

## **Industrial adjunct professors as a potential resource for developing engineering curricula - a pilot study**

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## **INTRODUCTION**

This paper presents the findings from a pilot study with the aim to investigate if adjunct professors can be used as a strategic resource when it comes to develop engineering curricula. The paper also investigates their balance of work and their preferences and possible intentions to change the balance to more education, i.e. development of engineering curricula, at bachelor and master level.

## **1 BACKGROUND**

### **1.1 Adjunct professors as a way to transfer knowledge**

During the last years many universities seem to have recognised mobility of personnel as a way to increase knowledge transfer between academia and the surrounding society. Some universities have developed strategies addressing how this kind of collaboration and cooperation could strengthen the university. One example is KTH in Stockholm, Sweden, which has set up a goal to double the number of adjunct professor in three years, from 2013 to 2016 [1]. Besides that, the number of industrial PhD students at KTH doubled between 2009 and 2012 [2], which is also a sign that the university emphasise cooperation with industry.

In an earlier study [3] of adjunct professors at KTH, the adjunct professors' ordinary employers stated three main reasons why these persons should spend a part of their work time at a university.

In short these reasons are:

- Increasing capacity: the collaboration gives the organization a stronger base for revivification and innovation through the academic network made available.
- Increasing competence: the collaboration helps the organization to keep and develop key employees and to get valuable connections with the future work force.

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- Increasing knowledge: the collaboration facilitates knowledge transfer that helps ongoing or future innovation projects.

The first and the third reason have obvious connections to the organisations own research and innovation, while the second reason has a more distinct connection to the education at the university.

Broström [4] studied organisations reasons for collaboration with universities, but the title of the article, “Firms’ Rationales for Interaction with Research Universities”, itself gives a clue that the focus is research rather than education.

However, the companies which employ engineers express difficulties on how to influence the engineering education curriculum [5]. Could the adjunct professor be the messenger or even be the bridge between academia and the society in developing engineering curriculum like in research and innovation?

Researchers seem to argue if mobility of personnel is an effective way of knowledge transfer or not, see for example Arvanitis et al [6], Bekkers & Bodas Freitas [7] and Edler et al [8] for a comprehensive literature overview. Knowledge transfer and mobility of personnel is often discussed in these articles from the universities’ point of view and with the assumption that knowledge is “produced” at the universities and has to be transferred out to the society, not the other way round. This study takes its standpoint that mobility of personnel in the form of adjunct professors is *one way* of enhancing knowledge transfer between academia and industry, in both directions.

## 1.2 The history of adjunct professors in Sweden

In a number of Swedish Government Official Reports in the 1950’s and 1960’ [9, 10] the Swedish Government stated that they anticipated a continued expansion of higher education in Sweden. But they also stated that this expansion would be very difficult to implement with the material resources and personal resources at hand. Pinpointing postgraduate education as a key for a successful expansion of higher education, about 75 companies and research institutes were surveyed in order to do an inventory of possible extra resources for postgraduate supervising outside academia. The survey results showed that suitable personal resources outside academia were available to a “considerable extent” and, if used, could allow an expansion of higher education in Sweden, at least in certain academic disciplines [11]. It was proposed that these external resources could be transformed into the academic system by experienced researchers outside academia who would be part-time employed by the universities. The competence requirements would be the same as for a full professor and the title, during the proposed limited assignment time, would be professor [12].

After a few bumps in the road, the Swedish government and parliament decided to introduce a new type of professor in Sweden – the adjunct professor. First, the adjunct professor was introduced in the mid 70’s on a try-out basis, and from 1983 on a regular basis. As a role model, Sweden took a close look at the system for adjunct professors in the Netherlands and copied parts of that system. In the Netherlands a fruitful cooperation between technical universities/polytechnics and industries with advanced research had been developed. One vital part of this cooperation was that experienced researchers from industry spent a part of their time at a university, mainly working with postgraduate supervision [11].

## 1.3 The role and function of adjunct professors in Sweden today

Right from the start in the mid 70’s, the areas of medicine & health and engineering science have been dominating the numbers of adjunct professors [11].

Through inventories made in 2011 and 2013 [13, 14], the conclusion is that there are approximately 1 100 persons affiliated (adjunct lecturers, adjunct associate professors & adjunct professors) at universities in Sweden. Of those, nearly 300 are adjunct professor in the area of natural & engineering science, see Fig. 1.

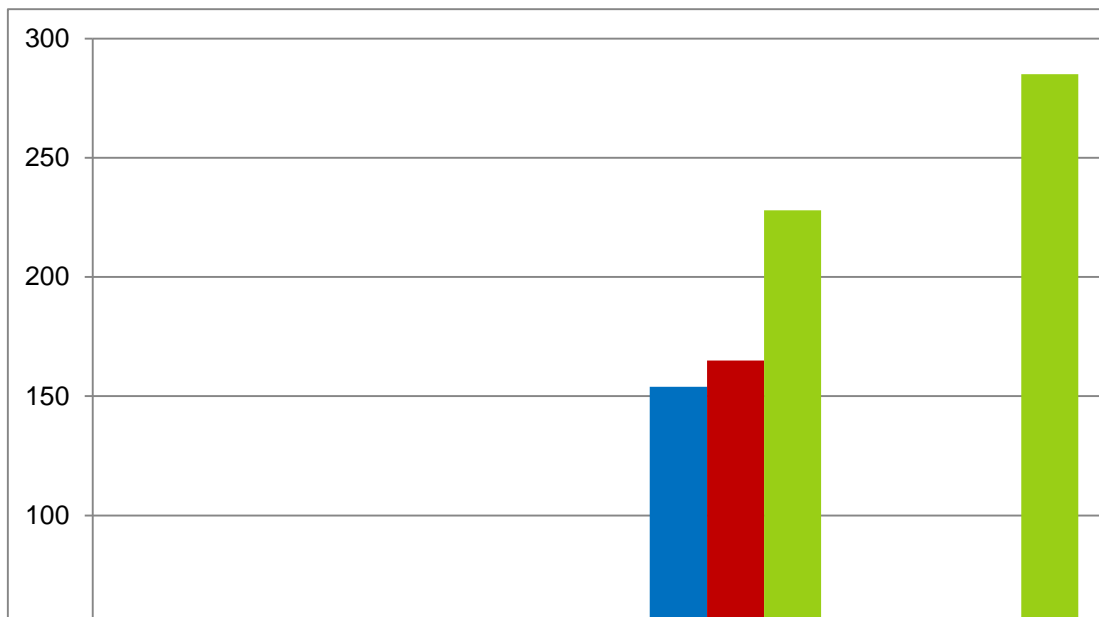


Fig.1. The numbers of affiliated persons at Swedish universities per type of appointment and areas of science [13]

An adjunct professor is appointed and employed by the university for a limited period of time, not exceeding twelve years [15]. As mentioned above from the proposals in the early 70's, the competence requirements are the same as for a full professor and the title, during the limited assignment time, is adjunct professor.

Normally the university does not pay any salary to the adjunct professor, the ordinary employer continues to pay the person full salary. Essentially that is how the function of adjunct professor is financed. Nevertheless the university must offer some fundamental supply though, like for example a room, ICT service, PhD students, a course to run and so forth.

The time spent at the universities differs for adjunct professors, but it's usually between 20 to 50 percent, typically 20 percent, i.e. one day a week. With that in mind, an adjunct professor appointed for a period of three years would contribute to the university's resources with 0,6 man-year during that time frame.

There seems to be no recent study on how adjunct professors in Sweden spend their time at their university. The original main purpose – to strengthen the postgraduate education – seems to have drifted away a bit already during the try-out time in the mid 70's [11]. A search in policy documents at Swedish universities [e.g. 16, 17] on how they appoint adjunct professors give no detailed clues on what they actually will work with during their time at the university. A general way to phrase it, is that the adjunct professor should have a competence "of importance" for the university. In some cases you can find phrases on what the adjunct professor is expected to bring into the university, mainly new ideas and valuable contacts with the society outside academia.

The expectations on adjunct professors from stakeholders, i.e. the ordinary employer and the university, seem to be virgin land in terms of research and/or policy documents. But in order to formulate valid expectations you have to have some kind of idea of the current situation. This study will hopefully shed some light in this respect.

## 2 PILOT STUDY

This is a pilot study for the analysis of data with the purpose to form the model for analysis of 30 interviews made during winter and spring 2014 at two universities in Sweden. With that said, the text below describes the method that was chosen for sampling and collecting data for the whole study.

## 2.1 Purpose and aim of the study

The purpose of the study is to investigate how adjunct professors can be used as a potential strategic resource for developing the engineering curricula in cooperation with industry. The study also highlights the individual perspective such as the balance of work for adjunct professors and their preferences and possible intentions to change the balance to more education, i.e. development of engineering curricula, at bachelor and master level. Having said that, the interest and the intention of stakeholders at hand, i.e. the ordinary employer and the university is of interest for the study. The main research questions to be answered are:

- How do external stakeholders on the one hand and universities on the other hand see adjunct professors as possible change agents in developing engineering curricula?
- What role in developing engineering curricula do adjunct professors have today?

## 2.2 Method

The study started with an overview of relevant literature within this field of research. The aim of the literature search was as much to prepare for the data collection as to prepare and facilitate the analysis of the collected data. As the purpose and aim of the study was to describe a phenomenon out of a group of peoples own experience, the study has a phenomenological standpoint [18]. We want to understand social phenomena from the view of those concerned with the phenomenon and describe the world as they see it. By using a phenomenological method we will have good chance to understand and describe the situation of the adjunct professors.

The sample for the study was made in two steps. First, we wanted to be able to compare and, if possible, find mutual connection with the role of adjunct professors at different universities. Therefore we chose two universities for the study. Second, we selected adjunct professors at the chosen universities to interview. Furthermore, as an extra factor in the choice of data sample, the companies and organizations where the adjunct professors have their main employment is of interest to interview.

To conclude, the data sample is split in three parts; the adjunct professors, their ordinary employer (represented by a person in a managing position) and the university where the person has been appointed as an adjunct professor (represented by a person in a managing position).

The choice of universities in the study was made by a purposeful sample [19]. The last few years KTH in Stockholm has upgraded its collaboration with the surrounding community and the "function" adjunct professors is an important part of this strategy. KTH could arguably be described as best practice in Sweden for this kind of collaboration.

Mälardalen University (MdH) would like to be renowned as a university who thrives through close cooperation with the surrounding community. As a relatively small, but growing, university they use part-time employments, for example in cooperation with companies, as a way to build and expand their research and education.

As a bonus, there are companies collaborating with both KTH and MdH, which makes it even more interesting to pick these two universities for this study. Persons involved in these collaborations are included in the study.

For the interviews, the sample of adjunct professors was made by a combination of purposeful and snowball sampling [19]. Some of the interviewed adjunct professors were selected because their ordinary employers have deeper collaborations with KTH and/or MdH, i.e. a purposeful sample. Others have been chosen through recommendations as being "good informants" during earlier interviews, i.e. a combination of purposeful and snowball sample.

The choice of adjunct professors for the interviews paved the way for the choice of persons at the employing companies and the two universities to interview. All informants in the study can be said to be leading persons within their respective field and function, hence the interviews must be considered as elite interviews [18]. It also justifies the initial literature review of both research and policy documents as a way to build the preunderstanding necessary for elite interviews.

The data collection was made through semi-structured elite interviews [18, 19]. Themes in the interviews were for example:

- expectations from the stakeholders on the adjunct professor

- expectation from the adjunct professor himself
- the actual work load situation for the adjunct professor
- the interest or intention to work with developing engineering curriculum.

All in all 21 interviews has been carried out at KTH (and associated companies) and around 10 interviews are planned to be carried out at MdH. 18 of the interviews were made face-to-face and three were telephone interviews. All but one were recorded and all have been transcribed. The time for the interviews varied between 15-55 minutes.

To this point three interviews have been analysed with respect to its content. The main purpose of this pilot analysis is to find and form a model for further analysis. The content analysis aims to find a meaning and a pattern in what has been said in the interviews [20], rather than a focus on the language. For the pilot analysis a manual topic coding was used [19].

### 3 RESULT FROM THE PILOT STUDY

As mentioned above this is the result of a pilot analysis of three of the interviews in the study. The three interviews which are analysed are linked together, see Fig. 2.

- One adjunct professor at KTH is interviewed,
- The adjunct professors' ordinary employer is interviewed (through a vice president at the company),
- One person at top management level at one of ten schools at KTH is also interviewed. The person at the university has a special assignment with respect to the cooperation with the above mentioned company.



Fig. 2. The links between the three interviews.

This sets the stage for a triangulation, where the relations between the three interviews should be exposed.

All citations that follow are translations made by the authors from the transcribed interviews. In the following text the person representing the university will be called "the university" and the person representing the company will be called "the company".

#### 3.1 The adjunct professor as a strategic resource in education

In what way can a company collaborate on education at the bachelor and master level? Lars Bengtsson has recently made a research overview of collaboration in education [21]. And the answer to the question is of course in many ways, depending on the purpose of the collaboration. Bengtsson cites Brandt et al [22] and lists three main purposes for collaboration in education:

- Collaboration with the purpose to create or develop educations,
- Collaboration with the purpose to be a part in the teaching and learning process of the educations,

- Collaboration with the purpose to ease the students' transfer from the education to the working life.

For this study the first of these purposes is in focus and the interviews have been analysed with these three categories at hand, albeit the question asked about this in the interviews did not reveal this set of specific categories.

The adjunct professor is involved in supervising master thesis and as a part-time teacher in a course. But he wants to be even more involved in the education, interpreted as being involved in the teaching and learning process. And he has been more involved in the past. But he does not express anything about being involved in the development of curricula for the educations. He does however express a concern about the insufficient time at hand.

For the company in this study the answer is clear – they want to do it all. It wants to be close to the education and the students, and it thinks that the adjunct professor is one of many ways to fulfil that. And even if the company does not seem to have a clear road map on how to influence the curriculum of engineering education, it expresses an insightful connection between research and education.

*We know very well that excellent education requires excellent research and excellent teachers. (The company)*

With that said, the company also realises that one way to influence education is to influence research. And that, the company has a more pronounced plan for. With an own Technology Road Map written down the company can approach the university with prospects of cooperation on its own terms, and in the long run it hopes to have an influence on the research at the university.

On the other hand, the university hesitates when asked about if adjunct professors could be a resource for developing engineering education curriculum. At last, there is an answer, but it does not reveal any thoughts of the adjunct professor as a strategic resource for developing curriculum. But at least, the university is very clear that adjunct professors are strategically important for the school.

There is no decisive conclusion on this question other than that the university does not see adjunct professors as a strategic resource for developing engineering curriculum. The company would very much like to influence the education and sees the adjunct professor as one way if doing it, but perhaps more through the influence of the research at the university than the education itself.

### 3.2 Do expectations ever meet?

One interesting theme in the three interviews is expectations. Expectations from the university on how it wants the adjunct professor to contribute. Expectations from the company on what it wants the adjunct professor to bring back from the university. And last but not least, the expectations from the adjunct professor. As mentioned above the focus on what the adjunct professor is supposed to work with at the university drifted away from the initial plans already at the time for the try-out period in the mid 70's. How is it today? Has the drift continued and can it be called an academic drift in more or less the same way that Harwood [23] and Christensen & Erno-Kjølhed [24] describe it?

A quick answer to the latter is no, at least it can't be seen in this pilot analysis. The university sees the adjunct professor as a good way to bring in new influences, new experiences, new networks, a resource and support for the postgraduate students and even as a teacher at the bachelor and master level. A little bit of everything with no "grand plan" essentially which is very much confirmed by the following:

*There was no specific mission, but I rather think that I was supposed to understand what to do. Supervising master thesis, supervising postgraduate students, come up with some ideas, join a few projects, well, like – a little bit of this and a little bit of that. (Adjunct professor)*

The company is very good at expressing what it wants from the collaboration projects with the university, but a bit surprisingly, it can not specify the role for the adjunct professor in this plan. Again the adjunct professor has an interesting comment on that:

*Well, I was the first adjunct professor at the company, and I don't think that they actually had that many ideas about what I was supposed to do. I think they thought it would be interesting with a professor and "well, he's good and like, let him do this (adjunct thing), that is probably good (for the company)". ... Then I think it has grown, they have started to realise the value. (Adjunct professor)*

At last, what kind of expectations did the adjunct professor have when he became appointed as an adjunct professor?

*Actually I had two things. I felt that one mission (from the company) was to increase the interactions (with the university). Hook up with good student, facilitate master thesis and so on, I felt that clearly. I think that's a clear mission with the adjunct function. Then, more personally, I really wanted to get more time to think, to think on a longer term. For me, honestly, this is a breathing space. (Adjunct professor)*

Can these expectations ever meet? Perhaps they already are met? The university gets a person who can contribute with a little of everything depending on a combination of what is needed at the moment and the competence and capacity of the adjunct professor. The company gets a deepened collaboration with the university and hopefully along the way, a closer relation to their future work force, the engineers. And the adjunct professor seems, at least in this case, to be able to manage all this. As a token he gets a breathing space, and perhaps even a competence and confidence boost. The real challenge for the adjunct professor seems to be how he can juggle with his time to squeeze even more out of his time limited assignment.

Can an adjunct professor have a role in developing engineering education curriculum? Yes probably, but some things must be twisted in order to fulfil that. And one important thing that would start such a development is that the university can see a role for the adjunct professor for this. Today the adjunct professor has a different role and the university does not necessarily see the point in engaging the adjunct professor in yet another project.

#### 4 SUMMARY AND ACKNOWLEDGMENTS

We conclude that this pilot study came up with some interesting results and that the method for collecting data and for analysis seems to be valid. A further analysis on the rest of the interviews would probably give a more multi faced view of the phenomenon of adjunct professors.

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