and a study of the implications for buildings in the longer term. These were tested in reference to two hypotheses, which concerned the (re-) emergence of a discipline area, and its establishment as a distinct area of expertise in the modern construction industry.

7.1.1 Hypothesis 1

Apart from the literature review, study 1 and study 3 were supposed to test the first hypothesis.

1. **Architectural Technology is an activity which was embedded historically in the old handicrafts, but now after the introduction of new materials and technologies has moved into the area of responsibility of the drawing office.**

Study 1, concerning the content of education based on the memory of graduates from the four types of education in question (Danish AT and AD and British AT and AD), resulted in a full coverage of the last half part of the hypothesis. This was done by showing coverage of all the more technical and management containing parts of the RIBA phases and especially by the coverage of the sort of formulated subjects, which had such characteristics.

Study 3 concerned the expert opinion of highly qualified professionals, within the context of a focus group discussion, gave a full and approving coverage of hypothesis 1, although debate remains about the timescale for emergence of a new discipline area.

Nevertheless, this indirectly supports part of thesis 1 which is in fact now better supported than the pool sheet indicates. This is due to the synergy effect of the studies. It was only considered indirectly based on literature because of the lacking evidence of AT deriving from the handicrafts. When the third study stated that this relation existed, the uncertainty evaporated because literature evidently shows that the handicrafts were replaced with other techniques and materials from around the mid of the 20th century.

The first hypothesis can be regarded as having been tested using a range of studies. This finding is important, as it will change the relatively blurred picture of the role of craftsmen, architects and technologists that exists presently and give a clear view of how they should share the different areas of responsibility discussed in the thesis.

7.1.2 Hypothesis 2

This hypothesis was tested in all three studies but was only vaguely supported within the literature, which clearly showed a that a lot of work earlier made by craftsmen now has to be done in the drawing office but did not say much about who should undertake it or to what extent it forms a new profession.

2. **There are clear indicators that Architectural Technology now stands as a profession in its own right within the drawing office.**

The result from study 1 is supportive by the fact that the AT-education exists in an increasing number of universities. This could of course be seen as a sufficient indicator, but when completely unnoticed by society a talk about “clear indicators” could barely be justified.

Study two, concerning the opinion of teaching staff, provides an additional indicator and it is chosen to show the result as a full coverage and support to the hypothesis.

Study 3 with the opinion of the professional groups informed by the result of study 1 was crucial and strongly supported the need of the AT-technologist in the industry. Study 3 left no doubt that there is an increasing demand for AT-trained people and that they have a clear profile of their own with a rather different approach to the design of a building than the one of the architects.

Both the hypotheses became finally convincingly supported by the studies and the future roles of both architects and architectural technologists can now be seen more clearly.

7.1.3 The importance of the findings

It is important to be aware of the difference the underpinning of the two hypotheses should logically produce. Of those studied, the Danish technologists had a clear idea of their own role in society. This suggested that there was a strong accordance between the hypotheses and the situation within industry. On the other hand, UK architects and technologists included within the study regarded themselves as covering similar areas, the only main difference being contrasting points of view. The Danish architects appeared aware that their education does not cover architectural technology, but have not, at an official level, explored the logical consequences of this.

The advantages and disadvantages of specialisation have been discussed and within the field in concern specialisation appear inevitable but it does not mean that the overall structure of consultant companies needs to be changed. It is argued that it would give better integrated architecture if the exercise of the two disciplines could be kept under the same roof (Bennets 2010).

Present common ideas		**Ideas supported by the studies**
Architects are well educated to do both AD and AT	1	Architect education is too orientated towards AD to cover AT as well (Study 1 and 3)
AT is a newer set of activities	2	AT derives from the handicrafts by solving the same principal problems of technical nature as they did. (Literature and study 3)
AT and AD are two sides of the same activity	3	AT, historically and today, is a separate activity and is typically practised as such within the drawing office (Literature, study 1, 2 and 3)
AT and AD are disciplines that can be achieved within the same long-term further education	4	It is not possible to deal efficiently with both within five to six years of theoretical study (Literature and study 3)
Architects are normally well suited for the AT discipline	5	Architects are orientated towards AD and possess a mindset less orientated towards AT (Literature and study 3)
Architectural technologists are well equipped to do AD	6	At best, technologists possess a split orientation and perform less good within both disciplines (Literature and study 3)
All relevant subjects within building design are subject to research	7	Research concerning the practise of AT opposed to construction technology is at its beginning and is not thoroughly recognised as a separate discipline (Literature)

More topics could be discussed but looking at these seven, very serious consequences for the industry and for society can be noticed.

Topic 1

Architect education in the UK should stop covering AT with the aim to exercise the discipline themselves but just search for sufficient information to optimise their own AD achievements.

Topic 2

The professional understanding of AT should be revised and realisation of thorough research as a necessary means to replace the quality of the old handicrafts should be established.

Topic 3

AT should be realised as discipline and the RIBA stage model should still embrace it but consider the two roles as shown in chapter 6.1.

Topic 4

It might still prove useful that some professionals possess both educations but the majority of graduates to be recruited will only possess one discipline and society deserves to be informed about the fact not to mislead itself.

Topic 5

To utilise the mindset of the architect within the design fields, an overall insight on materials and building physics together with insight on principles within load carrying and stabilising structures should be taught to the extent of dealing with the topics at a principal level only.

Topic 6

To utilise the mindset of the technologist the education should concentrate on AT and only go into AD for information purposes. A certain overlapping between AT and AD is necessary but should be limited to the requirements of each discipline.

Topic 7

Society should invest thoroughly in AT research since this field is so much behind all other important professional fields in society. A logical consequence will in Denmark be to move the education into university environment as quickly as possible.

Now it is very clear that this research taken seriously will cause significant changes.

7.2 A critical stage

The literature review in combination with the studies showed that the AT discipline has succeeded the old handicrafts in being responsible for an important area of dispositions creating our physical environment. It also became fully apparent that all this by the name of AT is a part of the responsibility of the drawing office and one can ask to what extent this change has improved the qualities of the environment in general.

Lack of awareness and clear understanding of the present situation within architecture and construction makes the situation risky as to reaching the best possible conclusion on behalf of society. The industry is running the risk of concluding on too simplified ideas of how to meet the challenges of the future and consequently continue to deliver less good buildings and physical environments.

The literature review and our data collection showed that education has changed significantly along with the technological development to the benefit of mainly simple physical requirements whereas the emotional requirements, not so as easy to define but no less important, have been suffering heavily from the loss of the handicrafts and the traditional experiences within the industry. This loss has caused buildings and outdoor environments to suffer from poor attempted replacements of the old habits with none experience based and none research based quick design solutions tending to be out of human scale. As a result people now tend to desert these areas when they can afford it and even if old buildings might lack some modern comfort regarding installations and traffic and parking facilities it can be noted that people are attracted to the old areas in the cities much more than to the newly built areas. Clearly, it is not within engineering and surveying the causes for the less fortunate situation can be found. No, it is within AD and AT one finds the crises. It is here the huge challenge is and here society should invest in better and further research and education to receive more qualified designs for the future.

It has been noticed how much research and education has meant within surgery and other disciplines and absolutely no one desire to go back to the habits of the barber-surgeons. It is also noticed that the building industry is far behind all other industries and presently has given up all the good things from the old handicrafts without having invested sufficiently in convincing replacements. The building industry was in the lead in comparison with other industries in the medieval period, the renaissance and on to the Great War. It was AD and AT in combination that caused that situation. They supplied society with wonderful structures for buildings supposed to be outstanding on behalf of society and fine well proportioned more anonymous buildings for ordinary people as it can still be noticed in old European city centers.

Present modern achievements are, due to a lack of ability to show society what to aim for today, rather far from being there. Considerably more research has to be undertaken and much more attention from society together with more qualified educations becomes the only suggestion to a means of amendment to the situation.

It has been questioned here if AD professionals tend to possess the mindset that will enable more anonymous but correctly positioned and correctly scaled building structures for the practical and emotional purposes of daily life in modern society. As stated in literature, it was traditionally the less ambitious master builders, who were capable of designing this kind of buildings that supported the level of ambitions and individualism balanced with a respect for the neighbors that ordinary people possessed, who gave us so many very popular fine old town and village environments. Architects were only called for when the church, the town hall or other buildings supposed to serve all society was to be designed and according to recent reports, from among others RIBA (2005), the traditional mindset of architects desiring to become stars provides a barrier to the best possible cooperation with other professionals.

It appears obvious that more research needs to be undertaken for the right outlining of the aims of the AD and AT educations. The two educations clearly create different mindsets and different focuses within their graduates, but if that should influence the areas of responsibility further than what the defined architectonic and constructive space areas point at, it will surely require a more thorough investigation. The fact that it did so historically will not in itself justify a return to such a situation. A request for AT professionals to design most of the structures, which are supposed to be obedient to the local order of the democratic society, should of course be based on a certainty that their education qualified well for such a responsibility. Surely, ability to do so requires a more humble mindset than that of the average architect graduate from today's architect educations. It must be suspected that AT professionals, even if they possess a more suitable mindset for the buildings that are not supposed to be outstanding, lack a suitable training in doing so, simply because the task also involves the architectonic space of these buildings.

The master builders did it, but that was after a much further training than what is now offered the AT professional. To be a member of the guilt and to play the role of being superior to guilt members staying within their individual crafts as master craftsmen required something extraordinary. If society wants to live up to such a level of design quality it has to supply its AD or AT professionals with suitable further education aimed to enable people to play such a role. At least a master level, requiring two more years of focused training, would be needed to reach such a qualification.

7.3 The theory of architectural technology

Being a part of the responsibility of the drawing office or the business of architecture as can be seen when looking at the stage model in use in Britain and other places, it becomes logical and practical to define the border lines of architectural technology and those of architectural design.

Architectural design was a newly recognised profession in the early days of the renaissance but also before this stage of the development of the European civilisation, AD skills were appreciated in more prestigious building projects like palaces and cathedrals. It was master builders, possessing certain art skills on top of their abilities within their crafts, who became what society today will call the architects of these magnificent buildings. But in the renaissance such people became recognised as artists like painters and sculptors whose professions also derived from the old handicrafts. The masters of the whole technical part of the building were still the master builders belonging to the areas of handicraft.

The old handicrafts like carpentry, masonry, and joinery consisted of the ability to handle hand tools with great precision, of knowledge about specific materials and their possible performance and of how to combine these two into good and acceptable building part solutions both technically and aesthetically. On top of this the master builder had the insight and the ability to balance the capacities of all handicrafts involved in fine total building designs staying within the tradition. The addition of new innovative aesthetically and artistically challenging shaping to these necessary basic capabilities made architecture and architects.

By the replacement of the craftsmanship with designs utilising new materials and new techniques and in a situation where again newer materials and newer techniques supersede old ones, there is obviously a need for professionals to replace the craftsmen and the master builders within all that belongs to the new knowledge and technique. There is absolutely no reason to believe that the type of person who traditionally became an architect at this stage in history should be able to take on this extra burden of responsibility on top of or as a background for the exercise of good architectural design skills within the process of building. No, AD is also in a more challenging position than ever before without any tradition to lean to.

Most of the demanding technical insight that earlier belonged to the handicrafts and to the most skilled among them – the master builders – has now moved into the drawing office to be accounted for there. This new discipline is named architectural technology and it looks like this:

Before:	More demanding decisions made by the different handicrafts
	+
	Balancing such decisions for the whole building by the master builder
	=
	The discipline of AT embedded in the handicrafts
Now:	More demanding technical decisions about different materials and different techniques
	+
	Balancing such decisions for the whole of a building
	=
	The discipline of AT embedded in the business of architecture

Within architectural design the activities have in principal remained the same:

Before and Now:	Decisions regarding numerous specific human functional and emotional requirements
	+
	Balancing all these requirements in a pleasant overall design
	=
	The discipline of AD belonging to the business of architecture

What AD and AT have in common is this balancing activity as a crucial part of both professions. Within AD it is about balancing a number of requirements other than the technical ones related to the construction namely human functional and emotional requirements to indoor and outdoor space and what can be experienced there. Within AT it is about balancing requirements regarding materials, tools, techniques, procedures, influences on climate etc.

Both professions are generalist professions but at the same time possess areas of specialisation of their own. The architectural designer is responsible for the architectural concept and for expressing the ideas belonging to this in the final result. The architectural technologist is responsible for the whole technical design and the technical performance of the building and also for making the design ideas from AD come true in the physical structure. It is obvious that this last requirement demands a close cooperation between the two; a cooperation that of course can thrive best within the same company.

The different kinds of engineering and surveying are dealing with specialist areas within relatively limited parts of the total building design and it is the two types of generalists, the AD and AT experts, who are responsible for the balancing of their contributions to the building as well as the balancing of their own work; AT more so than AD because a majority of the specialist contribution relates to the technical work to be done within the constructive space (Schön 1995 pp. 76 - 78).

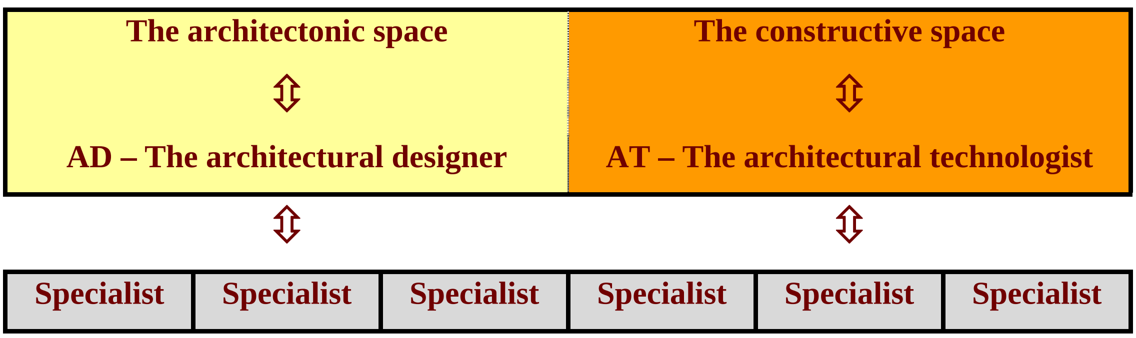


Figure 7-1: The shared responsibility of the building design between consultants

Apart from the dealing with over all decisions regarding the two kinds of space both AD and AT possess their own areas of detailing and specifying where no other specialists are normally involved. AD deals with the detailing of most of what will be visible, whereas AT mainly has to do with detailing, key junctions, selecting standard constructions and specifying materials to be chosen. As part of the technical quality management procedures AT will zoom in on risky areas in the design and secure extra precautions to avoid break downs and damages in the future.

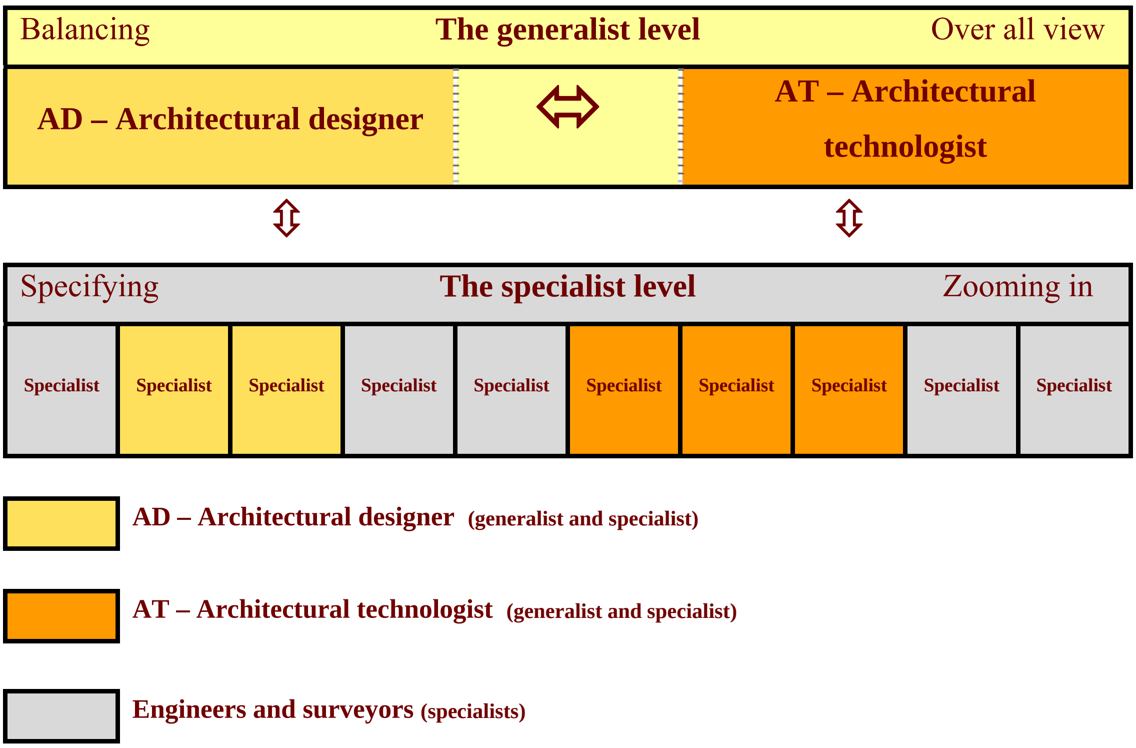


Figure 7-2: The shared responsibility within generalist and specialist level

Looking at figure 7-3 below we see an example of AT detailing of the constructive space and that is even in its first sketchy version. It is very apparent that already this sketch has required a number of considerations regarding the load bearing system, insulation, under-roof, vapour barrier, cladding boards, floor heating system, and right positions of the different parts etc.

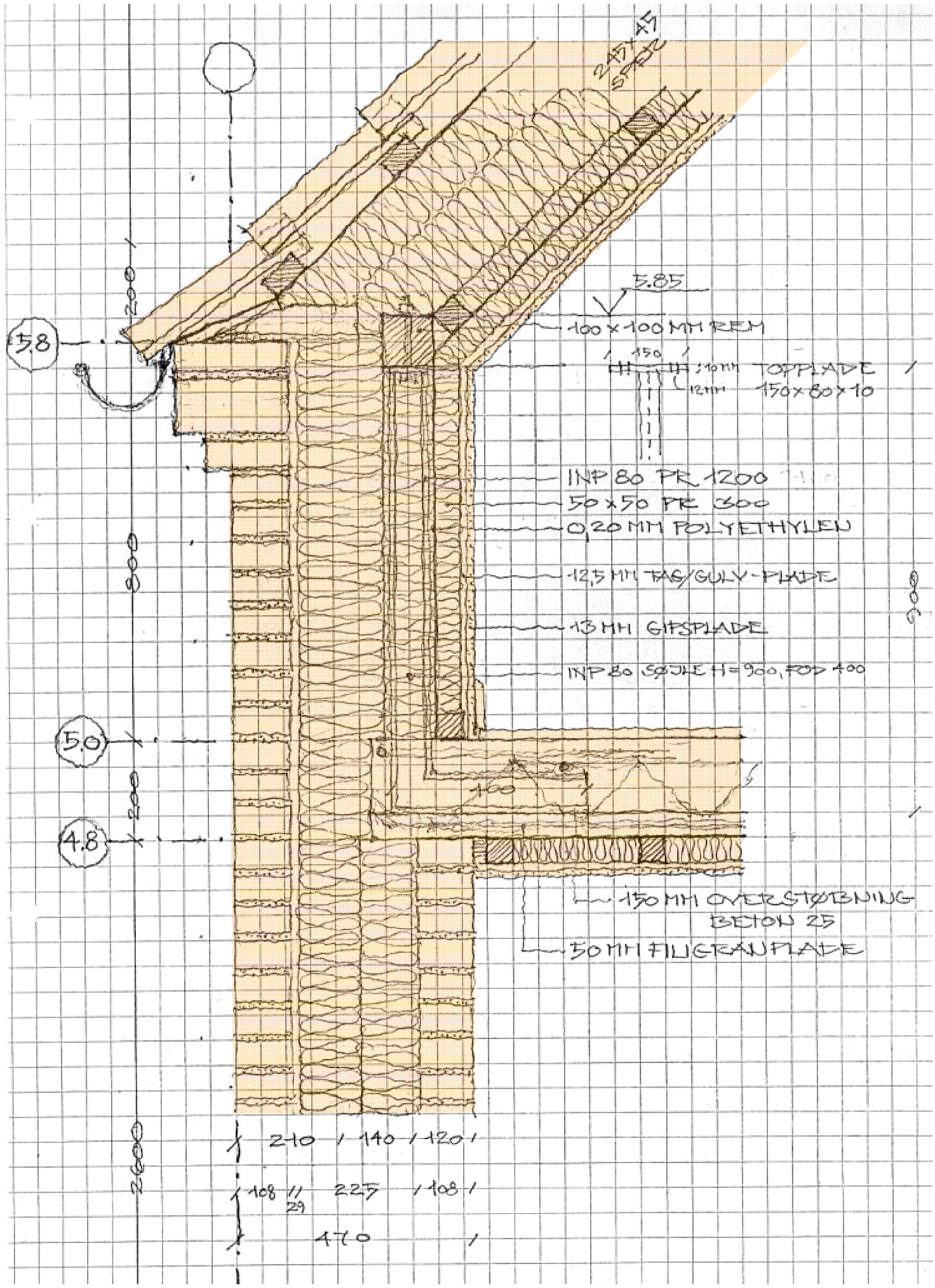


Figure 7-3: AT fill out of constructive space

The shown constructive space is fitting a rather traditional looking architectonic space that in the end will look like traditional craftsmanship of Danish origin but due to accordance to today's requirements, needs to be made with cavities filled with insulation etc. Today's skilled workers wouldn't know how to fit all this without being told by means of drawings and descriptions and the old craftsmen would also be unable to figure out how to fill this constructive space although the architectonic space looks like a result of their efforts. Therefore there is a need for today's AT generalist and specialist to produce the information even in such a traditional looking context. So even if the AD is rather traditional looking the AT has to stick to today's requirements and by the means of research contribute to the development of further demands.

8 Research within Architectural Technology

Potential research areas

Recommendations for further research

8.1 Potential research areas

As already mentioned, AT consists of activities within both the generalist level and the specialist level of the building design and so does of course also the relevant research to be undertaken. Therefore this chapter will discuss both levels and attempt to specify some of the relevant research areas within each of them.

As mentioned the generalist level is about balancing things, and not only few things but an increasing number of things, to become a harmonious whole with a lot of synergy effects caused by the final right positioning of everything. To use a metaphor one could say that the generalist level implies the ability to juggle with a large number of balls in the air at the same time and end up catching all of them in an elegant way. This applies to both AD and AT and the difference is just that the balls are rather different and require that the juggler knows all of them very well to be able to catch them in time.

A major difficulty is that each building project because of its position and function establishes its own rules for the performance. No two projects are exactly the same, so for each project both AD and AT have to find the right balls (resources, influences, principal solutions, materials, components etc.) and then figure out how to play them best. To do so the AT professional will need the following that could all be research subjects:

1. Knowledge about characteristics of building materials in general and their performance under different circumstances individually and together

2. Knowledge about building physics

3. Knowledge about climate, geological and environmental influences on buildings

4. Knowledge about technical performance of buildings and how to meet the different influences on buildings

5. Knowledge about execution techniques

6. Knowledge about relationship between technical building design and execution conditions for the good result and the well being of working staff

7. Knowledge about communication of a technical design to all relevant parties and the means it requires

8. Knowledge about what can be expected from all other participants due to their educational backgrounds and areas of responsibility

9. Knowledge about the performance of standard solutions and their level of sustainability

10. Knowledge about indoor climate factors and the balancing of these

11. Knowledge about technical design tools and their capabilities

12. Knowledge about quality management of the constructive space

13. Knowledge about technical "juggling" techniques

14. Knowledge about all above mentioned topics as well as all those not mentioned in relation to different regional cultures in order to be able to combine ideas from different places in new and better ways

There is much more to mention and regarding the balancing activity there is a lot to investigate and improvements to be invented. For example considering topics 6 and 9 in the list above, an urgent need for bridging the gap between the drawing office and the building site can be noted. A number of part standard constructions are not optimised to suit the execution adequately and subsequently a combined research within the two fields could lead to much better results. If it is a pleasure to do a specific piece of work on site the chances for a good final result are much better. This was automatically embedded in the old handicrafts because all steps were so well tested but now the professional has to figure out how to meet the requirements within still new and very individual technical solutions.

Topic 7 also provides a serious problem due to the fact that the staffs on the building sites often are there because they are not the kind of people who are most inclined to deal with a lot of documents being drawings or written texts. But they need a lot of information to reach a reasonable level of workmanship. The answer to the technical development has until now been to load the staffs on site with still more documents to investigate when at the same time the staff capacity to do so has declined. Here is an interesting subject to investigate in a time when BIM (Building Information Modelling) is the big issue and a lot of system makers are busy in the development of rather complicated systems for the information flow.

All research regarding the coherent technical design of buildings naturally belongs to those whose profession it is to do this specific kind of job, and the future presents us with a huge challenge within this field of research.

The specialist areas of AT is dealing with the creation of some of the balls to juggle with at its generalist level whereas others are made by the other specialist areas involved. Its specialist area is about, at a more detailed level, to balance numerous respects to for example key junctions so that the good performance of the building will be secured.

So many key junctions presented in books and recommendation papers of today are simply not good enough, because they very often concentrate on only one aspect of performance. The very specific and narrow research results of the present institutions will often be shown in contexts relatively poorly designed and ignoring a number of rather relevant requirements. But this is all what is available today, because of too little AT-research. Also quality management tools and procedures for the technical design area might deserve further and deeper research.

The discipline or field of AT is growing, as it is several times stressed, and continued ignorance of its relative independence and importance to society might just deepen the quality problems of the building industry and its attempts to support society by providing good environmental accommodation.

A further step in the direction of distinguishing the field would be the results from a development of a tailored ontology for its domain. This would probably require a number of research projects just to be established before a further development can take place. So far the field just has to lean towards the relatively poor and imprecise terms and ideas belonging to the neighbouring well established domains of AD, engineering, and surveying not being able to go into the depth with its own area of responsibility. – In the meantime society is suffering severely.

8.2 Recommendations for further research

Looking at all the information presented above, one can recognise some further areas to investigate and some areas already dealt with to be investigated even deeper than already done.

The UK quantitative data could be based on more respondents and give a more precise picture than what is the case right now. This would be correct to do if the data are to be used for other purposes than the present need for an overall rough picture.

There are no data from other countries in Europe and one can't be sure what precisely is going on in all the European countries where they have no official AT-education at the time being. Perhaps kinds of engineering are participating in the attempted coverage of the field? Or, perhaps architectural education is different from that of UK and Denmark?

Deeper investigation of the types of decisions made by the craftsmen, the master builders in the past, to be compared with those of AT today could be a very interesting more narrow study than the one undertaken here.

A field that for the well being of society would really need further investigation, and as a result hopefully an increased professional and public attention, is the quality of the building environments and the urban environments that became a result of the fact that AD took over much of the former responsibility of the master builder.

It can be noticed that the most desired urban environments tend to be in the old town centres even if they are so dysfunctional regarding car traffic and other modern means of transport. The newer urban environments don't possess urban space of a quality that can attract people without means of transport. A question to be answered could be if the artistic mindset of the AD professionals is suitable for the design of daily life environments for ordinary people? Perhaps it is naturally orientated towards the special and outstanding in scale and appearance, thus providing a hindrance to the creation of the pleasant, more humble multi functional environments that attract people without means of high speed transport?

Traditionally architects only designed the outstanding buildings and maybe the education and whole atmosphere in the education is still adjusted to do so. – If that is the case, who is then capable of doing the needed? Is it the AT-professionals? – Are they equipped with the abilities it would take to do so or would it be possible to equip them with such abilities?

Actually, it is hard to see any limit for the kinds of research that could be undertaken in line with what I have just begun in the project in hand and I certainly hope that others will enter the area and contribute to underpin the profession of AT with a serious research basis.

A randomly recognised field of research to be identified in general is the field of how to teach and educate within the fields in question. This is said to emphasise the fact that AD and AT are rarely separated within research concerning education of Architects because of the lack of awareness of the significant differences and because AT is the stepdaughter within all research undertaken. Research about education of technologists barely exists. The fields possess traditions and a lot of experience but might lack theories specifically orientated toward the ‘didactic transposition’ within the field of the didactics of AT and perhaps also AD. Bosch and Gascón (2006) were dealing with the subject of mathematics and their general overall transposition model is shown in figure 8-1.

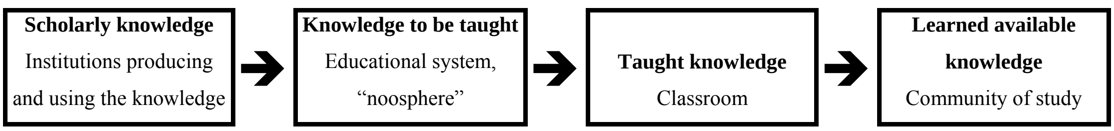


Figure 8-1: The didactic transposition process (Bosh and Gastón 2006)

Claiming that *"Considering the transposition process as a new object of study allows researchers ….. to free themselves from spontaneous epistemological models that are implicitly imposed by the educational institutions to which they belong"* Bosh and Gascón (2006 p. 57) present their idea of the relationship between the process and the research of it (Figure 8-2).

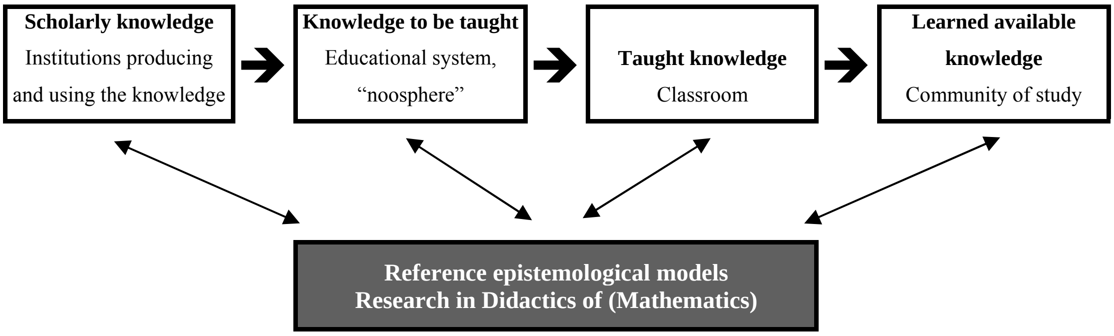


Figure 8-2: The 'external' position of researchers

Bosch and Gascón emphasize that the research in didactics needs to elaborate its own models of reference to be able to avoid being subject to the different institutions observed. They quote Yves Chevallard (1985) who, in their translation from French, says:

"Since 'scholarly knowledge' has been assigned its right place in the process of transposition, far from replacing epistemological analysis, in the strict sense, by the analysis of the didactic transposition, it turns out that it is indeed the concept of didactic transposition which allows the linking of the epistemological analysis to the didactic analysis, and from then on the guide of proper use of epistemology in didactics" (Chevallard 1985a p. 20, our translation)[45] (Bosch and Gascón 2006 p. 57).

Yves Chevallard has for nearly 30 years been dealing with this field of research regarding mathematics and it is of course a question to what extent it applies to our

[45] Translation from French by Bosch and Gascón

subjects of AD and AT. But changing the question to a "Why not?" it appears hard to think of good reasons not to introduce this field for our subjects as well.

Balancing the knowledge to teach and figuring out appropriate ways to teach the knowledge for the service of society appears a noble activity and requires a deep insight on all the four boxes shown in the figure 8-2 above and an external position for the researcher as stated by Bosh and Gascón (2006). As it is right now, our subjects are lacking such a background of research.

By this the thesis ends and new research can begin on its basis.

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Appendices

Appendix I – Danish educational data 1754-1950

24 Data sheets

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Abrahams, Charles	1838			1						1	5	1	2
2	Achen, Eggert Christoffer	1853	1				1		1			1		
3	Ahlmann, Hans Vilhelm	1852	1				1		1			6	1	
4	Ahrens, Jochum*	1811	1				1					5		1
5	Albinus, Svend Gotthold	1901			1				1			4	1	
6	Amberg, Hans Christian	1837	1				1					9	1	3
7	Ambt, Einar	1877		1			1		1			8	1	
8	Andersen, Carl	1879	1				1		1					
9	Andersen, Einar	1881	1						1			7	1	
10	Andersen, Hans Carl	1871	1				1		1			7	1	1
11	Andersen, Ib	1907			1		1					3		
12	Andersen, Ludvig	1861	1				1		1			10	1	
13	Andersen, Marius	1895	1				1		1			9	1	
14	Andersen, Rigmor	1903			1				1	1		5		
15	Andersen, C. C. Thorvald	1893		1			1		1			6		
16	Andresen, Hans Carl	1891	1				1					10	1	
17	Antoft, Ernst Møller	1901	1				1		1					
18	Appel, Frederik	1884	1				1		1			9	1	
19	Arboe, Thomas	1836	1				1	1				7		
20	Archtander, Philip	1916			1							4		
21	Arens, Johan August	1750			1						1	5		4
22	Arne Petersen, Knud	1862		1					1			6	1	
23	Arentzen, Christian August	1852	1				1		1			3		
24	Arp-Nielsen, Niels P. E.	1887		1			1		1			9	1	
25	Asmussen, Feodor Alexander	1887	1				1		1			8		
26	Bagger, C. C. Julius	1856	1				1		1			1		
27	Bang, Jacob Eiler	1899	1				1		1			5		1
28	Bang, Jens	1737			1						1	9		
29	Barfod, Knud Valdemar	1888			1		1		1			10	1	
30	Baumann, Povl Erik Raimond	1878			1		1		1	1	1	2		
Sum			17	4	9	0	22	1	21	2	4	173	14	12
Average					0,30		0,73		0,70			5,77	0,47	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Bay, Erik	1884	1				1		1			6		
2	Bech, Marcus Christian	1850	1				1					10		
3	Beenfeldt, Thor	1878	1				1		1			10	1	
4	Behnke, Hans*	1800										3	1	
5	Bendix, Anthon Julius	1882	1				1		1					
6	Bendtsen, Simon Peter Christian	1842	1				1				1	12	1	
7	Berg, Emil Axel	1856	1				1				1	7	1	
8	Bergmann, Richard Leopold	1860										9	1	
9	Bidstrup, Mathias Andreas	1852	1				1		1			1		
10	Bie, Curt Emil Gotfred	1896			1					1		7		
11	Billmann Petersen, Gunnar	1897							1			7	1	
12	Bindesbøll, Michael Gottlieb	1800	1			1	1					10		3
13	Bindesbøll, Thorvald	1846		1		1					1	8	1	1
14	Bjørn, Acton	1910	1				1		1			3		
15	Blem, Johan Peter*	1784	1				1					3		1
16	Bliechfeldt, Frederik Emil	1849	1						1			7	1	2
17	Bo, Jørgen	1919			1							5	1	
18	Boesen, Viggo	1907			1							4		
19	Bojsen-Møller, Helge	1874	1				1					8		
20	Boldt, Ove	1905	1				1		1			6	1	
21	Borch, Christen	1883			1		1		1			5		
22	Borch, Martin	1852	1				1		1			7	1	1
23	Borg, Ejnar	1912	1				1					5		1
24	Bradt, Johannes Gottfred	1741				1	1					7		5
25	Brandstrup, Christian	1859		1			1		1			8	1	
26	Brandt, Alfred	1873	1				1		1			8	1	
27	Bredsdorff, Peter	1913			1							7		1
28	Brummer, Carl	1864	1				1		1			8	1	1
29	Brücker, Knud	1885	1			1	1		1			10	1	
30	Bræstrup, Cosmus	1877			1	1			1	1		10	1	
Sum			18	2	6	5	20	0	15	2	3	201	16	16
Average					0,20		0,67		0,50			6,70	0,53	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Brøtterup, Rasmus Severin*	1803				1	1					10		2
2	Bugge, Aage	1874	1				1		1			9	1	
3	Bunch, Erik Christian*	1881	1				1		1			6		
4	Bundser, Axel*	1768										4		
5	Bøneche, Peter Christian	1841	1				1				1			
6	Bøttger, Frederik Christian	1838	1				1					10		2
7	Carlsen, Johannes	1896	1				1		1			10	1	
8	Christensen, Charles	1886	1				1		1			8	1	
9	Christensen, Niels Christian	1867	1				1		1			8	1	1
10	Christensen, Sigurd	1888	1				1		1			14	1	
11	Christiansen, Edvin	1901	1				1					10	1	
12	Christiansen, Helmuth	1890	1				1		1			12	1	
13	Christiansen, Knud Helge	1892	1				1		1			4		
14	Christiansen, Paul*	1807	1				1		1					
15	Christoffersen, Agner	1907	1			1	1					14	1	
16	Clausen, Martin Ludvig Philip	1851	1				1		1			6	1	2
17	Clemmensen, Andreas	1852				1						8	1	1
18	Clemmensen, Ebbe	1917			1							5	1	
19	Clemmensen, Karen	1917			1							7	1	
20	Clemmensen, Mogens	1885							1			9		
21	Cock-Clausen, Alf	1886							1			6	1	1
22	Colding, August	1874	1			1	1		1					
23	Dahl, Viggo Albert	1860	1				1		1			8	1	
24	Dahlerup, Jens Vilhelm	1836				1						5	1	4
25	Dahlerup Bertelsen, Hans	1881	1						1			1		
26	Dall, Andreas	1882	1				1		1					
27	Dam, Carl Emil	1883	1				1		1			12	1	
28	Dam, Knud Emanuel	1909	1				1					8	1	
29	Dam, Niels Jensen*	1761										12		3
30	Deuntzer, Johan Jacob	1808				1						7		2
Sum			20	0	2	6	20	0	17	0	1	213	17	18

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Average					0,07		0,67		0,57			7,10	0,57	
Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Dich, Johannes (John)	1865	1				1		1			8	1	
2	Dietz, Orla Christian	1914	1				1		1			4	1	
3	Dorph-Petersen, Viggo Theodor	1851	1				1		1			9	1	
4	Draiby, Frederik M. Rasmussen	1877	1				1		1			8		
5	Drewsen, Axel William	1843	1				1					8	1	2
6	Drewsen, Harald	1836										13	1	
7	Dreyer, Thorvald	1895	1				1		1					
8	Drosted, Volmar	1890		1			1		1			9	1	
9	Dyggve, Ejnar	1887			1				1	1		11	1	
10	Dyggve, Ingrid	1890			1					1		6		
11	Eckersberg, Jens Juul*	1822	1				1					10		2
12	Egeroed, Andreas Wilhelm*	1792				1	1					4		2
13	Ekberg, Martin Axel	1882	1				1		1			14	1	
14	Engelhardt, Knud Valdemar	1882		1			1					10	1	
15	Engell, Emil	1890	1				1		1			8	1	1
16	Engqvist, Hans Henrik	1912		1								7	1	
17	Estrup, Hector	1854	1				1		1			9	1	
18	Ette, Carl Rudolf	1826	1				1		1			6		
19	Falkentorp, Ole	1886	1				1		1					
20	Feldinger, Axel	1893		1			1		1			6		
21	Fenger, Ludvig	1833			1	1	1					7		4
22	Fink, Dan	1908			1		1					5		
23	Fink, Jep	1882	1				1		1					
24	Finsen, Helge	1897			1				1			11	1	
25	Fischer, Egil	1878	1				1		1			1		
26	Fischer, Vilhelm	1868	1						1			7	1	1
27	Fisker, Kay	1893		1			1				1	11	1	
28	Fleischer, Emaniel Christel	1850	1				1					6		
29	Frankel, Georg	1893		1			1		1			9	1	
30	Frankild, Otto	1918	1				1		1			4	1	
Sum			17	6	5	2	24	0	19	2	1	211	17	12
Average					0,17		0,80		0,63			7,03	0,57	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Frederiksen, Anton	1884	1				1		1			5	1	1
2	Frederiksen, Johannes	1881	1				1		1					
3	Friderichsen, Vilhelm	1841	1				1		1			9	1	
4	Friis, Frederik Ferdinand	1793			1							12	1	3
5	Friis, Peder	1763										12		4
6	Frimodt Clausen, Rudolf	1861		1			1		1			6	1	
7	Fritz, Marcus	1868			1				1	1		8	1	
8	Frænkel, Henry	1900			1					1		8	1	
9	Fugmann, Einar	1896		1			1		1			13	1	
10	Funch-Espersen, Ove	1883		1			1		1			6	1	
11	Fussing, Andreas	1871	1				1		1			7	1	1
12	Fussing, Christian	1852	1			1	1					3		
13	Fussing, Johan Christian	1878	1				1		1			3		
14	Fussing, Hans Nielsen	1838	1				1					7		1
15	Gad, Harald	1884	1				1		1			10	1	
16	Galatius, Frode	1890	1				1		1			6		
17	Garde, Harald	1861	1				1		1			7	1	
18	Gjellerup, Albert	1845	1				1					5		
19	Gjerløv-Knudsen, Oluf	1892			1				1	1		7	1	
20	Glahn, Carl Ejnar	1884	1				1		1			10		
21	Glahn, Henrik Christoffer	1850	1				1		1			7		
22	Glæsel, Henri	1853	1				1		1		1	5		
23	Gundzmann, Johannes Emil*	1837									1	7	1	
24	Gording, Kristen	1880	1				1		1			10	1	
25	Gotenborg, Niels	1878	1				1		1			7	1	
26	Gottlob, Kaj	1887			1				1			10	1	1
27	Graae, Ejner	1914			1		1					7	1	
28	Gram, P. A. Rosenkilde	1883		1			1		1			12	1	
29	Gram, Peder Jørgensen	1885	1				1		1			3		
30	Gosch, Henrik*	1801										4		2
Sum			17	4	6	1	22	0	21	3	2	216	18	13

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Average					0,20		0,73		0,70			7,20	0,60	

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Groth-Hansen, Vilhelm	1898			1							14		1
2	Grubb, Ragna	1903			1		1		1			10	1	
3	Grut, Flemming	1911			1							7	1	1
4	Guione, Joseph*	1746										7		2
5	Gundestrup, Thorvald	1869	1				1		1			11	1	
6	Gundelach-Pedersen, Oscar	1886	1				1		1			8	1	
7	Gundstrup, Niels P. Pedersen	1877	1				1		1			8	1	
8	Gøssel, Georg	1888	1				1		1			7		
9	Gøtzsche, Poul	1904										5		1
10	Hagemann, Henrik	1845	1				1		1			7		
11	Hagemann, Peter Christoph	1810					1					5		1
12	Hagen, Gustav Bartholin	1873	1				1		1			9	1	
13	Hagen, Ole*	1913										4		
14	Hagerup, Andreas	1856	1			1	1					8	1	
15	Hallander, Andreas*	1755					1					5		1
16	Halløv, Frede	1887	1				1		1					
17	Hammer, Valdemar Hansen	1821	1				1		1			6	1	
18	Hansen, Axel	1885		1			1		1			10	1	
19	Hansen, Christian	1803				1						7		4
20	Hansen, C. F.	1756				1	1					6		2
21	Hansen, Christoffer	1863	1				1		1			7	1	
22	Hansen, Claudius	1888	1				1		1			7	1	
23	Hansen, Frederik	1858		1			1		1			8	1	
24	Hansen, Hans	1899		1			1		1			4		1
25	Hansen, Hans Christian	1901	1				1		1			4	1	1
26	Hansen, Hans Henning	1916	1				1					6	1	
27	Hansen, Henning	1880	1				1		1			7	1	
28	Hansen, Isak*	1788				1						7		
29	Hansen, Johan Daniel*	1734				1						8		2
30	Hansen, Johan Matthias	1781					1					7		1
Sum			14	3	3	5	22	0	16	0	0	209	15	18
Average					0,10		0,73		0,53			6,97	0,50	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Hansen, Knud	1898	1				1		1			2		
2	Hansen, Nicolai	1867	1						1			8	1	
3	Hansen, Preben	1908			1							6		2
4	Hansen, Robert	1886	1				1		1			16	1	
5	Hansen, Theophilus*	1813				1						6		3
6	Hansen, Willy	1899	1				1		1			2		
7	Hansen-Marcher, Anders	1841	1				1		1			6	1	
8	Harboe, Frederik Carl	1880		1			1		1			9	1	
9	Harboe, Svend Gunnersen	1895			1		1					8		
10	Harild, Carl	1868	1				1		1			8	1	
11	Harpøth, Erik Tang	1904			1		1					10	1	
12	Harpøth, Harald Tang	1866		1			1		1			7	1	
13	Harsdorff, Casper Frederik	1735				1						5		1
14	Hartvig Rasmussen, Eigil	1905							1			5	1	
15	Hatting-Jørgensen, Niels	1881	1				1		1			6	1	
16	Hauberg, Niels	1885		1			1		1			8	1	
17	Haugsted, Hans Andreas	1832	1				1					3		
18	Havning, Thomas	1891			1		1		1			7	1	1
19	Heiberg, Edvard	1897			1	1						6		
20	Helger, Henning	1912			1							8	1	1
21	Helweg-Møller, Bent	1883		1			1		1			4		
22	Henningsen; Knud	1881	1				1		1			9	1	
23	Henningsen, Poul	1894							1		1			
24	Henningsen, Thorkild	1884							1			3		
25	Herholdt, Johan Daniel	1818	1			1	1					4		3
26	Herløw, Aage	1892	1				1		1			2		
27	Hess-Petersen, Carl	1882	1				1		1			6		
28	Hetch, Gustav Friederich	1788			1	1						5		2
29	Heylmann, Frederik Christian	1809				1						5		2
30	Hiort, Esbjørn	1912		1					1			6	1	
Sum			12	5	7	6	18	0	19	0	1	180	14	15

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Average					0,23		0,60		0,63			6,00	0,47	

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Hirth, Theodor	1862	1				1		1			10	1	
2	Hjejle, Therkel	1884			1				1			4		
3	Hjersing, Peter	1888	1				1		1			10	1	
4	Hoff, Poul Ernst	1903			1				1			7	1	
5	Hoffmeyer, Søren Henrik	1839	1				1		1			4		
6	Holck, Johannes	1876		1			1		1					
7	Holck, Vilhelm	1856	1				1		1			6	1	
8	Holgren, Georg Nielsen	1795				1						12		3
9	Holm, Friderich Daniel	?					1		1			5		2
10	Holm, Hans Jørgen	1835			1		1			1		7		2
11	Holm, Helge	1891	1				1		1			7	1	1
12	Holm, Johan Frederik	1803	1				1					8		2
13	Holm, Tyge	1912			1							5		
14	Holmgaard, Knud	1899		1			1		1			8	1	1
15	Holst, Aage	1915		1					1			4	1	
16	Holst, Christian	1882	1				1		1			13	1	
17	Holst, Erik	1909			1							7	1	
18	Holst, Ole	1886	1				1		1			12	1	
19	Holsøe, Niels Peter	1826	1				1					8		2
20	Holsøe, Poul	1873			1				1			7	1	
21	Hornbech, Christian Bernhard	1772				1						9		4
22	Houmøller Klemmensen, Jens	1902	1				1		1			6	1	
23	Huus, Ove	1884		1			1		1			11	1	
24	Huusmann, Hans Iversen	1892							1			4		
25	Hvalsøe, Vilhelm	1883		1			1		1			9	1	
26	Hvass, Tyge	1885	1				1		1			3		
27	Hygom, Louis	1879							1			2		
28	Høeg-Hansen, Axel	1877		1			1		1			9	1	
29	Høyrup, Svend Gunnar	1897			1				1			7	1	
30	Ingemann, Bernhard	1869	1				1		1			6	1	
Sum			12	6	7	2	19	0	23	1	0	210	17	17
Average					0,23		0,63		0,77			7,00	0,57	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Ingemann, Valdemar	1840	1			1	1					8	1	1
2	Ingwersen, Jens	1871	1				1		1			11	1	
3	Irming, Mogens	1915			1							5	1	
4	Jacobsen, Arne	1902	1				1		1			8	1	1
5	Jacobsen, Axel	1896	1				1		1			8	1	
6	Jacobsen, Hans Peter	1877	1				1		1			12	1	
7	Jacobsen, Holger	1876	1				1		1			7	1	1
8	Jacobsen, Jens Paul*	1804										8		2
9	Jacobsen, Niels	1865	1				1		1			6	1	
10	Jacobsen, Ole	1907							1			6		1
11	Jacobsen, Palle	1912		1								6	1	
12	Jacobsen, Viggo	1885	1				1		1			13	1	
13	Jacobsen, Jens	1887	1				1		1					
14	Jardin, Nicolas-Henri	1720				1					1	7		1
15	Jastrau, Frans	1896			1							8	1	
16	Jensen, Albert	1847				1			1			6	1	2
17	Jensen, Andreas	1878	1				1		1			8	1	
18	Jensen, Christian	1853	1				1		1			9	1	
19	Jensen, Erik	1894	1				1		1			4		
20	Jensen, Ferdinand Vilhelm	1837				1						6		3
21	Jensen, Hans	1804					1					10		3
22	Jensen, Jens Christian*	1892	1				1		1			8	1	
23	Jensen, Kristian*	1883							1					
24	Jensen, Valdemar Knud	1889							1			4	1	
25	Jensen-Klint, Peder Vilhelm	1853		1							1	7		
26	Jensen Wærum, Jens Peter	1855	1				1		1			4		
27	Jeppesen, Asger	1890							1			12	1	
28	Jeppesen, Emil	1851					1		1					
29	Jeppesen, Louis Ferdinand	1876							1			7	1	
30	Jessen, Peter Krogh Bonsach	1781				1						11		2
Sum			14	2	2	5	16	0	20	0	2	209	18	17

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Average					0,07		0,53		0,67			6,97	0,60	
Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Juhl, Finn	1912			1							4		
2	Juul Møller, Jørgen*	1913										4	1	1
3	Jørgensen, Alfred	1878	1				1		1			8	1	
4	Jørgensen, Axel Georg	1890	1				1		1			8		
5	Jørgensen, Carl Thorvald*	1888					1		1			8		
6	Jørgensen, Emil	1858	1				1		1			7	1	1
7	Jørgensen, Ernst	1859	1				1		1			6	1	1
8	Jørgensen, Fritz	1882	1				1		1			8	1	
9	Jørgensen, Frode	1903			1				1			3		
10	Jørgensen, Jens	1885		1			1		1			11	1	
11	Jørgensen, Sophus	1852	1				1		1			6	1	
12	Jørgensen, Thorvald	1867	1				1		1			4	1	1
13	Jørgensen, Valdemar	1893							1			6	1	
14	Jørgensen, Waldemar	1883	1				1		1			3		
15	Kaastrup, Vagn	1903			1				1			3		
16	Kalleberg, Andreas Dobert*	1772					1					6		3
17	Kampmann, Christian	1890			1							9	1	
18	Kampmann, Hans Jørgen	1889			1					1		10	1	1
19	Karlby, Bent	1912			1				1					
20	Karlebye, Johannes Georg*	1772										8		4
21	Kindt-Larsen, Edvard	1901			1				1	1		7	1	1
22	Kindt-Larsen, Tove	1906			1							4		
23	Kirkerup, Anders Peter	1896	1				1		1					
24	Kirkerup, Andreas	1749					1					5		4
25	Kiørboe, Frederik	1878		1					1			5		
26	Kjær, Hjalmar	1872							1			4		
27	Kjærgaard, Poul	1912			1							3		
28	Klein, August	1839					1				1	6		
29	Klein, Viggo	1850					1		1			15	1	
30	Klein, Vilhelm	1835	1				1		1			6		
Sum			10	2	9	0	16	0	20	2	1	177	13	17
Average					0,30		0,53		0,67			5,90	0,43	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Klein, William	1822	1				1					5		1
2	Klingsey; Christian	1850	1				1					12	1	
3	Klint, Kaare	1888	1				1		1					
4	Klok, Jens	1889	1				1		1			5	1	
5	Knudsen, Ludvig	1843	1				1		1			9	1	1
6	Knudsen, Niels Arnold	1904			1							6	1	1
7	Knutzen, Sylvius	1870	1				1		1			9	1	
8	Koch, Fritz	1857	1				1		1			5	1	1
9	Koch, Hans	1873	1				1		1			7	1	
10	Koch, H.P. Gyllembourg	1891	1				1		1			10	1	
11	Koch, Jørgen Hansen	1787					1					8		4
12	Koch, Peter	1905			1				1			3		
13	Koch, Valdemar	1852	1			1	1					8	1	1
14	Koch, Wilhelm Julius*	1788				1						4		2
15	Kofoed, Jens Christian	1864	1				1		1			8	1	
16	Koldborg, Johannes	1905	1				1		1			6	1	
17	Koppel, Niels	1914			1							6	1	
18	Kornerup, Peter*	1794				1						5		3
19	Kornerup-Bang, Aage	1882	1			1	1					7	1	
20	Kornerup-Bang, Ole	1917	1				1		1			4	1	
21	Kramp, Peter Christian	1817				1	1					9		2
22	Kretz, Georg	1810				1						5		2
23	Kretz, Peter Johannes	1780				1						8		2
24	Kristensen, Eske	1905	1				1		1			4		
25	Krog, Arnold	1856		1		1	1					6	1	
26	Krogsgaard, Harald	1896							1			8	1	
27	Krohn, Gunnar	1914			1							6	1	1
28	Kruuse, Anders	1745					1					5		
29	Kryger, Henry	1902	1				1		1			5	1	
30	Kurtzhals, Niels Schønberg*	1773					1					7		2
Sum			16	1	4	8	21	0	14	0	0	190	18	23
Average					0,13		0,70		0,47			6,33	0,60	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Kyed, Vagn Ove	1903	1				1		1			6	1	
2	Kühn, Ernst	1890	1				1		1					
3	Kühnel, Sophus Frederik	1851				1						8	1	
4	Køhnke, Magnus	1786				1						7		1
5	Laage, Gunnar	1876	1				1		1			5	1	
6	Langballe, Otto	1880	1				1		1			8		
7	Lange, Carl	1828					1					8		
8	Lange, Ferdinand	1742				1						8		2
9	Langeland-Mathiesen, Aage	1868	1				1		1			11	1	
10	Langkilde, Hans Erling	1906			1							3		
11	Larsen, Karl	1892	1				1		1			11	1	
12	Larsen, Knud	1854	1				1					6	1	1
13	Larsen, Lauritz	1868	1				1		1			9	1	
14	Larsen, Søren Christian	1886	1				1		1			10	1	
15	Lassen, Flemming	1902	1				1		1					
16	Lassen, Mogens	1901	1				1		1					
17	Lassen-Landorph, Thorkild	1894		1			1		1			12	1	
18	Laub, Ditlev	1847			1					1		8	1	1
19	Lauritzen, Aage	1871	1				1		1			8	1	
20	Lauritzen, Alvar	1902			1				1			9	1	
21	Lauritzen, Vilhelm	1894			1							9	1	1
22	Laursen, Christian	1902	1				1		1			14	1	
23	Lautrup-Larsen, Algot	1890	1				1		1			13	1	
24	Lehn Petersen, Knud	1890			1		1		1			6	1	
25	Lemche, Søren	1864	1				1		1			7	1	2
26	Lendorf, Carl	1839					1					8		
27	Leth, August	1897			1	1						10	1	
28	Leuning Borch, Casper	1853			1		1				1	8	1	
29	Levy, Frederik Lauritz	1851			1							8	1	
30	Lillie, Joseph Christian	1760					1					7		4
Sum			15	1	8	4	21	0	17	1	1	227	20	12
Average					0,27		0,70		0,57			7,57	0,67	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Lindahl, Helge	1915			1							5	1	
2	von Linstow, Hans Ditlev	1787			1						1	4		1
3	Lorentz, Erhard	1913			1							4		1
4	Louring, Jens Christian	1901	1				1		1			5	1	
5	Ludvigsen, Arne	1898			1						1	2		
6	Lund, Frederik Christian	1896			1					1		11	1	1
7	Lunding, Ib	1895			1					1		10	1	1
8	Lundqvist, Carl	1883		1					1			8	1	1
9	Lytthans, Kai	1888	1				1		1			9		
10	Lüttichau, Curt	1897			1							4		
11	Løffler, Chriatian	1757				1						6		
12	Løffler, Julius Bentley	1843			1							5		
13	Lønborg-Jensen, Aage	1877	1				1		1			4		
14	Lønborg-Jensen, Harald	1871	1				1		1			7	1	1
15	Løser, Jørgen Gerhard	1777				1						10		
16	Løvmand, Albert	1806				1						7		
17	Maar, Axel	1888	1				1		1			10	1	
18	Madsen, Jens	1885	1				1		1					
19	Madvig, Einer	1882			1		1		1			8	1	
20	Magdahl Nielsen, Johannes	1862	1				1		1			7	1	
21	Magens, Boye	1748				1						6		3
22	Malling, Peder	1781				1						5		3
23	Mandrup-Poulsen, Christian	1865	1				1		1			9	1	
24	Marstrand, Knud	1886			1				1			8		
25	Marstrand, Sophus	1860	1				1		1			8	1	
26	Mathiasen, Christian	1867	1				1		1			5	1	
27	Mathiesen, Niels	1807				1						7		1
28	Matthissen, Tage	1897				1						11	1	
29	Meldahl, Ferdinand	1827				1	1					11		3
30	Mencke, Mogens	1898							1			11	1	
Sum			10	1	10	8	12	0	14	2	2	207	14	16
Average					0,33		0,40		0,47			6,90	0,47	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Methling, Poul Joachim	1884	1				1		1			10	1	
2	Meyer, Henning	1915			1				1			4	1	
3	Meyer, Johan Andreas	1784				1						7		2
4	Meyer, Sonja	1898			1							8	1	
5	Meyer, Wilhelm Frederik	1799				1						7		3
6	Meyn, Christian	1785				1						5		3
7	Meyn, Peter	1749				1						5		3
8	Michaelsen, Mathias Kjeldsen	1900	1				1					11	1	
9	Michelsen, Peter Larsen	1813				1	1					8		2
10	Mikkelsen Kjær, Johannes	1908	1				1		1			8		
11	Miland Petersen, Torben	1909			1		1		1			6	1	
12	Milthers, Gunnar	1901			1		1				1	3		
13	Mindedal Rasmussen, Ejnar	1892	1				1		1			5	1	
14	Moll, Haldur	1909	1				1		1			10	1	
15	Momme, Ole Peter	1854	1			1	1					10	1	1
16	Monberg, Emanuel	1877	1				1		1			6	1	
17	Mortensen, Martin	1874	1				1		1			10	1	
18	Morthorst, Erik	1906			1							10	1	1
19	Mundt, Holger	1887	1				1		1			7	1	1
20	Mynster, Olaus	1858	1				1		1			5	1	
21	Møller, Adam	1883	1				1		1			8	1	
22	Møller, Alfred	1858	1				1		1			9	1	
23	Møller, Axel	1862		1			1		1			5	1	
24	Møller, Carl	1887	1				1		1			3		
25	Møller, Carl August	1805				1						5		4
26	Møller, C.F.	1898		1			1		1			5	1	
27	Møller, Erik	1909			1							7	1	1
28	Møller, Palle	1902			1				1			4		
29	Møller, Rasmus Smidt	1864	1				1					9	1	
30	Møller, Svend	1890	1				1		1			8		
Sum			15	2	7	7	20	0	17	0	1	208	19	21
Average					0,23		0,67		0,57			6,93	0,63	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Møller, Tage	1892			1							12	1	
2	Møller, Torkel	1868	1				1		1			8	1	1
3	Møller, Viggo Steen	1897		1			1					3		
4	Møller-Jensen, Viggo	1907			1		1					9	1	
5	Mørck; Niels Kristian	1901	1				1		1			5	1	
6	Mørck, Poul Herluf	1900			1							10	1	
7	Mørk-Hansen, V.J.	1856		1		1						9	1	1
8	Nebelong, Johan Henrik	1817				1						6		2
9	Neisse, Christian Adam Johan	1751				1			1			4		3
10	Neye, Carl	1897	1				1					12	1	
11	Nielsen, Christian Frühstück	1878		1					1			7	1	
12	Nielsen, Christian Vilhelm	1833				1						6		2
13	Nielsen, Harald	1886	1				1		1			3		
14	Nielsen, Jens	1887	1				1		1			8	1	
15	Nielsen, Johan	1863	1				1		1			11	1	
16	Nielsen, Peter	1886	1				1		1					
17	Nielsen, Tage	1914	1				1		1			4	1	
18	Nielsen, Niels Viggo Berner	1889	1				1		1					
19	Niepoort, Paul	1922			1		1		1			3		1
20	Nimb, Carl Henrik	1897	1				1		1			6		
21	Nordan, Jacob	1824	1			1	1					4		2
22	Norn, Viggo	1879	1				1		1			4	1	
23	Novi, Cajus	1878							1			6	1	1
24	Nyboe-Pedersen, Paul	1904	1				1		1			5	1	
25	Nyebølle, Victor	1862	1				1		1			9	1	
26	Nygaard, Thorvald	1892		1			1		1			8	1	
27	Nyrop, Martin	1849			1		1		1			6	1	2
28	Nystrøm, Arne	1900	1				1		1			6		
29	Næss, Hans	1723				1						5		3
30	Næss, Johan Peter*	1771										5		2
Sum			15	4	5	6	20	0	19	0	0	184	17	20
Average					0,17		0,67		0,63			6,13	0,57	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Odgård, Carlo*	1899							1					
2	Olavsen, Olav	1753			1						1	5		2
3	Olesen, Ludvig Frederik	1853	1				1		1			10	1	
4	Olivarius, Tage	1847	1				1		1			9	1	
5	Olrik, Christian	1881	1				1		1			3		
6	Olsen, Anders Christian*	1792										3		
7	Oppenheim, Albert	1879	1				1		1			8		
8	Orland, Knud Verner	1904	1				1		1			6	1	
9	Ortmann, Henning	1901		1			1		1			6		
10	Overgaard, Peder Skole	1909	1				1		1			4	1	
11	Packness, Ejnar	1879	1				1		1			8	1	
12	Palludan, Georg	1889	1				1		1			9	1	
13	Paludan, Hother	1841	1				1					9		
14	Paludan Hother August	1871	1				1		1			10	1	
15	Paludan, Johannes*	1912										5	1	
16	Paulsen, Hubert*	1902										6	1	
17	Pedersen, Johan	1902			1					1		5		
18	Pedersen, Marius	1888	1				1		1					
19	Peters, Harald	1891							1			2		
20	Petersen, Aksel	1897	1				1		1			10	1	
21	Petersen, Albert	1889		1			1		1			10	1	
22	Petersen, Carl	1874		1			1		1			5		
23	Petersen, Carl Valdemar	1858							1			9	1	
24	Petersen, Erhard	1873	1				1		1			10	1	
25	Petersen, Ernst	1883	1				1		1			12	1	
26	Petersen, Gunnar	1914	1				1		1			7	1	
27	Petersen, Harald	1890	1				1		1					
28	Petersen, Harald Georg	1903		1			1		1			6	1	
29	Petersen, Ludvig	1848	1				1					2		
30	Petersen, Ove	1830	1				1					11		4
Sum			18	4	2	0	22	0	22	1	1	190	16	6
Average					0,07		0,73		0,73			6,33	0,53	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Petersen, Theodor	1889		1			1		1			10	1	
2	Petersen, Vilhelm	1830				1						10		3
3	Petersen, Jens Vilhelm	1851		1			1		1			5	1	1
4	Petri, Olaf	1875	1				1		1			7	1	
5	Pfaff, Georg	1886	1				1					14	1	
6	Plesner, Ulrik	1861		1			1		1			13	1	
7	Plum, Harald*	1920										6	1	
8	Polzin, Jacob Ephraim	1778				1						7		3
9	Ponsaing, Georg	1889	1				1		1			4		
10	Pontoppidan, Simon Christian	1793				1						10		4
11	Poulsen, Arne	1910			1							6		
12	Poulsen, Ejnar	1897	1				1		1			8	1	
13	Poulsen, Gerhardt	1883	1				1		1			7	1	1
14	Preisler, Axel	1871	1				1		1			9	1	
15	Prior, Alexis Johannes	1877	1				1		1			7	1	
16	Prip-Møller, Johannes	1889			1		1		1		1	9	1	
17	Puck, Vilhelm Carl	1844	1			1	1					3		
18	Quist, Johan Martin	1755					1					7		2
19	Rådvad, Alfred	1848	1				1		1					
20	Rafn, Aage	1890			1							10	1	1
21	Rasmussen, August	1890	1				1		1					
22	Rasmussen, Carl	1831	1			1	1					7		2
23	Rasmussen, Daniel	1865					1		1					
24	Rasmussen, Edgar	1858							1			14	1	
25	Rasmussen, Hans Christian	1888	1				1		1					
26	Rasmussen, Holger	1871	1				1		1			6	1	1
27	Rasmussen, Kai	1886	1				1		1			6		
28	Rasmussen, Ludvig	1859	1			1	1					8	1	
29	Rasmussen, Rasmus	1890	1				1		1			9	1	
30	Rasmussen, Steen Eiler	1898	1			1	1					3		
Sum			17	3	3	7	23	0	18	0	1	205	16	18
Average					0,10		0,77		0,60			6,83	0,53	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Rawert, Jørgen Henrik	1751						1				2		2
2	R'ee, Max	1889			1				1	1	1	11	1	
3	Reimer, Frederik (Fritz)*	1827										12		2
4	Remark, Helmer	1913	1				1		1			8	1	
5	Richter, Gabriel*											4		1
6	Risom, Sven	1880			1		1		1			11	1	
7	Rohweder, Jørgen	1904			1							6	1	
8	Rohweder, Niels	1906			1					1		7	1	
9	Rosen, Anton	1859	1				1		1			5	1	1
10	Rosenberg, Georg Erdmann*	1739										7		3
11	Rosenkjær, Niels	1886	1				1		1			8	1	
12	Rosenstand, Einar	1887		1			1		1			14	1	
13	Rue, Rasmus	1863	1				1		1			8	1	
14	Rue, Tage	1893	1				1		1			12	1	
15	Rustad, Hans	1759						1				4		3
16	Ry Andersen, Thorkil	1912							1			4	1	
17	Rømer, Hilda	1906			1							9	1	
18	Rønne, Gerhard	1879	1				1		1			8	1	
19	Sahl, Olaf	1905		1					1			5	1	
20	Salling-Mortensen, Harald	1921	1				1		1			1		
21	Salomon-Sørensen, Arnold	1887	1				1		1			7	1	
22	Sander, Valdemar	1876		1			1		1			8	1	
23	Schaper, C.F.H.	1798				1						7		
24	Schiødte, Erik	1849			1	1						7	1	
25	Schiøtz, Carl	1878				1						3		
26	Schlegel, Fritz	1896	1				1		1			7		2
27	Schlick, Benjamin	1796				1						6		1
28	Schmidt, Hans Christian	1765					1	1				7		3
29	Schmidt, Ole Jørgen	1793				1						7		4
30	Schmidt, Valdemar	1864	1				1		1			7	1	
Sum			10	3	6	5	14	3	16	2	1	212	18	22
Average					0,20		0,47		0,53			7,07	0,60	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Schmidt-Andersen, Johannes	1902		1			1		1			5	1	
2	Schmidth, Olaf	1857						1						
3	Schou, Charles Jacob	1889	1				1		1			2		
4	Schrøder, Johan	1836	1				1					10		2
5	Schrøder, Kay	1877			1				1	1		8	1	
6	Schroeder, Rolf	1872	1				1		1			9	1	
7	Schultz, Carl Georg	1905			1					1		6		
8	Schwanenflügel, Emil	1847			1		1		1			9	1	
9	Schwartzkopf, Johan Georg	1774				1						7		2
10	Seest, K.T.	1879		1			1		1			5	1	
11	Seidelin, Bernhard	1820				1	1					9		2
12	Seidelin, Conrad	1809				1						7		1
13	Sibbern, H.S.*	1826					1					8		2
14	Sinding, Svend	1881			1		1		1			12	1	
15	Skjøth, Niels Christian	1893	1				1		1			1		
16	Skov, Aksel	1903		1			1		1			5	1	
17	Skovgaard, Hans Georg	1898			1							6	1	
18	Skrivers, Niels	1880	1				1		1			8	1	
19	Smidt, Carl Martin	1872			1	1	1		1	1		2		
20	Smidth, Philip	1855		1		1	1					9	1	
21	Smith, Julius	1861		1			1		1			9	1	
22	Smith, Troels	1914		1			1		1			5	1	
23	Sottrup-Jensen, Jens Rasmus	1916							1			4	1	
24	Speyer, Rut	1914			1		1		1			5	1	
25	Sprechler, Ulrik	1851				1	1					9	1	
26	Stammann, Franz Georg*	1799				1						4		
27	Stanley, C.F.*	1769				1						7		4
28	Steenmann, Søhren*	1757				1						7		2
29	Steen, Hans Christian	1878	1				1		1			5	1	
30	Steenberg, Georg	1860					1		1			6	1	
Sum			6	6	7	9	20	1	17	3	0	189	17	15

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Average					0,23		0,67		0,57			6,30	0,57	
Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Stegmester, Johan Diedrich*	1775				1						7		3
2	Stengade, Erik	1914	1				1		1			5	1	1
3	Stephensen, Hakon*	1900				1			1			3		
4	Stephensen, Magnus*	1903							1			5	1	
5	Stilling, H.C.	1815					1					11		4
6	Stillmann, J.A.	1822		1			1					12		2
7	Stockfleth, Frederik Hannibal	1817				1						1		
8	Storck, H.B.	1839			1							6		2
9	Strøm Tejsen, Johannes	1878	1				1		1			7	1	1
10	Stuckenberg, Theodor	1835	1				1		1			7		
11	Stærmose, Jørgen*	1920										3	1	
12	Suenson, Palle	1904			1				1			6	1	
13	Svane, Christian	1890			1				1			4		
14	Sylow, Christian	1866		1			1		1			10	1	
15	Søgaard Petersen, Poul	1899	1				1		1			10	1	
16	Søndergaard, K.K.	1886	1				1		1					
17	Sørensen, A.M.	1845		1			1		1			13	1	
18	Sørensen, Holger*	1913										7	1	1
19	Sørensen, Knud	1902							1			6	1	
20	Sørensen, Salomon Eberhard	1856	1			1	1					7	1	
21	Sørensen, Theodor	1825					1					10		3
22	Sørensen, Thorvald	1849		1			1		1		1	3		
23	Tanggaard, Sigurd	1890					1		1			10	1	
24	Teisen, Flemming	1899				1						9	1	
25	Tersling, George	1857	1				1		1			6	1	
26	Teschl, Leopold	1911	1				1		1			3	1	
27	Thalbitzer, Viggo*	1869	1				1		1			7		
28	Thejll, Andreas	1852	1			1	1					10	1	
29	Thielemann, Ferdinand	1803				1						7		3
30	Thisted, Valdemar	1865	1				1		1			13	1	
Sum			11	4	3	7	18	0	18	0	1	208	17	20
Average					0,10		0,60		0,60			6,93	0,57	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Tholle, Julius	1831				1	1					7		3
2	Thomassen, Ole	1919			1							5	1	
3	Thomsen, Alfred	1853	1				1		1			7	1	
4	Thomsen, C.F.	1855	1				1		1			14	1	
5	Thomsen, Edvard	1884	1				1		1			10	1	1
6	Thonning, Carl	1855	1			1	1		1			8	1	
7	Thorball, Knud	1904	1				1		1			5	1	
8	Thorson, John	1894							1			6	1	
9	Thrane, Jacob Laurids	1785					1					4		
10	Thuren, Christian Lauritz	1846	1				1		1			14	1	1
11	Thuren, Ejnar	1877	1			1	1					6	1	
12	Tidemand-Dal, Johannes	1882			1		1	1	1			9	1	
13	Tillisch, C.T.	1903			1							4		
14	Timmermann, G.W.*	1789				1						6		4
15	Toft-Hansen, Hans	1888	1			1			1					
16	Toubo, Paul	1913	1				1					6	1	
17	Truelsen, Hans Peter*	1781										6		4
18	Turin, Niels	1887	1				1		1			6	1	
19	Turin-Nielsen, Kai	1885	1				1		1			8		
20	Tvede, Gotfred	1863		1			1		1			9	1	
21	Tvede, Hans	1885	1				1		1			8	1	
22	Tvede, Jesper	1879	1				1		1			10	1	
23	Tvede, Vilhelm	1826				1	1					8		2
24	Tybjerg, Christian	1815				1	1					6		2
25	Tøgern, Mogens	1895	1				1		1			15	1	
26	Uldall, Johannes Frederik	1839		1			1					8		
27	Ulstrup Hansen, Peter	1876	1			1	1		1					
28	Utzon, Jørn	1918			1							5	1	1
29	Wagner, Frederik	1880			1			1	1	1		6	1	
30	Wagner Smitt, Arne	1910									1	5		
Sum			15	2	5	8	21	2	17	1	1	211	18	18
Average					0,17		0,70		0,57			7,03	0,60	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
No	Name		School education				Trade education			University		Architectural education		
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Walsøe, Sven	1901		1			1		1			6	1	
2	Walther, V. TH.	1819				1						7		4
3	Wancher, Axel*	1902							1					
4	Wancher, Ole	1903		1					1			3		
5	Varming, Kristoffer	1865	1				1		1			7	1	1
6	Weber, Conrad	1830					1		1					
7	Weidemann Petersen, Karl	1907	1				1		1			10	1	
8	Vejby-Christensen, Hans	1869	1				1		1					
9	Wenck, Heinrich	1851				1			1			7	1	1
10	Wenzel, Jacob Beierholm	1808					1					6		
11	Wessel, Carl Emil	1831				1	1					12		4
12	Westergaard, Kirsten	1901							1			5		
13	Westergaard, Niels	1883	1				1		1			10	1	
14	Westermann, Poul Theis	1902				1						9	1	
15	Wiboe, Poul	1907			1							7	1	1
16	Vig-Nielsen, Søren	1876	1				1		1					
17	Wiinholt, Claudius August	1855	1			1	1					9	1	
18	Wiinholt, Fritz Peter	1877			1				1	1		8	1	
19	Wilcken, Anton Christoffer*	1759										7		4
20	Wilhardt, Hans	1907			1					1		4		
21	Wilsbech, Frederik	1844	1			1	1							
22	Windeleff, Peter	1886	1				1		1			11	1	
23	Windinge, Bennet	1905			1		1		1			7		
24	Winstrup, Lauritz Albert	1815				1	1					11		4
25	Wittmaack, Arthur	1878	1			1			1			1		
26	Wittrock, Georg*	1843	1				1		1			7		
27	Wittrup, Vilhelm	1894			1		1		1		1			
28	Voeler, Valdemar	1911	1				1		1			7	1	
29	Wohlert, Vilhelm	1020			1							6	1	1
30	Wolf, V.C.H.	1833	1			1	1					5		
Sum			12	2	6	9	18	0	18	2	1	172	12	20
Average					0,20		0,60		0,60			5,73	0,40	

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Danish educational data 1754-1950

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
			School education				Trade education					Architectural education		
No	Name									University				
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Wolff, Henning	1828				1						10		2
2	Wolmar, Carl	1876	1				1		1			6	1	
3	Voltelen, Mogens	1908			1							2		
4	Wright, Hans	1854		1			1		1			5	1	
5	Zangenberg, Halvor	1881	1				1		1			4		
6	Zeltner, Hans Christian	1826	1				1					6		
7	Zeltner, Otto	1858	1				1		1			8	1	
8	Zeltner, Theodor	1822					1					10		2
9	Zeuthen Nielsen, Erling	1910			1							11	1	
10	Zinn, J.G.	1836	1				1					9	1	1
11	Zuber, Christian Joseph	1736			1						1	4		4
12	Zwingmann, Christian	1827					1					5		2
13	Ørnsholt, Ejnar	1887	1				1		1			9		
14	Adler-Nissen, Jørgen	1912		1			1		1			7	1	
15	Berg, J.C.*	1837					1					5		
16	Black-Petersen, Mogens	1917			1							1	1	
17	Bondo, Andreas	1815					1					11		1
18	Borring, Knud	1838	1			1	1							
19	Buhl, Ole*	1912							1			2		
20	Burmeister, Joachim	1782					1					5		2
21	Bøgh, Vilhelm	1913			1		1		1			3	1	
22	Börgen, Kai	1915		1					1			6	1	
23	Christensen, Kai	1916							1			4	1	
24	Faber, Tobias	1915			1							6	1	
25	Fehmerling, Jean	1912	1				1		1			3	1	
26	Finsen, Arne	1890	1				1		1			4		
27	Foged, Jens	1890	1				1		1					
28	Graae, Rolf	1916			1		1					5	1	
29	Grauslund, Emanuel	1901		1			1		1			5	1	
30	Græbe, Eiler	1892			1	1	1					10	1	
Sum			10	4	8	3	21	0	14	0	1	166	15	14
Average					0,27		0,70		0,47			5,53	0,50	

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Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
			School education				Trade education					Architectural education		
No	Name									University				
												at the academy		
		Borne	Basic	Upper	Upper secondary	Academy	Craftsman	Military	Technical school	cand. phil.	Other	Years	Graduation	Medals
1	Hansen, Gorm	1912							1			6	1	
2	Hegelund, Niels	1895			1	1	1					12	1	
3	Herløw, Erik	1913			1		1					4	1	
4	Iversen, Henrik	1920			1		1					6	1	
5	Møller, Rogert	1844				1		1						
6	Pedersen, Peder	1897	1				1		1			8	1	
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
Sum			1	0	3	2	4	1	2	0	0	36	5	0
Average					0,50		0,67		0,33			6,00	0,83	

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Danish educational data 1754-1950

Sum results of Weilbach data

Statistics on Architectural education in Denmark 1754 - 1950 based on Weilbach, 1947, 1949 and 1952														
Sheet number	Sum lines from		School education				Trade education			University		Architectural		
	696 architects in total											at the academy		
			Basic	Upper	Upper	Academy	Craftsman	Military	Technical	cand. phil.	Other	Years	Graduation	Medals
1			17	4	9	0	22	1	21	2	4	173	14	12
2			18	2	6	5	20	0	15	2	3	201	16	16
3			20	0	2	6	20	0	17	0	1	213	17	18
4			17	6	5	2	24	0	19	2	1	211	17	12
5			17	4	6	1	22	0	21	3	2	216	18	13
6			14	3	3	5	22	0	16	0	0	209	15	18
7			12	5	7	6	18	0	19	0	1	180	14	15
8			12	6	7	2	19	0	23	1	0	210	17	17
9			14	2	2	5	16	0	20	0	2	209	18	17
10			10	2	9	0	16	0	20	2	1	177	13	17
11			16	1	4	8	21	0	14	0	0	190	18	23
12			15	1	8	4	21	0	17	1	1	227	20	12
13			10	1	10	8	12	0	14	2	2	207	14	16
14			15	2	7	7	20	0	17	0	1	208	19	21
15			15	4	5	6	20	0	19	0	0	184	17	20
16			18	4	2	0	22	0	22	1	1	190	16	6
17			17	3	3	7	23	0	18	0	1	205	16	18
18			10	3	6	5	14	3	16	2	1	212	18	22
19			6	6	7	9	20	1	17	3	0	189	17	15
20			11	4	3	7	18	0	18	0	1	208	17	20
21			15	2	5	8	21	2	17	1	1	211	18	18
22			12	2	6	9	18	0	18	2	1	172	12	20
23			10	4	8	3	21	0	14	0	1	166	15	14
24			1	0	3	2	4	1	2	0	0	36	5	0
Sum			322	71	133	115	454	8	414	24	26	4604	381	380
Average of all 696 architects			46%	10%	19%	17%	65%	1%	59%	3%	4%	6.61	55%	55%
Average for the 651architects who attented the Academy												7.07	59%	58%
Average number of medals to the 194 architects who got the medals														2,0
Number and percentage of architects who attended but neither graduated nor got medals												143	22%	
Percentage of architects with no academy education													6%	

Study 1 – present education data

Appendix II – Study 1 – present education data

Average schedule – Danish technologists

Question	Year	a	b	c	d	e	f	g	h	j	k	l
1	1	2.17%	1.22%	2.66%	4.09%	2.95%	1.19%	0.23%	0%	0%	0.06%	0.19%
1	2	0.49%	0.89%	1.5%	2.81%	2.83%	1.96%	0.55%	0.21%	0.17%	0.24%	0.12%
1	3	0.61%	0.38%	0.79%	1.96%	2.22%	1.66%	0.99%	0.59%	0.34%	0.41%	0.3%
1	4	0.21%	0.15%	0.3%	0.8%	0.79%	0.87%	0.38%	0.16%	0.16%	0.18%	0.04%
sum		3.48%	2.64%	5.25%	9.66%	8.79%	5.68%	2.15%	0.96%	0.67%	0.89%	0.65%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
2	1	1.01%	1.52%	2.58%	3%	1.06%	0.12%	0.08%	0%	0%	0%	0.02%
2	2	0.75%	1.44%	2.61%	2.56%	2.14%	0.86%	0.24%	0.05%	0.13%	0.05%	0%
2	3	0.5	1.2	1.73	3.07	1.64	1.11	0.6	0.4	0.2	0.3	0.2

Study 1 – present education data

		8%	9%	%	%	%	%	2%	1%	5%	1%	%
2	4	0.5%	0.62%	0.68%	1.11%	1.13%	0.61%	0.28%	0.15%	0.02%	0.12%	0.01%
sum		2.84%	4.87%	7.6%	9.74%	5.97%	2.7%	1.22%	0.61%	0.4%	0.48%	0.23%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
3	1	1.25%	0.7%	2.12%	0.75%	0.05%	0.05%	0%	0%	0%	0%	0%
3	2	0.76%	0.61%	1.57%	1.35%	0.12%	0.08%	0.02%	0%	0%	0.25%	0%
3	3	0.68%	0.51%	1.06%	0.8%	0.16%	0.1%	0.02%	0.01%	0.01%	0.01%	0.01%
3	4	0.22%	0.2%	0.38%	0.39%	0.01%	0.01%	0%	0%	0%	0%	0%
sum		2.91%	2.02%	5.13%	3.29%	0.34%	0.24%	0.04%	0.01%	0.01%	0.26%	0.01%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
4	1	0.7%	0.32%	0.21%	0.48%	0.8%	0.13%	0.08%	0.04%	0.18%	0.17%	0.17%

Study 1 – present education data

4	2	0.67%	0.37%	0.32%	1%	1.19%	0.58%	0.51%	0.4%	0.34%	0.59%	0.28%
4	3	1.07%	0.42%	0.35%	0.82%	0.91%	0.93%	0.71%	0.63%	0.58%	1.23%	0.54%
4	4	0.13%	0.19%	0.09%	0.27%	0.34%	0.33%	0.23%	0.14%	0.14%	0.55%	0.12%
sum		2.57%	1.3%	0.97%	2.57%	3.24%	1.97%	1.53%	1.21%	1.24%	2.54%	1.11%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
5	1	0.76%	0.93%	2.47%	1.46%	1.07%	0.21%	0%	0%	0%	0%	0%
5	2	0.36%	0.31%	2.21%	2.54%	1.13%	0.65%	0.06%	0.02%	0%	0.02%	0.02%
5	3	0.18%	0.16%	1.27%	2.55%	1.19%	0.42%	0.26%	0.12%	0.02%	0.05%	0.02%
5	4	0.11%	0.12%	0.72%	1.11%	0.58%	0.26%	0.12%	0.02%	0%	0.01%	0%
sum		1.41%	1.52%	6.67%	7.66%	3.97%	1.54%	0.44%	0.16%	0.02%	0.08%	0.04%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**

Study 1 – present education data

6	1	0.68%	0.3%	1.46%	4.12%	4.03%	1.3%	0.04%	0%	0%	0.12%	0%
6	2	0.36%	0.3%	1.34%	4.86%	5.33%	1.92%	0.53%	0.14%	0%	0.17%	0%
6	3	0.41%	0.08%	0.96%	3.94%	5.16%	2.83%	0.58%	0.36%	0.11%	0.42%	0.11%
6	4	0.18%	0.1%	0.73%	1.72%	2.99%	1.52%	0.23%	0.1%	0.07%	0.23%	0%
sum		1.63%	0.78%	4.49%	14.64%	17.51%	7.57%	1.38%	0.6%	0.18%	0.94%	0.11%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
7	1	0.66%	0.83%	2.31%	6.53%	5.38%	2.92%	0.16%	0%	0%	0.34%	0.12%
7	2	0.62%	0.25%	1.48%	5.54%	6.2%	4.11%	0.65%	0.03%	0.03%	0.56%	0.11%
7	3	0.66%	0.1%	1.45%	3.85%	5.25%	4.65%	0.59%	0.39%	0.3%	0.88%	0.17%
7	4	0.34%	0.05%	0.84%	2.39%	2.5%	2.37%	0.39%	0.1%	0.07%	0.28%	0.06%
sum		2.28%	1.23%	6.08%	18.31%	19.33%	14.05%	1.79%	0.52%	0.4%	2.06%	0.46%

Study 1 – present education data

Question	Year	a	b	c	d	e	f	g	h	j	k	l
8	1	0.21%	0.44%	0.74%	1.47%	1.27%	0.66%	0.21%	0.2%	0.05%	0.1%	0.06%
8	2	0.61%	0.44%	0.94%	1.51%	2.12%	1.49%	1.11%	0.77%	0.18%	0.27%	0.06%
8	3	0.34%	0.25%	0.54%	0.92%	1.85%	2.03%	1.64%	1.28%	0.59%	0.85%	0.59%
8	4	0.15%	0.19%	0.37%	0.56%	0.75%	1.16%	0.93%	0.48%	0.25%	0.67%	0.25%
sum		1.31%	1.32%	2.59%	4.46%	5.99%	5.34%	3.89%	2.73%	1.07%	1.89%	0.96%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
9	1	0.5%	0.52%	0.28%	0.15%	0.09%	0.05%	0.05%	0%	0%	0%	0.03%
9	2	0.19%	0.25%	0.29%	0.6%	0.4%	0.09%	0.05%	0%	0%	0%	0.03%
9	3	0.27%	0.1%	0.25%	0.24%	0.26%	0.19%	0.05%	0%	0%	0%	0.03%
9	4	0.13%	0.02%	0.06%	0.12%	0.05%	0.18%	0.05%	0.01%	0%	0.01%	0.01%

Study 1 – present education data

sum		1.09%	0.89%	0.88%	1.11%	0.8%	0.51%	0.2%	0.01%	0%	0.01%	0.1%
Question	Year	a	b	c	d	e	f	g	h	j	k	l
10	1	0.74%	0.65%	1.32%	0.99%	0.33%	0.05%	0%	0%	0%	0%	0%
10	2	0.16%	0.6%	1.08%	1.02%	0.2%	0.09%	0%	0%	0%	0%	0%
10	3	0.29%	0.33%	0.43%	0.79%	0.2%	0.05%	0.03%	0%	0%	0%	0%
10	4	0.14%	0.09%	0.18%	0.36%	0.07%	0.07%	0.01%	0%	0%	0%	0%
sum		1.33%	1.67%	3.01%	3.16%	0.8%	0.26%	0.04%	0%	0%	0%	0%
Priorities of phases total sum of phase divided by length of education (3.5 years)		5.96%	5.21%	12.19%	21.31%	19.07%	11.39%	3.62%	1.95%	1.14%	2.61%	1.05%
Centre of gravity		a	b	c	d	e	f	g	h	j	k	l

Average schedule – Danish technologists

Study 1 – present education data

Average schedule – Danish architects

Question	Year	a	b	c	d	e	f	g	h	j	k	l
1	1	5.04 %	2.37 %	3.2 %	0.78 %	0.21%	0.23%	0%	0%	0%	0.11%	0%
1	2	4.32 %	2.88 %	3.26 %	0.95 %	0.11%	0.26%	0.03%	0.03%	0.03%	0.14%	0.03%
1	3	2.43 %	3.51 %	2.43 %	0.41 %	0.27%	0.31%	0%	0%	0%	0.54%	0.09%
1	4	2.1 %	2.86 %	3.18 %	0.91 %	0%	0.19%	0%	0%	0%	0.08%	0%
1	5	1.68 %	2.77 %	3.74 %	1.2 %	0%	0.08%	0%	0%	0%	0.08%	0%
1	6	1.01 %	0.62 %	0.86 %	0.46 %	0%	0.23%	0%	0%	0%	0%	0%
1	7	0.19 %	0.25 %	0.25 %	0.11 %	0.11%	0.11%	0%	0%	0%	0%	0%
sum		16.77%	15.26%	16.92%	4.82 %	0.7 %	1.41%	0.03%	0.03%	0.03%	0.95%	0.12%
Question	Year	a	b	c	d	e	f	g	h	j	k	l

Study 1 – present education data

2	1	6.49%	3.36%	3.29%	0.43%	0%	0.19%	0%	0%	0%	0%	0%
2	2	6.24%	3.85%	3.12%	0.65%	0.17%	0.17%	0%	0%	0%	0%	0%
2	3	6.39%	5.79%	2.63%	0.99%	0.18%	0.3%	0%	0%	0%	0.04%	0.04%
2	4	4.67%	5.41%	3.52%	1%	0.09%	0.2%	0%	0%	0%	0%	0%
2	5	5.32%	6.38%	3%	1.94%	0.25%	0.16%	0%	0%	0%	0.11%	0%
2	6	2.42%	2.67%	1.17%	0.96%	0.47%	0.27%	0%	0%	0%	0%	0%
2	7	0.69%	0.75%	0.35%	0.14%	0%	0%	0%	0%	0%	0%	0%
sum		32.22%	28.21%	17.08%	6.11%	1.16%	1.29%	0%	0%	0%	0.15%	0.04%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
3	1	9.41%	1.91%	0.72%	0%	0%	0%	0%	0%	0%	0%	0%
3	2	8.54%	2.52%	0.61%	0.15%	0%	0%	0%	0%	0%	0%	0%

Study 1 – present education data

3	3	5.22%	2.77%	1.64%	0.14%	0.34%	0%	0%	0%	0%	0%	0%
3	4	4.22%	2.18%	1.27%	0.17%	0%	0%	0%	0%	0%	0%	0%
3	5	3.16%	3.05%	0.91%	0.15%	0%	0%	0%	0%	0%	0%	0%
3	6	1.76%	1.08%	0.61%	0.04%	0%	0%	0%	0%	0%	0%	0.15%
3	7	0.34%	0.23%	0.11%	0.11%	0.11%	0%	0%	0%	0%	0%	0%
sum		32.65%	13.74%	5.87%	0.76%	0.45%	0%	0%	0%	0%	0%	0.15%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
4	1	0.38%	0.15%	0.09%	0.06%	0%	0%	0%	0%	0%	0%	0%
4	2	0.32%	0.21%	0.09%	0.06%	0%	0%	0%	0%	0%	0%	0%
4	3	0.45%	0.34%	0.23%	0%	0%	0%	0%	0%	0%	0%	0%
4	4	0.57%	0.57%	0.23%	0%	0%	0%	0%	0%	0%	0%	0%

Study 1 – present education data

4	5	0.4%	0.51%	0.28%	0.06%	0%	0.23%	0%	0%	0%	0%	0%
4	6	0.23%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
sum		2.35%	1.78%	0.92%	0.18%	0%	0.23%	0%	0%	0%	0%	0%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
5	1	3.34%	1.85%	6.28%	3.53%	0%	0.34%	0%	0%	0%	0.23%	0%
5	2	3.15%	2.06%	6.19%	3.73%	0%	0.34%	0%	0%	0%	0.26%	0.06%
5	3	2.86%	3.46%	5.97%	3.77%	0.12%	0.41%	0%	0%	0.05%	0.29%	0.12%
5	4	2.82%	2.88%	5.39%	3.99%	0%	0.39%	0%	0%	0.05%	0.24%	0.05%
5	5	2.46%	3.88%	6.44%	4.41%	0.36%	0.27%	0%	0%	0.05%	0.27%	0.05%
5	6	1.58%	2.54%	3.28%	2.85%	0.49%	0.57%	0%	0%	0%	0%	0.06%
5	7	0.08%	0.38%	0.78%	0.36%	0%	0.34%	0%	0%	0%	0%	0%

Study 1 – present education data

sum		16.29%	17.05%	34.33%	22.64%	0.97%	2.66%	0%	0%	0.15%	1.29%	0.34%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
6	1	1.33%	0.3%	0.87%	0.23%	0.06%	0.06%	0%	0%	0%	0%	0%
6	2	2.07%	0.62%	1.45%	0.79%	0.13%	0.06%	0%	0%	0%	0%	0%
6	3	0.71%	0.41%	1.2%	0.41%	0.09%	0.31%	0%	0%	0%	0.03%	0.03%
6	4	0.16%	0.5%	0.9%	0.6%	0.17%	0.17%	0%	0%	0%	0%	0%
6	5	0.5%	0.27%	1.13%	0.56%	0.05%	0.23%	0%	0%	0%	0%	0%
6	6	0.08%	0.08%	0.48%	0.33%	0.1%	0.06%	0%	0%	0%	0%	0%
6	7	0%	0%	0%	0.06%	0.11%	0.06%	0%	0%	0%	0%	0%
sum		4.85%	2.18%	6.03%	2.98%	0.71%	0.95%	0%	0%	0%	0.03%	0.03%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**

Study 1 – present education data

7	1	1.84%	0.47%	0.98%	0.42%	0.19%	0.19%	0%	0%	0%	0%	0%
7	2	2.48%	0.38%	1.46%	0.72%	0.38%	0.38%	0%	0%	0%	0%	0%
7	3	1.17%	0.66%	0.91%	0.55%	0.21%	0.44%	0%	0%	0%	0.02%	0%
7	4	0.19%	0.08%	0.98%	0.83%	0.38%	0.38%	0%	0%	0%	0%	0%
7	5	0.27%	0.33%	0.86%	1.18%	0.19%	0.11%	0%	0%	0%	0%	0%
7	6	0.13%	0.08%	0.53%	0.63%	0.3%	0.49%	0%	0%	0%	0%	0%
7	7	0%	0%	0%	0.27%	0.27%	0.27%	0%	0%	0%	0%	0%
sum		6.08%	2%	5.72%	4.6%	1.92%	2.26%	0%	0%	0%	0.02%	0%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
8	1	0.04%	0.15%	0.04%	0%	0%	0%	0%	0%	0%	0%	0.45%
8	2	0.04%	0.27%	0.04%	0%	0%	0%	0%	0%	0%	0%	0.23%

Study 1 – present education data

8	3	0.15%	0.04%	0.04%	0%	0%	0%	0%	0%	0%	0%	0.23%
8	4	0.19%	0.08%	0.08%	0%	0%	0%	0%	0%	0%	0%	0.23%
8	5	0.18%	0.29%	0.29%	0.03%	0%	0%	0%	0%	0%	0%	0.23%
8	6	0.11%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
sum		0.71%	0.83%	0.49%	0.03%	0%	0%	0%	0%	0%	0%	1.37%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
9	1	0.23%	0.28%	0.28%	0.45%	0%	0%	0%	0%	0%	0%	0%
9	2	1.15%	0.69%	0.35%	0.09%	0.11%	0%	0%	0%	0%	0%	0%
9	3	0.68%	1.55%	1.59%	0.53%	0.09%	0.09%	0%	0%	0%	0%	0%
9	4	1.34%	1.15%	1.51%	0.79%	0.11%	0%	0%	0%	0%	0%	0%
9	5	1.12%	1.01%	1.86%	0.61%	0.07%	0%	0%	0%	0%	0%	0%

Study 1 – present education data

9	6	0.6%	0.48%	0.31%	0.31%	0%	0%	0%	0%	0%	0%	0%
9	7	0.06%	0.06%	0.06%	0.06%	0%	0%	0%	0%	0%	0%	0%
sum		5.18%	5.22%	5.96%	2.84%	0.38%	0.09%	0%	0%	0%	0%	0%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
10	1	4.61%	0.88%	4.55%	2.11%	0.34%	0.34%	0%	0%	0%	0%	0%
10	2	5.22%	1.22%	5.22%	1.98%	0.28%	0.28%	0%	0%	0%	0%	0%
10	3	2.96%	1.34%	4.01%	2.38%	0.37%	0.37%	0%	0%	0%	0.03%	0.03%
10	4	2.13%	1.71%	4.44%	1.71%	0.4%	0.4%	0%	0%	0%	0%	0%
10	5	1.98%	1.67%	4.12%	2.6%	0.37%	0.17%	0%	0%	0%	0%	0%
10	6	1.14%	0.52%	1.84%	1.62%	0.27%	0.63%	0%	0%	0%	0%	0%
10	7	0.23%	0.17%	0.51%	0.11%	0.34%	0.23%	0%	0%	0%	0%	0%

Study 1 – present education data

sum	18.27%	7.51%	24.69%	12.51%	2.37%	2.42%	0%	0%	0%	0.03%	0.03%
Priorities of phases total sum of phase divided by length of education (5 years)	27.07%	18.76%	23.6%	11.49%	1.73%	2.26%	0.01%	0.01%	0.04%	0.49%	0.42%
Centre of gravity	a	b ↑	c	d	e	f	g	h	J	k	l

Average schedule – Danish architects

Study 1 – present education data

Average schedule – British technologists

Question	Year	a	b	c	d	e	f	g	h	j	k	l
1	1	4.71%	2.08%	1.61%	1.58%	0.53%	1.08%	0.32%	0%	0%	1.53%	0.26%
1	2	3.63%	1.65%	1.81%	2.01%	0.82%	3.61%	0.38%	0.07%	0.16%	0.9%	0.22%
1	3	1.61%	2.01%	1.4%	3.29%	1.18%	1.71%	0.71%	0.13%	0.26%	0.84%	0.26%
1	4	0.33%	1.7%	0.75%	0.75%	1.02%	1.6%	0.11%	0%	0.31%	0.37%	0.16%
1	5	0%	0%	0%	0%	0%	0.79%	0%	0%	0%	0%	0%
sum		10.28%	7.44%	5.57%	7.63%	3.55%	8.79%	1.52%	0.2%	0.73%	3.64%	0.9%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
2	1	2.4%	0.82%	2.66%	0.1%	0.36%	0.3%	0.23%	0.1%	0%	0.13%	0%
2	2	1.79%	2.07%	1.33%	0.63%	1.04%	0.5%	0.2%	0.07%	0%	0.26%	0%

Study 1 – present education data

2	3	0.72%	1.24%	2.03%	0.52%	1.31%	0.91%	0.46%	0.26%	0.12%	0.78%	0.06%
2	4	0.79%	0.7%	0.57%	0.44%	0.97%	0.07%	0%	0%	0.07%	0.03%	0.03%
2	5	0.16%	0.16%	0.16%	0.16%	0.16%	1.32%	0%	0%	0%	0%	0%
2	6	0.26%	0.26%	0.26%	0.26%	0.26%	0%	0%	0%	0%	0%	0%
sum		6.12%	5.25%	7.01%	2.11%	4.1%	3.1%	0.89%	0.43%	0.19%	1.2%	0.09%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
3	1	7.06%	1.54%	0.53%	0%	0.26%	0.26%	0%	0%	0%	0%	0.61%
3	2	1.75%	0.18%	0.26%	0.13%	0.13%	0.13%	0.13%	0%	0%	0%	0.44%
3	3	1.05%	0.13%	0.66%	0.26%	3.16%	0%	0%	0%	0%	0%	0.26%
3	4	1.14%	0.09%	1.32%	0%	0%	0%	0%	0%	0%	0%	0.09%
sum		11%	1.94%	2.77%	0.39%	3.55%	0.39%	0.13%	0%	0%	0%	1.4%

Study 1 – present education data

Question	Year	a	b	c	d	e	f	g	h	j	k	l
4	1	0.53%	1.95%	0.37%	0.13%	0.13%	0%	0.18%	0%	0%	0.55%	0.37%
4	2	2.02%	0.96%	1.23%	0.57%	0.44%	0.57%	0.61%	0.53%	0.66%	2.32%	0.88%
4	3	2.06%	1.01%	1.67%	0.09%	0.4%	1.32%	1.59%	0.35%	0.53%	1.89%	1.46%
4	4	0.93%	0.81%	0.72%	0.81%	0.78%	0.67%	0.64%	0.46%	0.67%	0.85%	1.07%
4	6	0%	0%	0%	0%	0%	0%	0%	0%	1.32%	0%	0%
sum		5.54%	4.73%	3.99%	1.6%	1.75%	2.56%	3.02%	1.34%	3.18%	5.61%	3.78%
Question	Year	a	b	c	d	e	f	g	h	j	k	l
5	1	1.68%	0.32%	2.55%	1.19%	0.45%	1.45%	0%	0%	0%	0.53%	0%
5	2	2.85%	0.7%	2.74%	1.25%	1.33%	2.47%	0%	0%	0%	0.79%	0.24%
5	3	1.05%	0.58%	1.54%	2.2%	1.68%	2.03%	0%	0%	0%	0.39%	0%

Study 1 – present education data

5	4	0.95%	0.25%	1.04%	0.42%	2.09%	0.53%	0%	0%	0.26%	0.26%	0%
5	5	0.26%	0.26%	0.26%	0.26%	0.61%	0%	0%	0%	0.35%	0.35%	0%
5	6	0.11%	0.11%	0.11%	0.11%	0.11%	0%	0%	0%	0%	0%	0%
sum		6.9%	2.22%	8.24%	5.43%	6.27%	6.48%	0%	0%	0.61%	2.32%	0.24%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
6	1	3.37%	1.11%	2.07%	0.5%	0.34%	1.03%	0%	0%	0%	0.26%	0%
6	2	1.05%	0.24%	1.03%	0.5%	0.53%	1.56%	0%	0%	0%	0.83%	0.04%
6	3	0.66%	0%	0.26%	0%	0.44%	1.49%	0%	0%	0.66%	1.23%	0%
6	4	1.05%	0.92%	0.13%	0.13%	0%	1.18%	0%	0%	0%	0.26%	0%
6	5	0.39%	0.79%	0%	0%	0%	0%	0%	0%	0%	0.39%	0%
sum		6.52%	3.06%	3.49%	1.13%	1.31%	5.26%	0%	0%	0.66%	2.97%	0.04%

Study 1 – present education data

Question	Year	a	b	c	d	e	f	g	h	j	k	l
7	1	3.03%	0.92%	1.64%	2.7%	2.39%	2.65%	0%	0%	0%	2.19%	0%
7	2	1.16%	0.68%	1.81%	4.2%	1.37%	3.55%	0.88%	0.23%	0%	1.68%	1.02%
7	3	0.53%	0.11%	2%	3.7%	3%	3.92%	1.04%	1.04%	0.83%	2.88%	0.95%
7	4	1.18%	0.65%	0.65%	1.17%	0.98%	0.39%	0%	0%	0%	0.58%	0.19%
7	5	0.26%	0%	0%	0%	0%	1.32%	0%	0%	0%	0.26%	0%
sum		6.16%	2.36%	6.1%	11.77%	7.74%	11.83%	1.92%	1.27%	0.83%	7.59%	2.16%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
8	1	2.25%	0.49%	0.14%	0.05%	0.05%	0.09%	0%	0%	0%	0%	0.09%
8	2	1.49%	1.45%	0.57%	0%	0.18%	0.09%	0.18%	0%	0%	0.18%	0.09%
8	3	0.61%	0.66%	0.66%	0.13%	0.34%	0%	0%	0%	0.21%	0.34%	0.21%

Study 1 – present education data

8	4	0.61%	0.22%	0.48%	0%	0%	0%	0%	0%	0%	0.13%	0.13%
8	5	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0%	0%	0%	0%	0%
sum		5.14%	3%	2.03%	0.36%	0.75%	0.36%	0.18%	0%	0.21%	0.65%	0.52%

Question	Year	a	b	c	d	e	f	g	h	j	k	l
9	1	1.42%	0.59%	0.24%	0.24%	0.24%	0.31%	0%	0%	0%	0.15%	0.24%
9	2	1.07%	1.6%	0.68%	0.41%	0.41%	0.61%	0%	0%	0%	0.24%	0.24%
9	3	0.76%	0.54%	0.54%	0.8%	0.16%	0.56%	0.26%	0%	0%	0.08%	0%
9	4	1.6%	1.18%	0.52%	0.52%	0.35%	0.66%	0.66%	0%	0%	0.15%	0.15%
9	5	0.26%	0%	0%	0%	0%	0%	0%	0%	0%	0.26%	0.26%
9	6	0.79%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
sum		5.9%	3.91%	1.98%	1.97%	1.16%	2.14%	0.92%	0%	0%	0.88%	0.89%

Study 1 – present education data

Question	Year	a	b	c	d	e	f	g	h	j	k	l
10	1	1.68 %	1.16 %	0.5 %	0.11 %	0.24%	0%	0%	0%	0%	0%	0%
10	2	0.76 %	0.24 %	0.56 %	0.61 %	0.59%	0.59 %	0%	0%	0%	0.24%	0.11%
10	3	0.13 %	0.13 %	0%	0.79 %	0%	0%	0%	0%	0%	0%	0%
10	4	0.58 %	0.05 %	0.05 %	0.05 %	0.05%	0%	0%	0%	0%	0%	0%
sum		3.15 %	1.58 %	1.11 %	1.56 %	0.88%	0.59 %	0%	0%	0%	0.24%	0.11%
Priorities of phases total sum of phase divided by length of education (3.5 years)		19.06%	10.14%	12.08%	9.7 %	8.87%	11.86%	2.45%	0.93%	1.83%	7.17%	2.89%
Centre of gravity		a	b	c	d ↑	e	f	g	h	j	k	l

Average Schedule – British technologists

Study 1 – present education data

Average schedule – British architects

Question	Year	a	b	c	d	e	f	g	h	j	k	l
1	1	3.71%	2.29%	4.79%	3.71%	1.93%	0.71%	0%	0%	0%	0%	0%
1	2	1.57%	3.71%	6.21%	3.36%	1.57%	0.71%	0%	0%	0%	0%	0%
1	3	1.12%	2.07%	3.14%	3.14%	3.26%	2.26%	0%	0%	0%	0%	0%
1	4	0.24%	0.24%	0.6%	0.6%	1.67%	1.67%	0%	0%	0%	0%	0%
1	5	0.83%	1.55%	2.14%	1.43%	1.07%	2.98%	0%	0%	0%	0%	0%
1	6	1.02%	1.02%	1.74%	3.52%	3.52%	0.6%	0%	0%	0%	0%	0%
1	7	0%	0%	0.71%	0%	0%	0%	0%	0%	0%	0%	0%
sum		8.49%	10.88%	19.33%	15.76%	13.02%	8.93%	0%	0%	0%	0%	0%
Question	Year	a	b	c	d	e	f	g	h	j	k	l

Study 1 – present education data

2	1	2.62 %	1.9 %	2.62 %	1.67 %	0.24 %	0.2 4%	0%	0%	0%	0%	0%
2	2	4.29 %	2.14 %	2.5 %	2.02 %	0.24 %	0.2 4%	0%	0%	0%	0%	0%
2	3	2.86 %	4.29 %	5.71 %	1.19 %	0.12 %	0.1 2%	0%	0%	0%	0%	0%
2	4	1.71 %	1.35 %	0.78 %	1.35 %	0.99 %	0.6 4%	0.0 6%	0.0 6%	0.4 2%	0.4 2%	0.0 6%
2	5	3.45 %	2.74 %	3.81 %	2.86 %	0.36 %	0.3 6%	0%	0%	0%	0%	0%
2	6	3.21 %	3.21 %	2.14 %	2.14 %	0.36 %	0.3 6%	0%	0%	0%	0%	0%
2	7	0.06 %	1.14 %	1.14 %	0.06 %	0.06 %	0.0 6%	0.0 6%	0.0 6%	0.0 6%	0.0 6%	0.0 6%
sum		18.2 %	16.7 7%	18.7 %	11.2 9%	2.37 %	2.0 2%	0.1 2%	0.1 2%	0.4 8%	0.4 8%	0.1 2%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
3	1	6.48 %	2.19 %	2.19 %	3.86 %	0.57 %	0.4 3%	0%	0%	0%	0%	1.4 3%
3	2	5.67 %	1.38 %	1.38 %	4%	1.86 %	0%	0%	0%	0%	0%	2.1 4%

Study 1 – present education data

3	3	6.38%	2.1%	1.62%	0.43%	1.86%	3.57%	0%	0%	0%	0%	0.48%
3	4	4.79%	0.14%	0.5%	0.14%	0.14%	0%	0%	0%	0%	0%	0%
3	5	6.19%	1.9%	2.62%	1.43%	1%	0.71%	0%	0%	0%	0%	0.43%
3	6	1.9%	1.9%	2.98%	1.79%	0.71%	0%	0%	0%	0%	0%	0%
3	7	0.24%	0%	0.24%	0.24%	0%	0%	0%	0%	0%	0%	0%
sum		31.65%	9.61%	11.53%	11.89%	6.14%	4.71%	0%	0%	0%	0%	4.48%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
4	1	0.71%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	2	0.71%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	3	1.78%	1.06%	0.35%	0.35%	0.59%	0.3%	0.06%	0.3%	0.06%	0.06%	0.06%
4	4	1.46%	1.31%	1.46%	1.28%	3.42%	3.6%	3.81%	3.81%	3.1%	3.81%	0.78%

Study 1 – present education data

4	5	0.86%	0.14%	0.14%	0.14%	0.14%	0%	1.19%	1.19%	0.48%	0.71%	0%
4	6	0.35%	0.55%	0.55%	0.35%	0.35%	0.27%	0.27%	0.27%	0.27%	0.27%	0.06%
4	7	2.5%	2.67%	1.09%	2.67%	2.67%	2.5%	2.5%	2.5%	2.5%	2.5%	0.91%
sum		8.37%	5.73%	3.59%	4.79%	7.17%	6.67%	7.83%	8.07%	6.41%	7.35%	1.81%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
5	1	0.43%	0.71%	5.48%	3.33%	5.48%	0.29%	0%	0%	0%	0%	0%
5	2	0.36%	1.36%	4.93%	3.86%	3.86%	0.64%	0%	0%	0%	0%	0%
5	3	0%	0.54%	1.96%	5.89%	3.04%	0%	0%	0%	0%	0%	0%
5	4	0%	0.54%	1.25%	4.11%	0.54%	1.43%	0%	0%	0%	0%	0%
5	5	0%	1.43%	2.02%	5.24%	2.38%	0.36%	0%	0%	0%	0%	0%
5	6	0%	0.68%	1.87%	1.87%	1.87%	0.14%	0%	0%	0%	0%	0%

Study 1 – present education data

5	7	0%	0%	0.71%	0.71%	0%	0%	0%	0%	0%	0%	0%
sum		0.79%	5.26%	18.22%	25.01%	17.17%	2.86%	0%	0%	0%	0%	0%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
6	1	0%	0%	1.07%	2.5%	1.43%	0.71%	0%	0%	0%	0%	0%
6	2	0.29%	0.71%	2.07%	3.14%	2.07%	1%	0%	0%	0%	0%	0%
6	3	0%	0.71%	2.02%	1.31%	0.24%	0.71%	0%	0%	0%	0%	0%
6	4	0%	0%	0.24%	0.24%	0.24%	0.71%	0%	0%	0%	0%	0%
6	5	0%	0.71%	2.14%	1.43%	0%	0.71%	0%	0%	0%	0%	0%
6	6	0%	0%	1.31%	1.31%	0.24%	0.71%	0%	0%	0%	0%	0%
6	7	0%	0.24%	0%	0.24%	0%	0.24%	0%	0%	0%	0%	0%
sum		0.29%	2.37%	8.85%	10.17%	4.22%	4.79%	0%	0%	0%	0%	0%

Study 1 – present education data

Question	Year	a	b	c	d	e	f	g	h	j	k	l
7	1	0.29%	0.29%	0%	1.36%	3.14%	1.36%	0%	0%	0%	0%	0%
7	2	0%	0%	0%	1.07%	2.14%	0.36%	0%	0%	0%	0%	0%
7	3	0%	0%	0%	1.67%	2.38%	0.95%	0.71%	0.71%	0%	0%	0%
7	4	0%	0%	0.54%	2.68%	1.25%	1.25%	0.71%	0%	0%	0%	0%
7	5	0%	0%	0%	3.81%	1.67%	0.95%	0.71%	0.71%	0%	0%	0%
7	6	0%	0%	0%	2.26%	2.26%	0.48%	0%	0%	0%	0%	0%
7	7	0%	0%	0%	0.71%	0.71%	0%	0%	0%	0%	0%	0%
sum		0.29%	0.29%	0.54%	13.56%	13.55%	5.35%	2.13%	1.42%	0%	0%	0%
Question	Year	a	b	c	d	e	f	g	h	j	k	l
8	1	0.71%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Study 1 – present education data

8	2	0.71%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
8	3	1.07%	0%	0.36%	0%	0%	0.48%	0.48%	0.48%	0%	0%	0%
8	4	1.19%	1.9%	0.71%	1.19%	1.19%	0.71%	0.48%	0.48%	0.48%	0.48%	0.48%
8	5	0.62%	0.62%	0.14%	0.62%	0.68%	0.54%	0.54%	0.54%	0%	0%	0%
8	6	0.5%	0.14%	0.5%	1.57%	0.14%	0%	0%	0%	0%	0%	0%
8	7	0.26%	0.26%	0.97%	0.97%	0.97%	0.97%	0.26%	0.26%	0.26%	0.26%	0.26%
sum		5.06%	2.92%	2.68%	4.35%	2.98%	2.7%	1.76%	1.76%	0.74%	0.74%	0.74%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
9	1	1.25%	0.54%	0.18%	0.18%	0%	0%	0%	0%	0%	0%	0%
9	2	1.01%	2.62%	1.37%	0.89%	0.71%	0.54%	0%	0%	0%	0%	0%
9	3	0.3%	0.48%	0.48%	1.19%	1.01%	0.12%	0%	0%	0%	0%	0%

Study 1 – present education data

9	4	0.29%	0.29%	0.29%	1%	0.29%	0%	0%	0%	0%	0%	0%
9	5	0.62%	1.33%	1.33%	0.98%	0.98%	0.48%	0%	0%	0%	0%	0%
9	6	0.38%	0.38%	0.38%	1.1%	0.38%	0.24%	0%	0%	0%	0%	0%
9	7	0%	0%	0%	1.43%	0%	0%	0%	0%	0%	0%	0%
sum		3.85%	5.64%	4.03%	6.77%	3.37%	1.38%	0%	0%	0%	0%	0%
Question	**Year**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**j**	**k**	**l**
10	1	1.46%	1.46%	2.65%	2.65%	2.48%	0%	0%	0%	0%	0%	0%
10	2	1.71%	1.71%	1.95%	1.95%	1.95%	0%	0%	0%	0%	0%	0%
10	3	0.43%	0.96%	1.2%	1.92%	2.27%	0.36%	0%	0%	0%	0%	0%
10	4	0.14%	0.32%	0.32%	0.68%	0.68%	0%	0%	0%	0%	0%	0%
10	5	0.43%	0.61%	1.56%	1.56%	0.85%	0%	0%	0%	0%	0%	0%

Study 1 – present education data

10	6	0.14%	0.32%	1.33%	1.33%	1.33%	0.54%	0%	0%	0%	0%	0%
10	7	0%	0%	0%	2.14%	0%	0%	0%	0%	0%	0%	0%
sum		4.31%	5.38%	9.01%	12.23%	9.56%	0.9%	0%	0%	0%	0%	0%
Priorities of phases total sum of phase divided by length of education (5 years)		16.26%	12.97%	19.3%	23.16%	15.91%	8.06%	2.37%	2.27%	1.53%	1.71%	1.43%
Centre of gravity		a	b	c	d	e	f	g	h	j	k	l

Average schedule – British architects

Study 2 – level of professions

Appendix III – Study 2 – level of professions

Questionnaire

Staff members are kindly requested to provide responses to the following topics, regarding the professions of Architecture and Architectural Technology. **The aim is to obtain data regarding what staff members thinks about the level of the two professions as they appear right now. –** Recognising week points is the first step to improvement.

First you are asked to give an **estimate of the importance of each of the ten topics** at a scale from 1 to 10 – 10 being the highest. All could have 10 or all could be different – what do you think?

Second, at a scale from 1 to 10, where within the topic area would you **place the profession in comparison with professions in general** if 10 are highest and 1 is lowest?

1. Level of skills and knowledge

This is both about the level of culture and the level of special knowledge and ability the members of the profession possess in relation to all other professions.

topic importance **1**☐ **2**☐ **3**☐ **4**☐ **5**☐ **6**☐ **7**☐ **8**☐ **9**☐ **10** ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ **10** ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ **10** ☐

2. Level of formal education

This is about the length and or/level of the required education – again in relation to other professions.

topic importance **1**☐ **2**☐ **3**☐ **4**☐ **5**☐ **6**☐ **7**☐ **8**☐ **9**☐ **10** ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ **10** ☐

Study 2 – level of professions

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

3. Level of organisation

About how the profile of the professional body is

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

4. Level of respectability

About the reputation of the profession in society

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

5. Level of exclusivity

The extent to which the profession require special basic personal abilities that not everyone possess

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Study 2 – level of professions

6. Clients' social ranking

Socially high ranking clients tend to have a positive influence at the reputation of a profession

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

7. Level of professional body control

The extent to which the professional body control the abilities and the behaviour of the members

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

8. Level of indeterminacy of knowledge and skills

This is about the degree to which the members of the profession can act individually and independently

topic importance 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architecture: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Architectural Technology: 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10 ☐

Study 2 – level of professions

9. Level of legitimacy

About laws and legislation recognising the profession and giving it a say

topic importance ☐ **1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10**

Architecture: ☐ **1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10**

Architectural Technology: ☐ **1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10**

10. Level of income and fees

Again an estimate in relation to other professions

topic importance ☐ **1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10**

Architecture: ☐ **1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10**

Architectural Technology: ☐ **1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10**

Name

Own profession

Confidentiality
Personal anonymity is guaranteed and it will not be possible to identify any individuals as respondents to this questionnaire in what will be published or given to others at a later stage.

Niels Barrett

Study 2 – level of professions

Results

Statistics on Danish Staff replies to questionnaire														
Topic			1	2	3	4	5	6	7	8	9	10		avera
			mar	mar	mar	mar	mar	mar	mar	mar	mar	mar		
no. 1	importance													#####
	Architect		6	8	7	9	9	9	7	8	8	8		7.9
x	Technologis		8	5	9	6	5	7	7	8	5	6		6.6
no. 2	importance		10	10	7	5	5	8	8	10	10	8		8.1
x	Architect		9	9	8	9	9	9	7	9	9	7		8.5
x	Technologis		9	9	9	7	6	7	7	7	9	5		7.5
no. 3	importance		8	6	7	5	4	3	7	7	6	3		5.6
	Architect		8	6	6	7	8	6	7	9	8	6		7.1
	Technologis		6	6	6	7	4	4	7	6	7	5		5.8
no. 4	importance		6	7	5	6	6	6	6	7	6	6		6.1
	Architect		5	7	8	8	6	6	6	6	5	7		6.4
	Technologis		7	5	5	4	5	6	6	5	6	5		5.4
no. 5	importance													#####
x	Architect		10	10	8	9	10	10	8	10	9	9		9.3
	Technologis		10	7	10	9	7	10	10	8	9	8		8.8
no. 6	importance		10	10	8	7	5	1	10	7	7	7		7.2
	Architect													#####
	Technologis													#####
no. 7	importance													#####
	Architect		5	10	3	5	9	8	4	10	8	5		6.7
x	Technologis		8	6	9	9	7	7	9	3	8	5		7.1
no. 8	importance													#####
	Architect		6	6	7	5	8	7	5	8	6	7		6.5
x	Technologis		6	5	6	6	4	7	7	5	6	6		5.8
no. 9	importance		10											10
x	Architect		10	9	10	9	9	9	6	8	10	7		8.7
x	Technologis		10	7	8	5	6	6	6	8	10	5		7.1
no. 10	importance		10	10	10	10	10	6	8	10	10	10		9.4
x	Architect		9	9	9	9	9	9	8	9	9	9		8.9
x	Technologis		9	6	9	9	9	7	8	7	9	8		8.1
no.11	importance		2	1	10	7	3	9	8	5	6	4		5.5
x	Architect		8	8	7	7	8	8	6	8	5	6		7.1
	Technologis		6	4	6	3	5	7	5	4	1	2		4.3
no.12	importance													#####
	Architect													#####
	Technologis													#####
x Means that the respondent possess the profession														

Study 2 – level of professions

	11 answers													
	Average marks - individual topics												All topics	
	Importance		8.0	7.3	7.8	6.7	5.5	5.5	7.8	7.7	7.5	6.3		7.02
	Architect		7.6	8.2	7.3	7.7	8.5	8.1	6.4	8.5	7.7	7.1		7.71
	Technologis		7.9	6.0	7.7	6.5	5.8	6.8	7.2	6.1	7.0	5.5		6.65
Calculation of resulting final mark for the two professions														
Architect														
topic			mar		importance				poin					
1			7.6	*	8				60.8					
2			8.2	*	7.3				59.8					
3			7.3	*	7.8				56.9					
4			7.7	*	6.7				51.5					
5			8.5	*	5.5				46,7					
6			8.1	*	5.5				44.5					
7			6.4	*	7.8				49.9					
8			8.5	*	7.7				65.4					
9			7.7	*	7.5				57.7					
10			7.1	*	6.3				44.7					
Points			max.		701	Points achieved			538.3		Resulting			**7.68**
Technologist														
topic			mar		importance				poin					
1			7.9	*	8				63.2					
2			6.0	*	7.3				43.8					
3			7.7	*	7.8				60.0					
4			6.5	*	6.7				43.5					
5			5.8	*	5.5				31.9					
6			6,8	*	5.5				37.4					
7			7.2	*	7.8				56.1					
8			6.1	*	7.7				46.9					
9			7	*	7.5				52.5					
10			5.5	*	6.3				34.6					
Points			max.		701	Points achieved			470.2		Resulting			**6.71**
By coincidence the two resulting marks, when the importance is considered, are very close to the average marks that can be seen above.														

Study 3 - Professional groups meetings and questionnaires

Appendix IV – Study 3 – focus group invitations

Apart from the meeting invitations, all other documents regarding for example the data from the focus group meetings in London and Copenhagen can be found in section 5 – Professional groups.

Study 3 - Professional groups meetings and questionnaires

P.S. Krøjer: The architect Martin Nyrop gives instructions under the erection of the Town Hall in Copenhagen 1903, The Hirschsprung collection

Theme:

Education of architects and architectural technologists in UK, Denmark and Europe, or how we deliver professionals to the architect's office now and in the future

Agenda:

14.00	**Welcome, presentation of participants and introduction**
14.10	**Comparison of the quantitative data and conclusions to be drawn**
14.30	**The recent development and the possible prospect in an international perspective**
15.00	**The need for two educations**
15.20	**Conclusion**
15.30	**End of session**

Niels Barrett
October 2009

Study 3 - Professional groups meetings and questionnaires

ORGANISATION	**RIBA** Director of Research & Development **Dr. Keith Snook**
	CIAT Director of education and international **Tara Pickles**
	Head of Department of Architecture and Planning Sheffield Hallam University **Norman Wienand**
EDUCATION	**University of Westminster** Head of the undergraduate course in architecture Principal lecturer **Dr. Ian Murphy**
	Head of the course in Architectural Technology Architect lecturer **Virginia Rammou**
	Senior Lecturer **Adam Thwaites**
BUSINESS	**John Robertson Architects (UK)** Director **Festus Moffat** RIBA
	DEGW (UK) Managing director **Philip Tidd** RIBA
	PLH Architects (DK) Partner **Lene Nepper Larsen** RIBA, MAA
Moderator	Architect, Senior Lecturer **Niels Barrett** MAA Robert Gordon University + Copenhagen School of Design & Technology
Observer	Dr. Professor **Richard Laing** Robert Gordon University

Study 3 - Professional groups meetings and questionnaires

P.S. Krøjer: The architect Martin Nyrop gives instructions under the erection of the Town Hall in Copenhagen 1903, The Hirschsprung collection

Tema:

Uddannelse af arkitekter og konstruktører i Storbritannien, Danmark og Europa, eller hvordan vi leverer professionelle til arkitektvirksomheden nu og i fremtiden

Dagsorden:

14.00	**Velkomst, præsentation af deltagere og introduktion**
14.10	**Sammenligning af de kvantitative data og mulige konklusioner**
14.31	**Seneste udvikling og de mulige udsigter set i internationalt perspektiv**
15.00	**Behovet for de to uddannelser**
15.20	**Konklusion**
15.31	**Afslutning**

Niels Barrett
Oktober 2009

Study 3 - Professional groups meetings and questionnaires

Deltagere

ORGANISATION	**Arkitektforbundet** Faglig Sekretær cand.polit. **Ib Sander-Hansen**
	Konstruktørforeningen Formand bygningskonstruktør **Gert Johansen** MAK
	Faglig sekretær/Director International bygningskonstruktør **Jacob Ravn Thomsen** MAK
EDUCATION	**Kunstakademiets Arkitektskole** Arkitekturlærer arkitekt **Jakob Knudsen** MAA
	Lektor, studieleder arkitekt **Finn Selmer** MAA
	Københavns Erhvervsakademi Proceslærer arkitekt og bygningskonstruktør **Lars Hartmann Petersen** MAA
	Proceslærer bygningskonstruktør **Anni Bryld** MAK
BUSINESS	**JJW Arkitekter A/S** Partner arkitekt og bygningskonstruktør **Kaj Wohlfeldt** MAA
Moderator	**Niels Barrett** MAA Robert Gordon University + Københavns Erhvervsakademi

Study 3 - Professional groups meetings and questionnaires

Questionnaire

ARCHITECTURAL AND TECHNOLOGICAL EDUCATION ASSESSMENT

Dear participant in the focus group on the 16th of October
Referring to the quantitative data collected from architects and architectural technologists debated at the focus group meeting in which you participated on the 16th of October you are now asked to express your final personal opinion. The data indicated that the architects concentrated their studies on activities more art related and belonging to the first phases of the phase model, whereas the technologists not surprisingly dealt more with all phases. This tendency is much more significant in Denmark than in UK where only the dealing with question 7 about standard constructions, key junctions and building physics indicated a clear difference.

Have we found the right balance in the two educations and are they covering the needs of the industry sufficiently? – The following questions are meant to allow you to give your opinion.

1. **Comparing the situation in the UK with the one in Denmark, what model appears the best or less bad to you? The Danish? ☐ Or the British? ☐**
   Please give your comment:

2. **Regarding the data from Denmark: Of the two educations only the technologist education deals with almost all the phases of the phase model. Does that mean that we could do without the architects?**
   Yes ☐ **No** ☐

   If no:
   Is it then because of a different culture within the two educations? Yes ☐ No ☐
   Are the architects dealing mainly with art, design and function? Yes ☐ No ☐
   Are the technologists dealing mainly with technology and process? Yes ☐ No ☐

   Please give your comment:

3. **Regarding the data from UK: The two educations appear rather similar with only a certain difference as to the technological emphasise. Does that mean that we could do without the technologists?**
   Yes ☐ **No** ☐

   If no:
   Is it then because of a different nature of the two educations? Yes ☐ No ☐
   Are the architects dealing mainly with art, design and function? Yes ☐ No ☐
   Are the technologists dealing mainly with technology and process? Yes ☐ No ☐

   Please give your comment whether the first answer were yes or no:

Study 3 - Professional groups meetings and questionnaires

Questionnaire

4. **Is there a different culture within the two different courses in UK?**
Yes ☐ **No** ☐

If yes:
Is it because architecture tends to be art related and technology isn't?
Yes ☐ No ☐
Does that mean that architects aim to do the outstanding designs mainly?
Yes ☐ No ☐

Please give your comment:

5. **In the past architects only did the design of buildings, which were meant to be outstanding. The rest was done by master builders. Have the technologists to some extent replaced the master builders' role but within the drawing office?**
Yes ☐ **No** ☐

Please give your comment:

6. **Has it in UK become a tradition to give architects a kind of informal training in AT in the drawing offices?**
Yes ☐ **No** ☐

If yes:
Is this training well planned and sufficient for a professional of today? **Yes** ☐ **No**
☐

Does it cause mistakes and documents to redo? **Yes** ☐ **No** ☐
Is it the clients who pay the costs of this? **Yes** ☐ **No** ☐
Would it be better to use technologists and let them cooperate with the architects?
Yes ☐ **No** ☐

Please give your comment:

7. **Is the Architectural Technology discipline growing within the activity of the drawing office due to new and more complicated techniques and materials?**
Yes ☐ **No** ☐

Please give your comment:

8. **Is it possible to educate a person to become both a good architect and a good technologist within a theoretical education of 5 year duration?**
Yes ☐ **No** ☐

If yes:
Is it then an average architect student of today? **Yes** ☐ **No** ☐

Study 3 - Professional groups meetings and questionnaires

Questionnaire

Please give your comment:

9. **Is it possible to educate a person to become a good designing architect within a theoretical education of 5 year duration?**
   Yes ☐ **No** ☐

   If yes:
   Is it being possible to do it within 3 years? **Yes** ☐ **No** ☐

   Please give your comment:

10. **Is it possible to educate a person to become a good Architectural Technologist within a theoretical education of 5 year duration?**
    Yes ☐ **No** ☐

    If yes:
    Is it being possible to do it within 3 years? **Yes** ☐ **No** ☐
    Is it recommendable to prolong the education to 5 years? **Yes** ☐ **No** ☐

    Please give your comment:

11. **Is it recommendable that drawing offices employ both Architects and Architectural Technologists?**
    Yes ☐ **No** ☐

    If yes:
    Would it balance the cooperation best if the technologist had an education of the same duration as the architect? **Yes** ☐ **No** ☐

    Please give your comment:

12. **Does the title "Architectural Technologist" say the right thing about the profession to ordinary people?**
    Yes ☐ **No** ☐

    If no:
    What name would you suggest?

    Please give your comment:

Study 3 - Professional groups meetings and questionnaires

Questionnaire

Your data:

Name:

Occupation:

Company/institution:

Address:

E-mail:

Confidentiality:

The answers above will only be used with reference to the focus group as a whole and it will not be possible in the thesis, other publications or oral presentations to identify the opinion of the individual respondent.

Niels Barrett

Conference programme and presentation in Copenhagen 2008

Appendix V – Conference programme and presentation Copenhagen 2008

Architectural Technology

In a European and Global Perspective

Focus is to outline the future roles of this part discipline of architecture taking the influence of Globalisation and increased European co-operation into consideration.

Definition: Architectural Technology in this context is not mainly about the many techniques used by the architect to produce the documents, drawings and models, but rather the techniques of how to put the building together that are to be embedded in the documents produced by the firm of architects. It is about how to master the "coherent" technical design of buildings in the drawing offices today and in the future.

The problem to focus on is the problem of specialisation within the discipline of architecture. Ever since the first attempts to replace the old traditional craft based building techniques with the technological results of the growing industrial society, the architects have lost areas of responsibility to new kinds of specialists like service engineers, structural engineers, electrical engineers and acoustic engineers etc.

These are officially new and other trades because they deal with new kinds of design to be installed in the building. But also the core area of architecture has been split into a number of professional specialisation areas like landscaping, urban planning and industrial design etc. From a situation a 150 years ago, where one man mastered all it took to design a building in its surroundings and with all the parts to be installed in it, we are now facing a situation where a growing number of specialists are required – specialists whose work is a separate delivery not necessarily integrated in the architectural concept.

The resulting buildings are suffering increasingly from this lack of integration and the technological development is not about to pause to enable us to adjust to the situation. It is speeding up and leaving us with a serious problem of how to manage all the new possibilities made by new materials, tools, equipments, techniques and political requirements.

Conference programme and presentation in Copenhagen 2008

Within architecture in today's understanding of the term we face the problem that one education of 5 years of theory can't teach anyone to master both the more artistic part dealing with function and design and the growing technological part required to do the coherent technical design. **– So, what do we do? – Split up the trade again? Or do we develop a new area of educational specialisation to stay within the trade: The Architectural Technologist, the Constructing Architect, the Architectural Engineer or the Technical Architect? – As other existing educations are called if translated to English?**

Let's gather and discuss this important matter!

Programme

Thursday the 6th of November

18.30 Gathering in reception at hotel Copenhagen Island for foreign attendants
Copenhagen Island, Kalvebod brygge 53, 1560 København V, 0045 33389600

19.30 Dinner at hotel Copenhagen Island for attendants staying over night

Friday the 7th of November

9.15 Check in, registration and coffee at Ingeniørforeningens Mødecenter, Kalvebod Brygge 31-33, next to the hotel

9.40 Please be seated by Mornings chair person course leader **Yrsa Gregersen** CTA

9.45 Welcome by Study Rector **Bente Øhrstrøm** Copenhagen Technical Academy

10.00 Key note speech: Architectural Technology before, today and in the future
by Professor Hisham Elkadi Head of School of Architecture and Design at the University of Ulster

10.30 The situation in Denmark by **Gert Johansen** President of Konstruktørforeningen and pedagogic coordinator **Verner Larsen**, VIA , Horsens

11.00 Coffee

11.20 The situation in Holland by Head of Department of Architectural Technology **Hans Ten Voorde** Amsterdamse Hogeschool voor Techniek

11.40 The situation in Ireland by IATGN committee member **Noel Scanlon**

12.00 The situation in UK by CIAT President **Mark Kennett** and Vice President Education **Colin Orr**

12.30 Sum up of morning by Course Leader **Graham Paterson** RGU

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12.40 Lunch

14.00 Please be seated by afternoons chair person course leader **Jan Forna** CTA
14.05 The new technology: James Harty, Architect RIBA, RIAI, MAA, PG-cert (research), PhD-student RGU, CTA

14.25 The educational issue: Niels Barrett, Architect MAA, PG-cert (research), PhD-student RGU, CTA

14.45 Coffee

15.00 Workshop 1: on technology Moderator: Course Leader **Tahar Kouider** RGU
Workshop 2: on education Moderator: Professor Richard Laing RGU

17.00 Reports in plenum by the moderators

18.00 End of day

19.00 Conference dinner at Ingeniørforeningens Mødecenter Kalvebod Brygge 31-33

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Saturday the 8th of November

10.00 The Architecture of Copenhagen before and now: Architect MAA Henry Voss
Copenhagen Island Hotel, Kalvebod brygge 53, 1560 København V, 0045 33389600

10.10 Bus to Grundtvigskirken etc.

12.00 Bus to lunch restaurant

14.00 Sightseeing from bus with small stops with Henry Voss as tour guide

17.00 End of session

Conference fee: 150 Euro
Dinner at hotel Thursday evening: 80 Euro
Hotel room 135 Euro for single room
Hotel room 165 Euro for double room
Bus tour and lunch on Saturday: 80 Euro

Attendance confirmation form to fill in and return to sender before end of September

Participation in the Architectural Technology conference 6th to 8th of November 2008 in Copenhagen						
name						
address						
occupation						
institution						
e-mail						
I am sharing the room with: name						
Dinner Thursday	☐	Bus tour and lunch	☐	I want to stay in hotel Copenhagen Island	☐	
Tick for one or two persons	Wednesday the 5th ☐ ☐	Thursday the 6th ☐ ☐	Friday the 7th ☐ ☐	Saturday the 8th ☐ ☐	Sunday the 9th ☐ ☐	

If you want to participate then please fill in the form above and return the file by e-mail to nib@kts.dk

Conference programme and presentation in Copenhagen 2008

International AT Conference 6th to 8th of November

Presentation paper

Architectural education and the design problem

Abstract

This paper describes in short terms the relationship between the discipline of architecture and the discipline of architectural technology. It looks at the professions and their behaviours and at the educations. Both disciplines stay within the wider profession of architecture as it has been traditionally, but the technological development has caused a relatively new situation in the industry that we have to consider.

The text below is based on a study of literature covering the development, but seen from a new angle. It is also considering the results from a pilot questionnaire aiming to clarify how the two educations in question are covering the needs of the architect firm. The results are supported by interviews and discussions undertaken during the last 3 years. Furthermore, it refers to research undertaken in Denmark in 2006 and 2007 to uncover how the education of architects suits the drawing offices.

Conference programme and presentation in Copenhagen 2008

Architectural education and the design problem

What architecture is about?

Architecture has always required a combination of a sensitive artistic approach and a practical knowledge about materials and how to put them together (Crinson 1994). This consideration is based on definitions like Nikolau Pevsner’s in his book “An Outline on European Architecture” (Pevsner 1973). It says that “A bike shed is a building, but Lincoln Cathedral is a piece of architecture.”

How the technical knowledge was involved traditionally

Traditionally, the craftsman and especially the master builders, who were the established superiors within the building related crafts, delivered the necessary knowledge on materials and how to join them in an appropriate way (Brochmann 1969). The architect mainly had to deliver the main overall drawings and some details about more decorative features and profiles. When the term ‘Architect’ became common, it referred to an artist like a painter or sculptor (King 2005).

The recent history

150 years ago architects gradually began to design for ordinary people. Until then, they had concentrated on the more spectacular or outstanding buildings ordered by the upper class (Brockmann 1969). But in the beginning of the twentieth century they more or less overtook all building design from the master builders. Perhaps because society had become prosperous in general and the wealth began to spread to wider groups in society; groups that now wanted a little more than just a building.

After the Second World War the results of industrialism became still more visible in the building industry, thus causing new materials and new techniques to use them (Backer 1999).

This meant the end of the old crafts and that still more decisions were moved from the workshops and the building sites to the drawing offices (Sebestyen 1998). The architects had to follow this development and many of them were eager to do so. This eagerness was due to the new morally based functionalism or modernism that celebrated all these new possibilities they now wanted to express all this new in their architecture (Frampton 1980).

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A simple way to recognise the resulting change in behaviours is to make a comparison between the very few drawings required in the old days with the number of drawings it takes to make a sufficient documentation today.

Consequences for the educations

Did this lead to significant changes in the education of architects? I don't think so. Yes, there were changes, but they were of the kind that had always followed the transfer from one architectural language or style to another (Brochmann 1969). Why is that? The main reason might be that it would have required a significant prolonging of the education if the traditional level of design skills in the artistic sense were to be maintained as well.

Perhaps as a realisation of this lack of technical education a number of European countries have begun to educate architectural technologists and they are in general pretty successful to access the drawing offices (Brookfield 2003).

How do we manage today?

Who is then doing the more technical work in the drawing office today? The answer might differ from country to country but some places an increasing number of architectural technologists are hired. Of course, they can't cover all the needs. So who is doing all the rest then? It is in fact the architects, who are passing periods of unofficial apprenticeship in the drawing office to achieve the required capabilities.

Without having investigated this in detail I think it is fair to say that apprentices require time from somebody else and that they tend to make more mistakes than people trained in advance, all at society's expense.

Comparison with other professional areas

If we compare with other professional areas it is hard to find anything alike. Where a comparison can be made it is normally a very open and well known traditional procedure, where the professional is considered educated and ready after the period of apprenticeship.

Furthermore, the here called technical part of the architect's work is still growing and it requires still more new qualifications (Alai 1998). In other professions, the standard reply to such a situation has normally been kinds of specialisations within the educations.

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Thus, the question is**: "Is a new kind of architect in the shape of the architectural technologist about to be a reality?"**

How are we using the technologists?

Until the issues raised in this paper are generally recognised, it is a question if the technologists get the position in the office they are educated for. What I sometimes hear from graduates is that it is sometimes difficult for them to use their knowledge sufficiently. Even in situations where they can really see that something is less appropriate with a project this is a problem.

Of course, it is an option that technologists make their own companies. But what responsibility will they then take? In Denmark, architecture is a free trade and until recently it was common that technologists made their own architect companies especially in the province. Their architecture was, not surprisingly, less good, but their technical designs were fine in general. It simply did not rain through the roof and moist problems from the ground were solved. – That sort of thing.

It is very often experienced that young newly started architect firms that base the company on the first won competitions have the opposite problems.

The problems caused by specialisation

Another problem, as a result of not only educational specialisation but also specialisation of the consultant business itself, can be noticed by looking at what happened when engineers began their own consultant businesses.

A certain integration of load bearing structures were maintained, probably because architects were used to deal with those as a part of their architecture but without much calculation, which is now required.

Within the new area of technical installations it turned out otherwise. In general they never became an integrated part of the architecture[46]. This is visible everywhere but people are so used to the situation that they barely notice it. As a result, the standard in our physical environment has somehow declined.

Because of the risk of getting more disintegrated building parts and less good buildings it could be recommended to keep architecture and architectural technology below the same roof of the architect's drawing office. Ideally, one single person could master everything. That would save a lot of communication work and eliminate some of the sources of mistakes. The second best must be to make the closest cooperation possible between to professionals who can cover the

[46] Centre Pompidou in Paris constitute an exception

Conference programme and presentation in Copenhagen 2008

requirements together. Also, it might be considered if, in such a situation, it is not the best to give the two an equal position to secure a reasonable balance in the results.

To support the latter idea it can be mentioned that the architect traditionally knew the old crafts to a certain extent. He knew he would get into serious trouble if he overruled the solutions the craftsmen had and prioritised a shaping on the costs of the strength and sustainability in the methods of the craftsmen. We talk about methods that had been developed over centuries. Many craftsmen had passed a very long period of training and had become professionals at a very high level (Brochmann 1969).

Where could this lead to?

Given the present situation, both educations should begin to prepare for this kind of cooperation. But there is a long way to go. We have two very different kinds of educations and they have developed so different cultures and environments that it almost provides a chock to the few people who go from one education to the other here in Denmark (Studieordning 2002) (Hartmann-Petersen 2002). It is as if the knowledge of the technologist doesn't count when he, after graduation, begins the long education to become an architect as well. This is simply because the architect school chooses to treat him as a beginner. Which, seen from a pedagogic point of view, is rather unreasonable.

The educations should make sure that the drawing offices possess all the qualifications required by the area of architecture at the highest possible level. – Who would object to this statement, the importance of the products to society taken into consideration?

I doubt we are close to this level anywhere in the world. The results of the efforts can be seen everywhere and are far from convincing. This goes both for the quality of the architectural design that very often ignores the environment in which it is going to be placed and for the technical quality that very often lacks the necessary precautions (Barrett 2005).

The data I have collected at this stage of my research, based on results from a pilot questionnaire and interviews with people with the relevant backgrounds, also gives me a good reason to suspect that the main differences between the educations we here talk about are real. In fact, no one has objected to what I have expressed here so far. Recent research undertaken by the Union of Architects in Denmark and the Architect School in Aarhus is also pointing in the same direction if it is seen from this point of view. The report concludes that the technologists establish a group of "competitors" to the architects and from the report's viewpoint that is of course true (Hougaard 2007).

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But, seen from an educational point of view there is no direct competition, which is also clearly underpinned by the mentioned fact that the architect schools in Denmark do not give any merit from one education to the other. Actually, there is a certain minor overlapping between the two educations, but that is also necessary to make the students capable of cooperating with each other after graduation.

It is also a question if the lengths of the educations are right. It is more or less decided by the ministers of education in Europe that a master degree should take 5 years (THE EUROPEAN MINISTERS OF EDUCATION 1999). This is also the present length of the architect education many places, but it looks as if mainland Europe sooner or later will get a bachelors level introduced everywhere. The architectural Technologist education takes 3-4 years in UK and other places and is a bachelor or an honours degree.

The reason why we now face certain changes is that the politicians have decided to equalise all higher educations looking at what is the average in Europe. But is that what society needs to get the best value for its educational investments?

At least I doubt that the education of architectural technologists is long enough to give a sufficient background. And I am pretty sure that in we have a huge undeveloped potential research-wise.

Conclusion

To conclude, I would like to say that we are facing certain barriers in our service to society, which, naturally, should be our foremost purpose:

To get the best possible use of the available knowledge, the barriers the educational system and the professional tradition provide in the industry need to be broken down.

The knowledge available within architecture and architectural technology is lacking the same intensive research background as such a discipline as nursing has established today. And that despite the fact that our disciplines had a much better starting position not so long ago.

A further research is necessary to help us to look at what we are doing and where we are heading from all relevant angles. Sometimes it is even necessary to look from angles we do not feel inclined to look from and are not used to, to find what will later on be considered the right solution. In this case it is the right balance between the disciplines of Architecture and Architectural Technology.

Niels Barrett
Architect MAA, PG-Cert (research)

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Appendix VI – Conference presentation in London 2008

Annual AT Course leader meeting

Westminster University, December the 5th

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Abstract

This paper tells about where AT derives from and explains the relationship with architecture. It also describes the present situation and suggests a reasoned definition of the term AT. Furthermore, it uncovers missing and less good covered areas within the profession of architecture and planning and suggests educational solutions to fill the gaps.

The data collection behind the descriptions and conclusions is based on a literature study and an initial pilot investigation as parts of a PhD-project in cooperation with Robert Gordon University in Aberdeen and the Copenhagen Technical Academy.

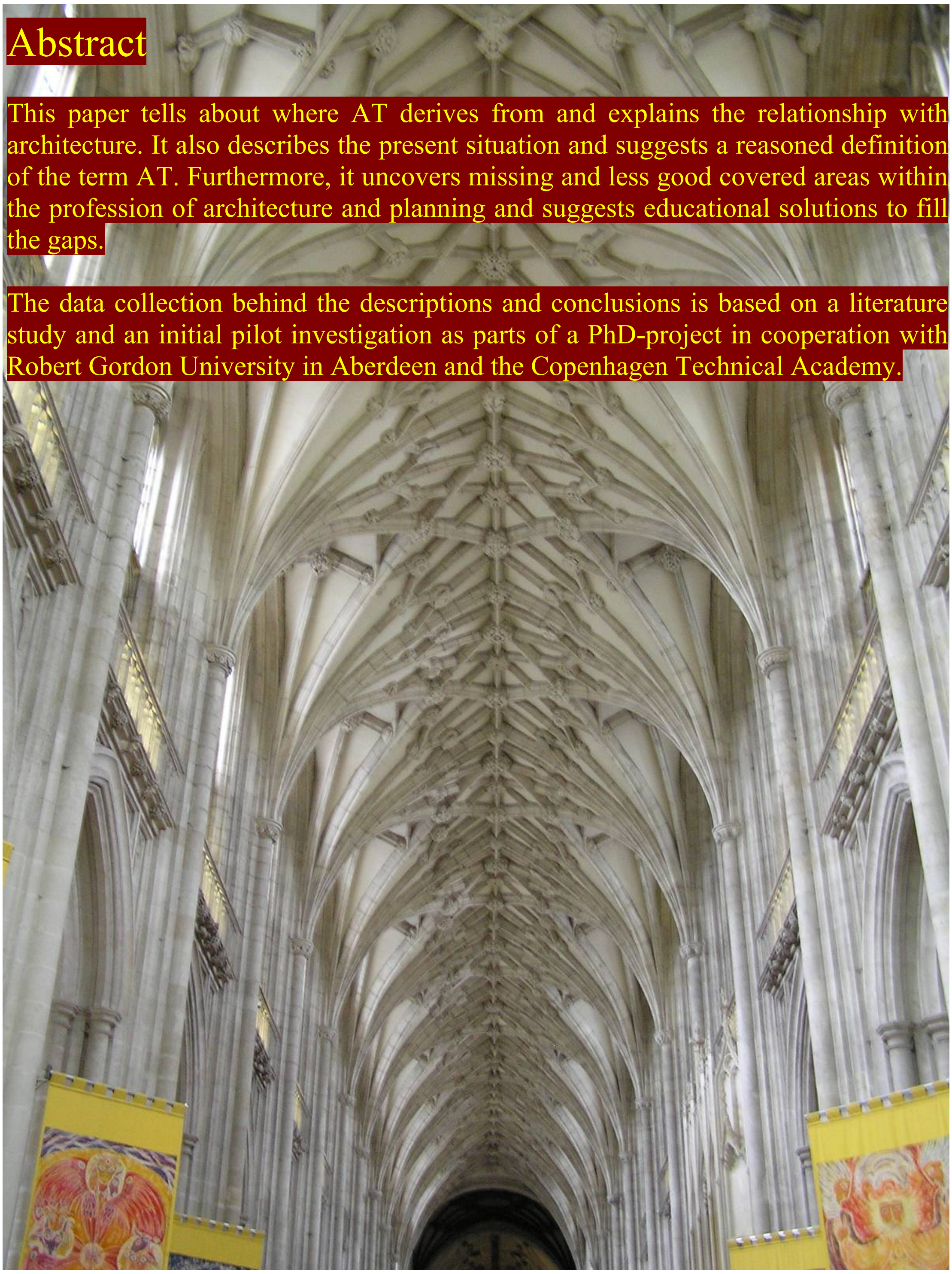

Figure 0-1: Winchester Cathedral

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Where does the AT profession derive from?

Like the profession of architecture AT derives from the tradition of master builders. In UK it might be seen as a new profession because the education is relatively new but in Denmark, where I am from, it has an unbroken link back to the master builders.

Originally, the theoretical education we now call AT was in fact called master builder in Denmark. That was more than a hundred years ago and the students were all craftsmen like bricklayers, masons, carpenters and joiners. The aim was to educate people who could produce all the drawings of the building and afterwards could lead the execution of the work on the building site. The theoretical education was established as a reaction to the fact that the old guilds lost their privileges by law (1857) and as a result also lost control of the education of master builders (Brochmann 1969).

In the beginning of the twentieth century it became popular to ask architects to do the design of ordinary people's buildings such as tenement buildings and even factory buildings and they took over most of the drawing work in the industry. Thus, the habit to have the same person do both the drawings and the site management vanished and around 1930 it was almost gone in the cities (Frampton 1980).

The only difference between UK and Denmark is that UK gave up the education of master builders as someone who could also produce the drawing documentation and that we kept it in Denmark. That was probably not because we in Denmark were more foresighted. No, I think it was because we, as usual, were later to realize the changes that had taken place.

Since the Second World War the Danish education was called "Bygnings-konstruktør", which directly translated says "Building Constructor" but rather means Architectural Technologist. The term we usually use when we translate is "Constructing Architect". The main content of the education is about how to put a building together (Hartmann-Petersen 2002).

Why did you begin to educate Architectural Technologists in UK? There could be different explanations and one could be that it was realized that young people who became technicians felt and expressed a need for further education. Another explanation could be that it was required by the industry. Or, perhaps both the factors were in play behind the initiative. At a recent conference in Copenhagen architect Ed Melet of the Hoogeschool van Amsterdam said that they in Holland quite recently began an AT course parallel with their bachelor course in architecture because they had realized a gap in the educational system as to covering the more technical needs of the industry.

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So what gap was he talking about? – Obviously the gap that occurred, when the old crafts were gone and a lot of technical decisions moved from the craftsmen or master builders to the responsibility of the drawing office where there was no one with a formal education in such disciplines.

How to define AT

If the discipline of architecture, as so often claimed, is about creation of that extra spiritual and emotionally appealing appearance that distinguish it from the simple ordinary utility based building (Pevsner 1973), then AT could be seen as all that makes a piece of architecture a building – and not just a sculpture.

The taught discipline called architecture deal mainly with function and design - with the shaping of the building to make it meet functional and emotional requirements (Pevsner 1973). The taught discipline of architectural technology aims to cover all the rest required for fulfilling the formal area of the responsibility of the architect's office. The architect shapes the functional, architectonic space and the technologist disposes the technological space between the different architectonic spaces. It is about standard constructions, key junctions, columns, beams, slabs etc. and how to put those together (Crinson et al. 1994).

There are building engineers who are kinds of experts within different narrow calculation based dispositions but the only one educated to master **the coherent technical design of the building** is the Architectural Technologist (Hartmann-Petersen 2002).

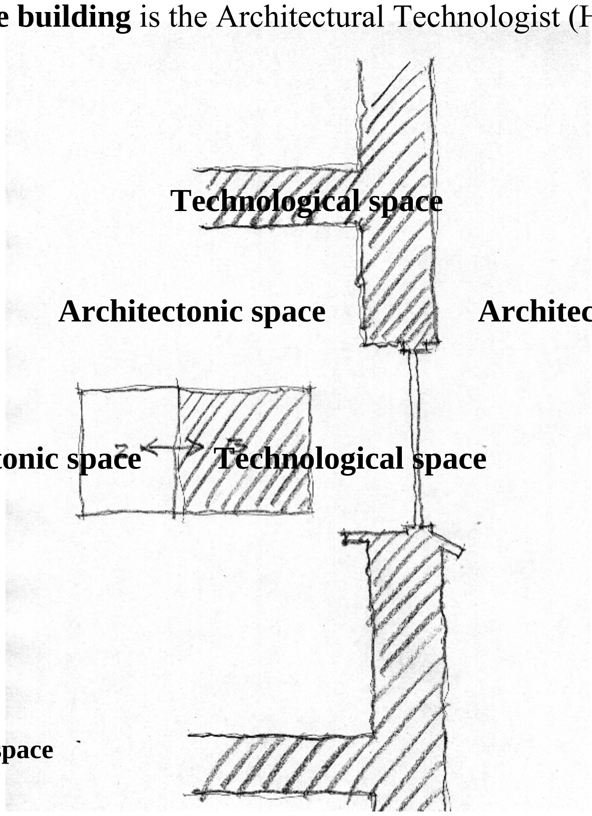

Figure 0-2: Two types of space

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Architects traditionally drew buildings emphasizing the contour lines that border the outdoor and indoor architectural spaces as it can be seen below. The space between these borders is empty and left to somebody else to fill in with the required technicalities.

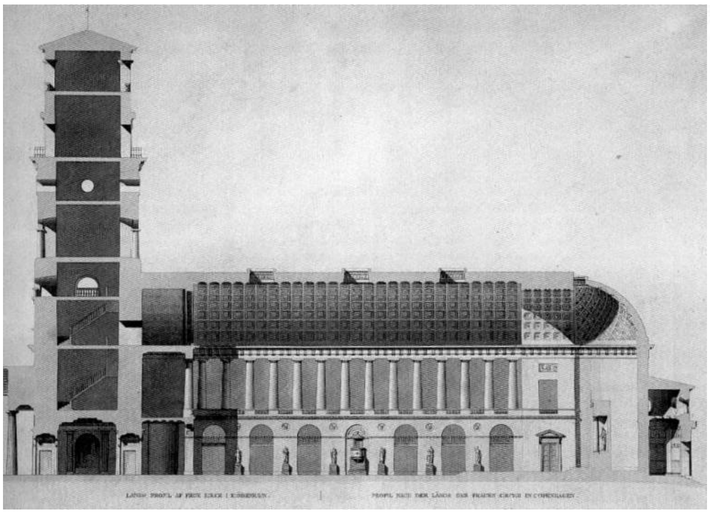

Figure 0-3: Architectural space before

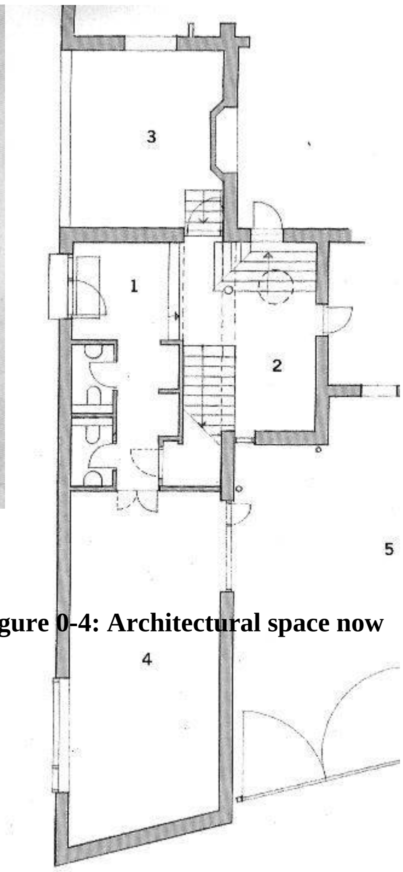

Figure 0-4: Architectural space now

This has not changed. Architects need to leave out the concern about the technological space in the first place in order to be able to concentrate on the shaping of the architectonic spaces, which comes first because they constitute the reason for making the building. The plan to the right shows a modern example.

Subsequently, we have a situation where the architects are no longer educated to do certain important parts of the work the drawing office is responsible for (Hougaard 2007).

Since there are different ways of learning, it has been possible for architects to achieve the skills of a technologist. These are those architects who have passed a period as unofficial apprentices in the drawing office and after a number of years have become pretty experienced technologists Hougaard 2007). For a long time, the industry got away with this but now official four year Architectural Technologist educations have started many places in Europe to fill the educational gap.

The technical requirements are still more demanding and getting still more complicated and thus they require still more education to provide a sufficient

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theoretical background instead of just an informal period as apprentice (Gideon 1967).

Concluding the definitions of architecture and architectural technology we could say that **"architecture is the discipline that shapes the architectural space** and that **architectural technology is the discipline that fills the technological space".**

Historical sustainability

The second term in this subtitle has become a modern buss word that covers almost everything that sustains a thing. There are a number of definitions available, for example the Bruntland Report that emphasise the rights and well being of the generations to come (Bruntland 1987). Here, I will narrow it down to what has proved to be sustainable within building seen from a historical perspective.

How sustainable is a red brick? If we see it in a historical perspective the answer must be that it depends on what kind of building it became a part of. The very same kind of material used in the walls of Pantheon in Rome has proved to be much more sustainable than so many other bricks that were used in buildings that just lasted a few years because they were used in relatively poor structures. We compare almost 2000 years plus a still continuing value with something that just lasted 20 – 30 years before it was broken down. The difference was the value of the structures – not the value of the materials.

What create such a value? We can notice two factors that constitute the value of a property. You can recognise them in the announcements of real estate agents. In almost all advertising the qualities of the building itself are mentioned together with the qualities of the environment. Within both groups of qualities we find both functional and aesthetic qualities praised. The highest square meter prises of buildings can be found where the environment is considered the best possible. Of course the valuable environment could be somewhere in nature with an "outstanding beauty" but it can also and more often be in an urban context of well recognised quality.

A conclusion on these considerations could be that **architectural and environmental qualities tends to be the key factors regarding sustainability in building seen from a historical perspective.**

History itself sustains a society and the main visualisation of history is provided by the building environments from the past and their architectonical monuments (Rasmussen 1964). Thus, each generation should feel responsible for leaving building environments of quality to the generations to come in order to tell about their part of history. Is that what we are doing? – Unfortunately, I doubt it! And that has to do with a noticeable unbalance in the roles in the building industry.

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For the first time in history we can notice a situation where old buildings that have been updated with technical installations etc. can have a higher value than brand new buildings. At the time being such old buildings almost always possess the qualities of the old handicrafts in contrary to the new more industrialised buildings. Maybe the old crafts are more appreciated than the new industrial products. Perhaps it is due to the properties belonging to the local environments the typical buildings are parts of.

Looking at a map of for example Copenhagen we can notice significant differences in the environmental contexts the different buildings belong to.

1. Old narrow town centre. 2. The new open area. 3. The one block building area.

Figure 0-5: Map of Copenhagen showing different structures

We notice at least three rather different structures with the old narrow urban spaces belonging to the structure of the property-parted blocks, the newer areas from the beginning of the twentieth century with the bigger blocks consisting of only one building and the newest areas where the buildings do not shape defined external urban spaces.

1. Old narrow centre 2. The new open area 3. The one block building

Figure 0-6: Three types of building structures

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Isn't it obvious that the environment in the first picture is the one where people would like to stay and that the other ones require that people are protected and move with a certain speed in means of transportation? – No one ever stays there, but we ignore that fact and continue to build that way. – Sustainability has a lot to do with how well the environment suit human beings (Barrett 2005).

The gap in the capability of the designing and planning offices and the needs of society

Why don't we learn from history and built in a human scale and stick to human needs for variation and activity? I suspect it has to do with the characteristics of the architectural education and the culture of the profession of architecture. Seen in a historic perspective architects were only asked to do the special outstanding buildings. All the rest were designed by the master builders, who had no art training but had a thorough education in how to do a building in the local area (Engelmark 1983).

Architects still consider themselves a kind of artists and aim to make themselves world famous. We all hope to be able to make a new Sidney Opera House and when we are not asked to do such a thing we try to do it anyway within the assignments we get. Whether the function of the building requires the outstanding appearance or not we try to make it outstanding to show what we are really capable of. – Resulting in the catastrophe of the new town areas (Kostof 1992).

We simply lack the awareness and interest in society's needs that would enable us to make the environments that reply to the requirements of society regarding urban spaces, functional diversity and human scaling. Instead we make monuments. We make everything outstanding, but it has nothing to stand out from because all the others do the same. This is the recipe of the new Ørestad in Copenhagen as it has been so many other places all over the world the last 75 years.

When do we stop this nonsense? Or, when does someone stop us?

Figure 0-7: How many Sidney Opera Houses do we need?

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Back to the historical role of AT – or continued chaos?

We have now briefly described the history of AT and of architecture and the resulting present situation. We have defined what the role of AT is today, namely to do the coherent technical design or fill in the technological space. And we have indicated that the quality of the practiced AT could be improved by more and better use of the available education. But, we have also recognized that the profession of architecture is not likely to give answer to the needs of society when it comes to ordinary peoples' buildings and the creation of the general town pattern (Gehl 1971). We have noticed that it was traditionally the master builders who did so but that architects in the beginning of last century took over most of the responsibility for the drawing documentation when the old crafts vanished (Frampton 1980).

The outstanding buildings are a relief from the pattern of ordinary buildings when few and serving public purposes.

The ordinary buildings express the ordinary functions of living and working purposes and obey general guidelines

Together the outstanding and the ordinary make a nice urban environment.

It doesn't have to be old fashioned to stick to these requirements.

Figure 0-8: The common and the outstanding in balance

We can conclude that society is lacking attention to "the coherent technical design of buildings", but also needs someone to do "the coherent design of urban environments" to bring these up to a reasonable standard (Kostof 1992).

Besides that, we need someone who will become an expert in designing the common ordinary building that very well must be neat and nicely designed but first and foremost shall obey the local outlines and support the order of the environment.

Who can enter these two available roles? I recon, that the architectural technologist could take the latter one, if we put some stress on that in the education. The first one might need a specialist – an urban designer who could perhaps be a technologist with a special training or an architect with the same special training. But it is important to give up the idea of first and foremost being a self promoting artist and instead to realize the importance of serving society well.

Niels Barrett
1 December 2008

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