# Knowledge Compromise(d)? Ways and values of coproduction in academia

Fischer, Josefine

2015

*Document Version:*
Publisher's PDF, also known as Version of record

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DEPARTMENT OF BUSINESS ADMINISTRATION | LUND UNIVERSITY 2015

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LUND
UNIVERSITY

DOCTORAL DISSERTATION
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Lund University, Sweden.

To be defended at Pufendorfinstitutet.
November 20, 2015, at 10.00.

*Faculty opponent*

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| Organization<br>LUND UNIVERSITY | Document name |
|---|---|
| | Date of issue 30-10-2015 |
| Author(s)<br>Josefine Fischer | Sponsoring organization |

Title and subtitle
Knowledge Compromise(d)?- Ways and values of coproduction in academia



Abstract

This thesis deals with the colonisation of the university by market forces. The object of inquiry is coproduction of academic knowledge between academic and non-academic actors in newly established universities and university colleges in Sweden. The development of knowledge as a main competitive advantage for commercial companies, and the shift in policies accompanying this development, provides an explanation for the introduction of market mechanisms into the governance of university research. The main contribution of the thesis, however, is the analyses of three coproducing research centres – in service research, engineering and collaborative media – on the basis of epistemology, interpreted as different knowledge cultures. In most policy accounts knowledge is treated as homogeneous, which is problematic as it conceals differences in academic disciplines' relations to the object or phenomenon of inquiry. Such differences have bearing on publication patterns, prospects of generating academic credibility and possibilities to engage external partners in coproduction relationships. Importantly, this has an impact on the prospects of attracting various sources of funding that are of significance for newly established universities and university colleges with fewer fixed resources than the old universities. It is argued that not only are we witnessing a colonisation of the entire university by market forces, but also a colonisation of social science and humanities by science - scientific perspectives and work ways and the technical knowledge interest.



| Key words epistemology, knowledge interest, research policy, coproduction, university college | | |
|---|---|---|
| Classification system and/or index terms (if any) | | |
| Supplementary bibliographical information | | Language English |
| ISSN and key title | | ISBN<br>978-91-7623-542-3 |
| Recipient's notes | Number of pages<br>236 | Price |
| | Security classification | |




Signature  Date 15-10-2015

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ISBN 978-91-7623-542-3 (print)
978-91-7623-543-0 (pdf)

Printed in Sweden by Media-Tryck, Lund University, Lund 2015




# Contents

# Acknowledgements

First of all I would like to thank my supervisors, Professor Mats Benner for giving me plenty of freedom to develop my own thoughts, and Professor emeritus Håkan Hydén who has encouraged me to develop my critical thinking and offered a lot of support and ideas. I would like to thank Professor Emeritus Aant Elzinga for valuable comments on my final seminar, and Marcus Persson for valuable comments on my middle seminar. I would also like to thank all the interviewees for taking the time and doing their best to answer my not always clear and straight questions. Gunnar Widforss at Mälardalen University College deserves a special thank you for his engagement and assistance during my visits there. The Knowledge Foundation has funded three years of my work – thank you for that. Malin Henningsson at the KKS has been a great help in providing me information about the cases. I would also like to thank the former Research Policy Institute at the University of Lund, and its staff – we had a really good environment during my first year as a Phd student. Devrim, Mirjami, Emelie, Beatrice. Thank you also Matthias Baier and the department of Sociology of Law at the University of Lund for generously having me as a guest researcher for the most part of my PhD education. To all its staff, thank you for sustaining the academic culture I love, and for contributing to such a nurturing enviro ent. Ida Nafstad, Isabel Schultz and Per Wickenberg have either read pieces of my work, contributed with extensive support and help, or both. Peter, Karl, Julija, Hildur, Martin, Nicolas, Zara, you're the best! Other people and places, in no special order: Anna and the feminist academic guerrilla, Annika Hultgren, Studio Frid, Chez Madame, Raja Yoga, Isse, Tanja, Miguel, Ida, Øystein. Last but not least, Anette Fischer – for always taking time to listen and come with intelligent input to my confused thoughts.

# 1. Introduction
# Outlining the field of tension

The university is a place and a system in which knowledge is made; academic knowledge. Academic knowledge can be metaphysical and unworldly; knowledge existing only for the joy of she who knows. It can also be anchored in society; utility-oriented, as knowledge that exists as a means to an end, or for an external purpose. The university is one place in which knowledge is made. It has been the source of different kinds of knowledge, pertaining to different interests, existing side by side or in conflict, for a few hundred years. That which we think of as science has become the dominant configuration of the university but it began rather recently. With the growth of modern science an economic appeal for knowledge entered the university, in a more pronounced sense than before. The so-called *knowledge society*, originating in the 1970s, further increases this tendency. It can be argued that market forces gradually begin to colonise the university at this time, accompanied by shifts in research policies (Mirowski 2011; Slaughter & Leslie 1997; Hasselberg 2012).

This thesis deals specifically with knowledge that is coproduced by researchers and external organisations. Mostly the external organisations are private companies, but there are some exceptions such as public sector and non-profit organisations. This is a study of three research centres that are located in newly established university colleges (högskolor) and universities in Sweden. One centre is focussed on design and human sciences, one is a social science centre and one is a technology/engineering research centre. All of the centres have strong ties to one particular research funding agency, the Knowledge Foundation, and its specific policy of coproduction.

The fact that the cases I look at, Medea, CTF and ES, are located in newly established universities and university colleges is important. Several new colleges were established in Sweden from the 1970s onward, primarily for the purpose of providing education in nursing, teaching and engineering,

while at the same time sustaining the connection between research and education. This connection has been embraced by Swedish higher education policy since 1977 and is currently enshrined in the Higher Education Act as 'all post secondary education is to rest on scientific ground' (ukä.se). In order to sustain this connection it was not enough for the new colleges to provide education, they also had to engage in research like the traditional universities did. So the newly established university colleges became academic *actants*[1], just like the old universities. They did not, however, get the same amount of fixed resources, but were forced to find other ways to finance their research activities. The colleges were also established for another purpose, that of breathing life into declining regions. Transferring academic knowledge from the university college to the surrounding trade and industry is – according to the belief in the *knowledge society* - thought to be a vitamin injection of sorts. Hence, the newly established university colleges had to collaborate with companies in their proximity. The research activities of the colleges were established with two missions; to contribute academic knowledge to academia and to contribute economically useful knowledge to the surrounding society. As such they incorporate a potential field of tension which will be explored herein.

Coproduction is a central concept in this thesis. It is the name of a specific policy measure, to which the research centres are subjected. Coproduction is also an analytical concept dealing with the mutual making of knowledge and social order (Jasanoff 2004). The two meanings of the concept are not to be confused; the first is just a policy named by a funding agency while the latter is an analytical concept elaborated in order to understand effects of society, through policy, on knowledge and the effects of knowledge on society, through policy.

Coproduction in the sense of a policy, however, means that commercial companies provide 50 % co-funding for research projects and expect to benefit in return corresponding to the money invested. In research projects based on coproduction the researcher's agenda and the company's agenda are expected to form the research question together, and the results should be valuable output for the company and high quality publications for the

[1] i.e. actor, concept is elaborated in chapter 6.

researcher. In the ideal sense, that is. In reality the process is frequently far from ideal, in that there may be conflicts of interest between researchers and companies.

A question within Science and Technology Studies (STS) and research policy studies is how society affects knowledge and how knowledge affects society (the coproduction of knowledge and social order). For analytical purposes it is convenient to define 'society' as anything that is not university, but at the same time the university is clearly a part of society. Likewise it is convenient to distinguish knowledge from the world as we experience it, whilst in reality we experience the world from what we know. The point is, however, to look at how these pieces affect each other. This assertion requires some theoretical elaboration. A way of understanding academic knowledge is to look at the production of the knowledge, i.e. the activity we denominate research. Academic knowledge is socially constructed in the sense that it is made by someone, a researcher, who is ultimately a social being. Another way of analysing academic knowledge is by looking at the context in which it is made. Academic knowledge is material in the sense that it requires materials – money, laboratories, libraries – to come into being. Academic knowledge can thus be said to be both making and context. The social influence on knowledge is channelled through research policy, thought of as an interface between society and knowledge (Guston 2000).

What I empirically investigate is knowledge as output, the end product, which is being put to use either by an external actant or by being communicated to the wider academic community. This output is affected by the material and cognitive context in which it is made, and as output it will affect various aspects of the world as we know it. When knowledge is made in coproduction between academic and non-academic actants, the knowledge output will pertain to either the *internal* academic system or the system *external* to academia. Internal output, the way I choose to interpret it, is the rather disinterested search for new insights that can contribute to the total stock of knowledge available within the academic community. Internally, academic knowledge production is *publications*; communication of results to other knowledge makers, researchers. It potentially increases humanity's understanding of social as well as natural phenomena. It is disinterested in the sense that no external actant directly influences that knowledge with its own interests. It does not, however, mean that the researcher is disinterested; everyone has his or her interests. Externally,

academic knowledge is to contribute to something that lies outside of the disinterested search for new insights. External organisations, governmental authorities, companies and NGOs use knowledge from academia in different ways. In coproduced projects they define the value of that knowledge. By doing so they leave their mark on the knowledge as academic knowledge *output* cannot be separated from the process of making academic knowledge, and the making of academic knowledge cannot be separated from the context in which it is made - its materiality - other than for analytical purposes. The materiality of knowledge making includes these external organisations as they bring their agency to the knowledge making process. At the same time, the output constitutes the world; what we know about the world is how we are able to experience the world.

Hence, I see knowledge as output that pertains to both the academic and the external system. Let me give an example to clarify. A research project is constructed with three researchers and one company. The company expects to gain better understanding of their business model. This is the external output. The researchers expect to finish a PhD, write approximately three articles and participate in two conferences. These are the internal outputs. Depending on the discipline the researchers are working in, what methodological approach they employ and their knowledge interests, the output will differ. And depending on what expectations the company have and how they are willing, and able, to contribute, the knowledge output will also differ. Ultimately, exploring this is the theme of the thesis at hand.

# Aim and research questions

Coproduction as a research policy instrument is part of a much more encompassing development that has taken place from the 1970s onward. It entails a shift from self-governance to external steering (Elzinga 1997), bringing with it increased emphasis on evaluations, bibliometric surveys of impact (Nelhans 2013), and an increased focus on the commercial potential of research results (Mirowski & Sent 2002; Mirowski 2011; Hellström & Jacob 2005; Hellström 2004). This shift in policy is part of the surge of marketization of social and political relations (neoliberalism), and it can be argued that it entails a colonization of the university by market forces by means of government policies. The aim of this thesis is to explore how this

change plays out in the making of academic knowledge, on the form and content of knowledge output, and how this output integrate with the wider social context in which it is made. The policy and practice of coproduction in the three cases presented will provide a lens through which the marketization tendencies can be studied at close range.

A related aim of the thesis is to contribute theoretically to the broader field of coproduction of knowledge between academic and non-academic actants.

A first assumption is that academic knowledge output – the object of inquiry here – is evolving from the interplay between knowledge making and the context in which this making takes place. In order to shed light on this I disentangle the constituent parts of the interplay: the context, the new universities and university colleges, the research centres that constitute the cases in this study and the industrial environments – the companies and other organisations with which knowledge is coproduced. First question, thus:

- How do different contextual settings shape coproduction practices?

Secondly, I seek to identify different academic knowledge cultures. Academic knowledge is heterogeneous (Walsh 2013), with significant differences between disciplines, methodological perspectives, uses of theory etc. These differences can be conceptualised as differences in academic knowledge cultures, or the related concepts of knowledge interests. Second question, thus:

- How are knowledge cultures constituted in the three cases?

The third question deals with the interactions and tensions between internal and external values of academic knowledge in a more direct sense. In the idealised picture of coproduction, two agendas cooperate to find research questions that can result in outputs that are of value to both systems – for academic validation (credibility) and for market based outcomes (new products, services etc.). This picture is problematized here, and instead the

intricate interplay between the academic and the market systems is elucidated, the question is thus:

- How are internal and external outputs articulated within the three cases:
- As connected to different knowledge cultures?
- As linked to different contextual settings?

I rely for this task on a quite comprehensive empirical material, gathered from the three research centres in newly established university colleges that I investigate. The main part is made up of interviews with researchers and company personnel, but I also rely on written materials, and observations.

## Some thoughts about the field

The academic knowledge society, as well as academic knowledge *and* society, has been the subject of several inquiries. Not only in STS but in related fields as well (Sociology of Scientific Knowledge; Research Policy, see Hallberg (1997) for a comprehensive review of all the fields dealing with academic knowledge).

The main contribution of this study to the already well-scrutinized field is its thorough empirical material. It is a case study that takes into consideration not only policy but the actual doings of researchers, the process of making knowledge and the context in which this process takes place. Another contribution lies in its focus on epistemology. Even though policy is an important component in the study of academic knowledge, and I devote considerable focus to it, the real challenge, the way I see it, is to see how recent trends affect epistemology, that is, the conditions and sources of knowledge, as well as its structure and limits.

It can roughly be said that I relate myself to two types of studies. First the classic laboratory studies that see knowledge making as practice (cf. Knorr Cetina 1999; Latour & Woolgar 1986). These are important in that they point to the fact that knowledge is made *by someone*. Secondly I relate

myself to studies that look at the material conditions of knowledge production. Policy is one such condition, and one which is heavily scrutinised in the STS field. The epistemological parts are primarily developed relying on Whitley (1984) and Habermas (1967/1988; 1968/1971).

Philip Walsh, in an article from 2013, elaborates on theoretical contributions to the theme of knowledge and society. According to Walsh there is a disparity between perspectives that see how knowledge is affected by the social subject and how society is affected by knowledge. I draw a lot of inspiration from Walsh's perspectives, trying to see how society might, potentially, be affected by the knowledge it produces, and how certain types of knowledge are subsidized on a social level.

A number of doctoral theses are relevant to consider here. Karin Håkansta (2014) studied the academic field of working life research and how this field has changed according to different political views and policy doctrines. What makes her dissertation interesting is that she is able to see how also the so-called policy relevant science is fragile and subjected to policies and political views that may be inconsistent. To engage in politically fashionable research can be a risky business. This is relevant for my thesis as all the cases rely on external purposes, affected by various social policies. Schilling (2005) in his dissertation traces empirically the concept of modes of knowledge by Gibbons et al. The text relates to research policy rather than research as such and the policy developments in Sweden are analysed and compared to other countries. The thesis concludes that the concept of mode 2[2] alone is not sufficient for understanding the policy development in Sweden; it must be combined with other concepts. Schilling proposes the concept of a two-track system to be used in addition to the changing mode of knowledge production. Nelhans' dissertation from 2013 deals with citations and traces the development of citations as an indicator of the intrinsic values of science through three stages. Holmberg's (2012) thesis on the Knowledge Foundation is naturally of great significance for my own work, and I rely on it to a large extent for the analysis of the Foundation. Fridholm (2010) explores in his thesis basic social conditions for high

2 The concept is further elaborated in chapter 5.

quality research in Sweden. The thesis investigates researchers in industry related settings and explores possible tensions that may arise in academia as a result of increased marketization.

What distinguishes my own study from other writings in the same area is the specific focus on coproduction. Through this quite specific policy measurement there is opportunity to investigate the actual making of knowledge in the area between two quite distinct kinds of actants. The research centres I have looked at are not traditionally academic, neither are they consultants working only for trade and industry. What makes them stand out are the facts that they are supposed to be both real academics and of use to trade and industry, and that they are not really a synthesis of the purposes but rather a combination of two quite distinct value systems. Furthermore, I apply a distinct focus on epistemology, a perspective that is not common in policy related research. What distinguishes my work is also the focus on theoretical development. I have not attempted to make an instrumental study of three research centres but I use the centres as examples from which theoretical conjectures can be drawn.

## Outline

Immediately after this introduction is a methodological chapter (chapter 2) in which some philosophical concerns are elaborated and the collection of empirical material is described. After this, the thesis starts out with a historical exposé of the university system in general and the Swedish system in particular (chapter 3). The aim of this chapter is to present the university as an institution for the creation of knowledge and to point to the relationship between the university and its surrounding society in different times, seen through the main users of academic knowledge. The intention is to remind the reader of the historical roots of the university and point to its traditional role as a site for the critique of dominant ideologies in society. By making visible the history it becomes easier to see that the current situation is not to be taken for granted as a natural state. This chapter leads up to a chapter about the new universities and university colleges in Sweden (chapter 4). The establishment of the university colleges and universities are described from a policy perspective, focussing their role in the landscape of knowledge production. The knowledge society thesis is elaborated here, as a

background to expansion of the university system. in relation to this, consequences for the organisation of the making of academic knowledge are elaborated and some general perspectives on the shift in policy are presented. Chapter 5 is about funding models in Sweden. it also includes brief descriptions of funding agencies of importance for the centres in this study, and a rather thorough account of the Knowledge Foundation. The aim here is to place the Knowledge Foundation in a societal, economic and political context and to provide some explanation of its conflicting missions. The purpose of chapter 3, 4 and 5 is to provide a setting for the theory chapter, in which the developments described are scrutinized from a more abstract angle. The chapters combine descriptive pieces with more theoretical accounts of policy developments and their consequences for the making of academic knowledge. The theory chapter (chapter 6) is divided into two parts: general reflections on theoretical perspectives that constitute the basic understanding of knowledge as making and context. And theoretical perspectives on the distinction between different knowledge cultures. The theory chapter concludes with an analytical framework based on the Habermasian knowledge interest and the theories of Whitley (1984). Chapter 1-6 constitute the first part of the thesis. The second part, chapter 6-11, is devoted to the presentation and analysis of the empirical material. In chapter 7 the three research centres that constitute the cases of this study are presented in detail, together with the description of the establishment of their hosting colleges. In chapter 8 the cases are presented as academic actants in a real world and their strategies to cope with this world are scrutinised. Furthermore, the industrial environments of the cases are described, focusing on companies and other external organisations and their characteristics. The next chapter, 'Three centres – three academic knowledge cultures' provides an analysis of the knowledge cultures the researchers work within. Chapter 10, 'Knowledge as output – making two values in one project' serves to analytically connect the two values – internal and external outputs – to different knowledge cultures. Chapter 10 also provides an analysis of the research centres and their coproduction relationships based on epistemological issues - as presented in the analytical framework of chapter 6. Chapter 11 provides a conclusion and a discussion about the overall theme and question of the thesis, the colonisation of the university by market forces.

# 2. Methods

I believe that there is a subversive potential in academic research, and this potential deserves to be set free. The university, like the art sphere, is a place in which currently existing ideologies in society can be subjected to critique. In contrast to the coproduction research projects, which are the object of investigation in this study, I have the opportunity to be utterly critical. However, while the thesis is written with a critical perspective, it also, to some extent, betrays the ideological conviction of the author. Therefore, I take the opportunity here to declare my position. I have had two things in the back of my head while working on this project. The first is a general critique of the dominance of technical knowledge, in research and innovation policies and in discussions about economic (and social) development. The second thing is a feeling of unease with the dominant paradigm of economic growth. This can be seen as an ideology, although one so widespread as to be hardly visible, that also penetrates all political directives, policies and measures taken to promote the production of pure research. There are two parts to the growth critique. First, the obvious absurdity in actually believing that endless growth is possible in a world of limited resources (cf. Daly 1974; Naess 2006; Alvarez Lozano 2012). Secondly, the growth ideology is connected to a way of seeing profit-making as the ultimate reason for companies to exist. Generating profits for external shareholders seems more accurately to be the goal rather than the actual manufacturing of goods or providing of services fulfilling a customer demand. Policies aim, almost by routine, to maximise economic growth. It is considered an unquestionable good by which any measure can be motivated. Lately, critique has been raised against this and awareness about the issue has increased (cf. Berg & Hukkinen 2011), but in the areas of research (and innovation) things seem to remain the same. Furthermore, a number of academic knowledge making ideals are favoured here. These will be elaborated in the next section.

The primary method of inquiry is interviews with researchers active at the three centres of this study; the design and humanities centre Medea, the social science centre CTF/Samot and the engineering centre Embedded Systems. Interviews have also been conducted with three representatives from companies that collaborate with the technology centre. Other methods, observations and analysis of printed and web materials, have complemented the interviews, and contributed to the extension of the analysis into the wider context of the cases. The phenomenon of inquiry is coproduction, leading to a potential field of tension between conflicting missions and meanings of academic knowledge production, on the epistemic level.

In order to shed light on the phenomenon I make quite thorough examinations of the systems of knowledge production, policy wise and idea wise. These examinations are mainly based on external sources, academic publications as well as other written material.

# Starting out

The present study emanates from a research centre initiated by the Knowledge Foundation (KKS)[3] with the purpose of contributing to a fuller understanding of coproduction. The centre consisted of Mats Benner along with researchers from Linnaeus University, Umeå University and Blekinge Institute of Technology. It was my task to complete a PhD education within the centre, and the topic was defined beforehand, in quite a broad sense, as coproduction. The area of study was the newly founded universities and university colleges that constitute the target group for the KKS.

I undertook the mission according to the academic norms I had incorporated during what I consider my epistemological training: two ground level courses in gender studies. The entire field of gender studies is largely about questioning what is taken for granted, in this case science and the way science is done. Much critique has been targeted at the white, male, middle aged, middle class, and allegedly objective producer of knowledge. The bias

[3] Centre for Knowledge Governance Studies

of the taken-for-granted objective researcher has been illuminated, and space has been provided for other perspectives than the mainstream one. Within this approach it is important to also be aware of your one's biases, as far as possible, and to acknowledge the prerequisites that govern one's own knowledge production. Also, in order not to be too determined by your own previous understanding one has to start looking at the field of inquiry without too much initial information about it. A quote from Pierre Bourdieu captures this methodological attitude quite well:

> [W]hen we act without entirely knowing what we are doing, we make it possible to discover in what we have done something of which we were previously unaware. (Bordieu 1984/1988:7)

If one knows right from the start what you are looking for, there is no chance you will find that which you did not know that you did not know. I think this is beautiful and it is an ideal I want to honour. Hence, I started out just throwing myself into the field, enthusiastically scheduling meetings with researchers trying to make them speak freely about their work, about collaboration, funding, publications and so on. This resulted in a great deal of confusion, but luckily also in some fundamental insights about knowledge making in coproduction. As an example, it was not obvious to me that there are such big differences between different academic knowledge cultures and that this is influencing the coproduction relationship to such an extent. In most research policy writings, knowledge is referred to without further comment about its internal constituents.

## Different approaches to doing research

There is a strange thing about doing research on research; it puts our own practice in a new light. The considerations made in this chapter are as relevant for the understanding of my empirical material, as analytical tools, as they are for the understanding of my analysis. The difference between academic knowledge cultures and their relations to the objects or phenomena of inquiry, are both part of the analysis as well as relevant to my

own methodological perspective. A fundamental difference within social science, the way I see it, is that between instrumental and interpretative approaches (which is not to say that the instrumental researcher is freed from interpretation). The approach held in this thesis is an interpretative one in which the complexity of the phenomena under scrutiny is embraced.

Sociologist Johan Asplund (1987) writes about the value of understanding; to try to understand a phenomenon, and the 'mystical intelligibility' that is required. He writes:

> The problem with modern sociology is of course not that it collects data or sees to its measurement methods […] the problem is that often you settle with data, that you treat social phenomena as if they did not mean anything. For a modern sociologist the mystical intelligibility is nothing but just mystical" (1970: 27, translation by author).

Hence, I do not settle with a collection of data but constantly seek to illuminate the data from new angles. Data, however, is a problematic term. The people I interview contribute their own experiences and interpretations rather than fact-like 'data' (cf. Alvesson & Kärreman 2012). Anyway, important to note is that it is my interpretation that is mirrored in the text. It is not universal, and there is no reason why it should be. The way I understand mystical intelligibility is as a kind of thinking exercise that cannot be accounted for. The points I make are the results of my own internal analytic processes in the light of chosen theoretical and methodological approaches. I chose to focus on some issues rather than others, and I chose certain theories by which to understand the material and not others. Hence, another researcher doing the same study with the same respondents would probably have received different results. In positivist research this would be seen as a shortcoming, but in the interpretative approach the subjectivity of the researcher is recognised.

According to Asplund good social science resembles a detective story; the creation and the solution of a mystery. It entails a questioning of one's own initial interpretation in order to find what is missing and what is thrilling with a phenomenon. Like Alvesson and Kärreman (2012) note, from this point of view most social science research is not satisfying. Neither can I

claim to have followed the detective story ideal. But I do pause at the common understanding of current knowledge production.

## On the developing of theory

Like Smith-Doerr and Vardi (2014) point out, not many empirical studies looking at the recent marketization of the university at the level of the researcher or research group have been undertaken. Hence, there are possibilities to contribute new theoretical developments to the field. The purpose of my thesis is not to test existing theories, neither to develop grounded theory (Gläser & Strauss 1967/2006). Rather I would like to present an alternative way of interpreting coproduction with a focus on epistemology.

The approach leads to an abductive approach (Pierce 1990; Alvesson & Kärreman 2012). In contrast to the deductive approach in which existing theories, or hypotheses, are tested, and the inductive approach which can be said to generate theory from data (Alvesson & Kärreman 2012), the abductive approach is more of an interplay between theories and empirical material (data). According to Alvesson and Kärreman abduction takes place in three steps: 1, the use of an established rule of interpretation, a theory. My preunderstanding about the field and the way knowledge production is altered as a result of policy-wise, political and organisational changes would represent this step. 2, the observation of a surprising empirical phenomenon, in the light of the theory. This step could be said to be represented by the realisation of the big impact that the influence of the researcher's knowledge culture as well as the nature of the non-academic organisation has on the coproduction relationships. 3, the innovative formulation of a new theory that will revoke the surprise (2012:76, the three steps have been translated by the author). The purpose is not to render existing theories obsolete, nor to replace an interpretation. It is simply to suggest another perspective by which to view knowledge production.

The question of generalizability is interesting from the abductive point of view. The interpretation and the way of looking at the significance of knowledge cultures for the analysis of coproduction ought to be of a general character. The analysis could provide inspiration for analysing other research or R&D (Research and Development) units in which academic and non-academic researchers work on joint projects. It may also be sufficient

for analysing coproduction between academic researchers from different academic cultures.

Alvesson and Kärreman question the belief in the robustness of data, highlighting instead the way data already is a result of preunderstanding and interpretation. Instead they encourage the researcher not to put too much weight on data, but to see empirical material as a strong but flexible input into theorising – a dialogue partner. My work has not centred on finding stringency in the material, to codify and categorise. Instead I have looked for what I think is interesting, which turned out to be different knowledge cultures and epistemological categories of knowledge output. From this I have looked for theories sufficient for enhancing the understanding.

# The material

The first idea I had about this thesis was to make a study of humanities and social sciences, and to go against what I think of as a general trend in research policy research. At the same time I had to adjust to the wishes of the KKS to study research environments that are strongly represented among KKS funding recipients, and humanities and social science are not too frequent in that respect. Another initial thought was to make 'cases,' and treat research centres as cases that could be investigated. In short, there were not enough cases to make a study of both KKS-funded research centres and humanities/social science centres. And I did not look for more than four or five. Anyway, I have had some selection criteria in mind when trying to find interesting cases:

First and foremost it should be research at newly established universities and university colleges. This was also the request from my sponsor.

It should be a demarcated entity within the university or university college, more like a centre than a discipline or a topic. Usually these have come into being by a grant from the KKS or Vinnova[4].

[4] A public funding agency focussing on research for innovations.

- They should be research intensive and not primarily education oriented.
- Preferably they would include several disciplines in collaboration.
- Preferably dealing with humanities or social questions in some way.

The two last criteria have not been fulfilled when it comes to the engineering oriented centre. However, the research they do is just as 'social' as any social science – in that it is entwined in the surrounding society, affects society and so on – but they don't deal explicitly with social questions.

Embedded Systems (ES) is the name of the 'pure' engineering centre in the selection, and it has been quite successful in getting grants from the KKS. Basically this KKS related success is the reason why they were initially included in the study, but as I began investigating them I found them just as relevant as the other two. The fact that the hard sciences chase clear answers make them really attractive to study. To investigate the process by which something is made 'true' is very fascinating, and looking at the engineering case I came to understand why there is a preference for investigating this kind of research in STS. It is a much more complex undertaking to look at the soft sciences that do not produce 'hard facts' but interpretations.

I started my thesis work by looking into the webpages of all new universities and university colleges trying to find interesting cases. Simultaneously I was in dialogue with the KKS to take into account their view about what is interesting and what centres they had granted funding. I also made contact with several other centres: sustainability research at Blekinge Institute of Technology, 'well-being research' (*välbefinnandeforskning*) at Skövde University College, public health (*folkhälsovetenskap*) and energy systems (*energisystem*) at Mälardalen University College and innovation research at Halmstad University College. The first centre declined to participate, 'well-being research' was not sufficiently well-established and the other two were not considered interesting enough from a coproduction perspective. The final selection is thus a result of my own interests, the interests of the sponsor and the willingness of the researchers at the centres to be part of my study.

## Interviews

The interviews were done on two occasions; first right after I started working on the thesis, and then I revisited the centres approximately a year later. Sometimes I did follow up interviews and sometimes I met new people, usually depending on the interviewee's availability. This second turn of interviews proved very valuable in that I could, by then, go deeper into my ideas of looking at knowledge as output.

In total the study is based on 38 interviews with 32 persons, I have thus made follow up interviews with only some of them. Of these 32 persons, 29 are researchers and three persons work in companies that are partners with the research centres. The interviews were conducted face-to-face in an unstructured to semi-structured manner, following an interview guide with the purpose of ensuring that all relevant themes were covered. I have tried to follow the ideal of short questions-long answers, for instance by taking the time to let the interviewee pause and think in silence (Alvesson 2010). In addition to the interviews with people in the centres constituting the cases in the actual study, I have interviewed some other researchers, some of which belong to research centres that I have considered but that did not become part of the final study. These interviews have not in any sense been in vain but have increased my understanding of coproduction and the way the academic system works. I have also met and talked to some people that are not researchers at the centres that constitute the cases but who are interesting as academics and commentators. These are Peter Söderbaum, professor emeritus in ecological economics at Mälardalen University College, Ulf Johansson, professor emeritus in economics at Mälardalen University College and Lennart Olausson, who is the former Rector of Malmö University College. All of the interviews were recorded and transcribed in full, as part of the analysis.

## The researchers – experts or subjects

A lot of time and thinking have been devoted to the question of how to treat the researchers that I have interviewed. Are they informants, experts, research subjects or are they more like conversation partners that together help me increase my understanding of what it means to be a researcher at one of the newly founded institutions? My inclination is towards the latter; I

don't want to see them as subjects that I, as a "researcher," investigate. At the same time I interpret what they are saying, thereby to some extent depriving them of their own interpretive prerogative. They are also experts in the sense that they have provided me valuable information about the colleges, centres, funding, publications and so on. They have a double role. Perhaps they could be referred to as participants with expert knowledge.

The anonymity issue is another concern. When conducting the interviews, I have promised the interviewees anonymity in the final manuscript, simply because I have wanted them to be able to speak freely about sensitive matters too, such as their opinions about the KKS or the knowledge policy landscape in general. As I have not conducted that many interviews, the anonymity issue has to be taken seriously and I consistently avoid saying anything that reveals their identities. At the same time, they themselves will probably be able to discover their own voices in the quotes.

In order to honour the anonymity request I will not describe their functions within the centres in detail. There is an unfortunate predominance of men in the sample. I have only spoken to three women. This is not because I did not want to, but neither have I made any extra efforts to include women in the material. For the sake of anonymity, I have made the choice to use the terms 'he/she' or 'she/he' lest the women be immediately revealed. Please keep in mind, though, that the coproduction research of which this study is about, is a male dominated business.

## The companies

At the companies it is the company itself – the legal entity or person – who is interesting rather than the individual interviewee. The assumption is that employees at a company follow the logic of that company and make its interests their own interests, in their role as company personnel. They thus function as representatives for a business (actant) rather than being actants in their own right. I do not mean to deprive them of their agency, however, merely to clarify their role in my empirical material. Because of time and access constrains I have only conducted three interviews with company personnel, and they are all in companies associated with Embedded Systems. The reason is simply because these people were comparably easy to gain access to. I just asked the researchers I talked to, to supply me with names of some relevant persons they knew at the company with which they

had collaborated, and since I could refer to the researcher the company personnel were willing to participate. In the case of Medea I had actually interviewed three Medea associated companies previously, in connection with the writing of an M.A. thesis in 2008. This has contributed to my understanding of Medea's 'industrial environment'. In the case of CTF/Samot I have not specifically talked to any company but rely on the researchers' impressions of them.

## The conversations with the Knowledge Foundation

Even though I have not made any formal interviews with employees at the KKS I have learnt a lot from talking to them. It has been valuable in particular for the shaping of my own critical perspective on coproduction. I have spent some time at the foundation in Stockholm, a few days on two occasions, made use of their databases and looking through archives.

## Observations

I do not pretend that I have conducted an ethnographic study but still my knowledge about the field of study comes not only from the actual conversations with researchers and companies but also from having spent time at the research centres and on some occasions taken part in events in connection with the research centres. As Tjora (2011) notes, field observations without notes are not observations, the notes are the observations. I have observed without taking notes (not systematically written down), which is why I hesitate to think of my method as ethnographic.

I have taken part in a digital poetry event hosted by Medea, among others. It was a presentation and examination of students' dissertations. Malmö Playdays is a festival in which students in interaction design present games and toys they have developed. I visit the stpln building[5] sometimes, to work on my bike and soak in the atmosphere of creativity. The CTF/Samot people

[5] A 'maker's space', described further in chapter 6.

invited me to "*fika*" (coffee), a preparation for a dissertation and more informal lunches together with interviewees. At ES I was given a guided tour of the robot lab. I was also invited to participate at a representation lunch with research leaders and people from funding agencies, which was a very interesting experience. These experiences have resulted in memories that can be interpreted and analysed, together leading to a more solid context of the field of scrutiny.

All in all, the "ethnographic" impressions I have gotten from the research centres are expressed in the chapter 'situating, contextualizing and describing the cases'. There the attempt has been to provide the reader with context, to say something about what these centres are.

### Text material

A large part of the thesis is based on written material about the systems of knowledge production and funding of knowledge production, in Sweden and internationally. One part of this is information, mostly gained from web sites, about the colleges, about funding agencies, and about Swedish knowledge politics. Part of it is made up by what I would like to think of as instrumental theory; books and articles with a lot of data but less interpretative analysis – which, however, makes it prone to the kind of interpretative approach that I have adopted. This material could also be termed theory but I hesitate to do so because I think of theory as something more abstract, which is not to say that a high level of abstraction is better.

## Adapting to the requirements of a sponsor

Being externally funded and dependent on frequent contact with the sponsor has been challenging. Not because its staff have tried to dictate me and my research; if they have, my supervisor has made it clear to me that this is my project and that disagreements are a matter of communication and not really conflicts. Something that has become clear from my work, however, is that money from the KKS represents 'restricted' money, as opposed to the free funding that faculty grants would represent. This is both stated by researchers I have interviewed and is also my own impression. Even though

the KKS has not made any serious attempt to dictate or manage my research, I have felt an inclination to conform to my interpretation of their requirements. In particular my interpretive approach seems to have been hard to grasp by the funding agency.

## Demarcations and limitations

There are, naturally, some limitations I have been more or less forced to make, due to personal clumsiness and to circumstances over which my control is limited. In this section I will start by saying something about 'planned' demarcations, and after that I will go on to discuss things that have restricted my work and its positive and negative consequences, 'unplanned' limitations.

One demarcation concerns time. The newly established universities and university colleges are not too stable institutions, not the least does the funding picture shift a lot. Thus, they may not look the same now as when I made my interviews. Focus areas, project constellations, staff etc. may have changed. This is not really a problem, however, since I am after more general tendencies and have an interpretive approach. But still it is worth mentioning that the presentations of the cases in this text may not be valid as facts about the research centres. The project ran from late autumn 2010 to summer 2015. During all this time I have gathered information, although the majority of the interviews were conducted in 2011 and 2012. The same goes for the KKS. I focus on the KKS between 2010 and 2014. The foundation has changed course since then, but this is not covered by the thesis.

Information about the economic conditions of the centres was difficult to obtain. The original aim was to describe the relative importance of different funding sources on two occasions, 2010 and 2014, and I thought this would be easy to check with an administrator or economist at the centres. It was, however, virtually impossible to get this information. I did make contact with administrative personnel at two of the centres, and was promised the numbers I needed, which, however, did not come. I tried instead to find useful information about the funding sources of the research centres.

Furthermore, I would like to say something about the audiences for this text. Writing specifically about the internal/external divide of academic science

has made me think about what system from which I myself seek validation. While the research is obviously directed at the academic system, I also have a wish to influence actual policies and also research about policies. The result from this writing for multiple audiences is that the thesis is rather eclectic, as if I cannot decide whether it is a thesis on knowledge theory, a policy guideline or something else.

## Concepts and definitions

Of importance to the analysis are the classifications I make between different forms of businesses. Classifying businesses is usually done according to well-established sources, such as the Frascati Manual of the OECD (OECD 2002; see also United Nations 2008). The Frascati Manual is important, as its business classifications (industrial R&D) provide the groundwork for much research policy throughout the OECD countries. The OECD, however, is an organisation actively promoting economic growth and as such they do not pay attention to businesses that are explicitly and consciously not for growth. The most significant distinction I make between companies concerns their relationship to traditional company logic, i.e. whether or not, or to what extent, they are growth and/or profit oriented. Hence, I have not made use of the OECD or any other established classification, simply because it does not fit my purpose.

# 3. Changes in (Swedish) academic landscapes – historical legacies viewed in the long and short terms

> When history looks at the 20th century, she will see science and technology as its theme; she will find the monuments of Big Science – the huge rockets, the high energy accelerators, the high flux research reactors – symbols of our time just as surely as she finds in Notre Dame a symbol of the Middle Ages (Weinberg 1961:1).

This quote is interesting as it points at two highly relevant things. The first thing is the quite self-evident notion that knowledge is an inevitable part of our society, and, secondly, that the things which can be compared to the great cathedrals like Notre Dame – symbols of the power of God – are items that belong to the natural science part of science. It is not just any scientific area that Weinberg points to, but natural science with strains of technology. It is high-energy accelerators, technological tools, that is, by which the world is made sense of. It is not science but technoscience: science closely intertwined with technology. Social science and the humanities, on the other hand, are in this sense not really considered sciences at all, in Weinberg's account. They do not assemble technological artefacts or any other monument to bear witness to their greatness for future generations. Academic knowledge, like religion, can be thought of as a system by which we discover the world and make sense of nature (Harrison 2010). In secular societies it dominates religion, and as such it could be said to have a similar function (Stenmark 2010). In the following chapter I want to look more deeply into the relation between the two cultures of the university, natural science and humanities, and on the relation between the university, the entire university, and society.

The relation between society and the university can be interpreted as a contract (Elzinga 1997; Martin 2003; Jasanoff 2005) between two parties with differing interests (Hessels et al 2009). In the 20th century, the contract is usually expressed through research policies, acting as the interface between the university and society (Guston 2000). Policies affect the university system, but the university system is in no sense affected by policies alone; other influences and power relations also shape their activities. In a longer perspective, it is more relevant to consider the users of academic knowledge and to what institution in society it pertains.

The profound commercial power of academic knowledge is sometimes interpreted as a recent development. While it is true that the economic value of academic knowledge is heavily pronounced nowadays, links between commercial and academic activities have existed for as long as modern science. Furthermore, there have always existed connections between the university and the surrounding *society* (to the extent that this is distinguishable from the economy), especially given the task of education. According to Scott (2006) all universities are, and have been, designed to provide services to other actants in society, be it the church, the state, the people, etc. Naturally there could be no ties between university and economy before there existed such a thing as the economy. What I mean by this is that the industrial economic system is mainly based on innovations for its development and innovations and technoscientific development are closely connected (Mowery et al. 2005; Mowery 1991). In the very early phases of industrialisation there was a need for trained businessmen, but these were (in Britain, the country that first industrialized) typically not educated within the academic system but in private business schools. There are also connections between modern science and colonialism. The phenomenon of going to far-away countries, not only to establish productive units solely intended for export, but also for collecting and learning about new plants, animals and humans bears resemblance to the systematising of findings typical of the scientific outlook (Brockway 2011). There are many connections between the development of natural science and colonialism (Harding 2011). Point is, however, that there has always been a society-induced need for the knowledge emanating from universities, the differences lies in what society considers to be valuable skills and knowledge.

University-like institutions have existed all over the world, but they differed to quite a large extent. Particularly the difference between the European

universities and the universities of the rest of the world is significant. The non-European universities are not really to be considered real universities, according to Collins (1998), as they stagnated in scholasticisms while the European universities developed a creative environment of breaking down what was known and generating new ideas[6]. Islamic literature, Arab mathematics as well as Aristotelian philosophy were significant for this development (Scott 2006). Hence it was the break with the church as a dominating agent of power that set the university free and encouraged the free thinking that is now associated with it.

The university can be seen as a site for the espousal of knowledge – the point is that the university is something distinct from the society of which it is also a part. It resembles utopia, it is a nowhere place, a place out of existence that is not influenced by the everyday business of ordinary people (Rothblatt 2006). This is where the special character of the university is to be found – in its ability to remain external and function as an alternative to the structures that govern social life in society at large. According to Delanty (2001:29) "[i]t might even be suggested that the university was one of the few sites in society where culture was never fully dominated by power." The role of the university as a place where it is possible to exert critique against the dominant ideologies in society is also highlighted (Readings 1996; Lim & Svensson 2013; eg. Eagleton 2015). This is where a very important value of the university is to be found, and it is something different than the promises of commercial prosperity that comes with modern science.

The history of the university really starts in antique Greece and the academy of Plato (Delanty 2001). The review here, however, starts with the medieval universities, as these resemble today's universities in a more accurate sense. The origin of the university of today, though, is to be found in the late 19th century research oriented universities rather than in the medieval

[6] Scholasticism, thus, is non-European, and unreal, while the enlightened search for new knowledge, that which marked the European universities, is considered to be the real thing. When writing the history of the university it is all too easy to fall into ethnocentrism, or eurocentrism, equalizing "the world" with Europe and thus neglecting the universities of the Muslim world and of India, for instance. Of course, what we think of as the university, that particular model, has its origins in the European universities, which in itself is an expression of eurocentrism.

universities (Wittrock 1993). It is precisely this shift that interests me, from the medieval universities to the research dominated universities of today.

## The Medieval University – cosmopolitan centres in the Dark Age

In the medieval age there were universities not only in Europe but also in the Muslim regions and other parts of the world. One of the largest ones was that of Timbuktu with over 25000 students in the 15th century (Delanty 2001). Sweden got its first university in Uppsala in 1477. The great European universities of that time, in Paris, Oxford, Padua, Toledo and Bologna, were also much more cosmopolitan in their character than what the universities are today (Delanty 2001). The students came from all over Europe, while the majority were male there were also occasionally female students and professors (Scott 2006). When these universities flourished, the major agent of power was not the state but the church. The Christian ideology was considered universal (in Europe, that is) and this influenced the perception of knowledge. Scholasticism was the orientation of that time, in which "human reason was subordinate to biblical truth" (Scott 2006:2). Many of the students were monks and there were some connections to the monasteries (Delanty 2001), as there were catholic as well as protestant universities (Jonsson 2006). Religion was then still the major system of knowledge by which humankind made sense of the world. As the European universities became increasingly complex the church, as well as governments and municipalities required educated servants: priests, administrators, lawyers, physicians and clerks, and it was the task of the university to provide these (Scott 2006).

Epistemologically the medieval universities were more or less about instruction, not about critical thinking, systematised research or cultivation of the personality. Knowledge was reproduced, not created. There weren't any empirical collections, or analyses of natural or social data in these universities (Jonsson 2006). The typical lecture consisted of a master reading textbooks and explaining its content to the students (Scott 2006). The lack of academic techniques such as printing and fast copying did, of course, make the communication of knowledge slow; this was a time when

a person could believably claim to have read everything ever written (Delanty 2001).

While university education could be considered a service to society, knowledge was not utility oriented but rather metaphysical (Delanty 2001). The very definition of knowledge was related to the sphere of the divine, to acquire a sense of God given truth. Esoteric knowledge is that which does not belong to the daily activities of people, its very definition points to the fact that it is not having an everyday character. While the everyday knowledge, like how to grow food, is inevitably also knowledge, it was not that type of knowledge that prevailed in the universities.

Organisationally, this is the time when the original four faculties emerge. The faculty of philosophy was the one providing students with basic training needed in order to enter the higher faculties of theology, law and medicine (Jonsson 2006). With the development of natural science in the 17th century the traditional four faculty pattern will start to dissolve.

## The Swedish full scale universities: a foundation to be enhanced

The first university of Sweden was that of Uppsala, founded in 1477. The origin was a *studium generale* for priests, just to point out the strong and natural association between the church and the early universities (divine utility!). The second oldest university of Sweden is that of Lund, founded in 1666. The oldest Swedish universities were actually founded in areas that no longer belong to Sweden; Tartu in Estonia was established in 1632 and the Royal Academy of Åbo in 1640.

An interesting point is the use of language, Latin was the normal language for scientific publications in the medieval age onward. It was with the enlightenment ideals that the use of national languages became principal. In the royal academies the language of use was Swedish while in the universities publications were written in Latin. Starting in the beginning of the 19th century Swedish and German became established as the dominant academic languages, pointing to the common nature of these institutions. The Royal Academies carried the enlightenment ideals, education as emancipation, while the universities were more traditional (Frängsmyr 2006).

The old system is transformed as the state administration increased the need for training for the professions. All in all the result was more vocational education; a utility-based restructuring of the systems from metaphysical knowledge as an end in itself to a view of knowledge as a means to an end.

## The enlightenment and the nation state – universities become national

In the 18th century nation states started to form around Europe and in this project the universities became important actants in establishing the cultural foundations of national identities. The case of France is particularly interesting in this case, with the revolution that spurred the rejection of any ideas considered "old." The values of the enlightenment were very much about rationality and a technocratic tendency of dividing the world into small entities that could be objects of inquiry (Lafuente & Valverde 2009) and these were to be fostered in people through the system of higher education that the universities represented. In Napoleon's France this was explicitly stated (Andersson 2010). France is also where many of the medieval universities were closed down and replaced by the *grandes écoles* that were to spread and carry the ideals of the enlightenment. The *grandes écoles* were supposed to be for research while the universities should be engaged in teaching, thus a separation between research and teaching appeared in France in a far more pronounced way than in Germany or within the Anglo-American tradition (Delanty 2001; Andersson 2010).

From the 17th century onward the university began to lose its cosmopolitan character and became incorporated into the nation state. If they were relatively autonomous before, this autonomy was eroded by the nation states (Scott 2006). Thus, a connection between knowledge and power began to emerge, in which power is represented by the emerging state and knowledge by the university. The medieval university educated people to serve the church, or any other social institution, all based on the philosophy of scholasticism. Enlightenment represented a break with this philosophy, together with a partly new role for the university, to educate servants of the nation state. Thus, it is not just the dominant philosophy of knowledge that changed, so did the structure of society, resulting in a new mission for the university. While knowledge was connected to power also in the middle age

it was at the same time subjected to the highest power of God, whose words were interpreted by the scholastic method. With the development of nation states, "knowledge became a free-floating discourse to be used for domination or emancipation" (Delanty 2001:28-29).

The heritage from the enlightenment is still visible in the belief that the university rests on a basic idea (Delanty 2001; Andersson 2010). In Germany and England the universities were built up around a generative idea, that of Humboldt and that of Newman, respectively. In France the central idea was that of utility knowledge, the utilitarian aspects of knowledge were emphasised rather than the cultural ones. Broadly speaking, as a result it is possible to detect three various systems; the French elitist and occupationally oriented, the British liberal arts tradition and the German Humboldt model (Jonsson 2006). There was also the American tradition that arguably was influenced by the British and the German, but not so much by the French (Delanty 2001; Jonsson 2006).

In order to understand the connection between the university and society one has to look at the different perceptions of knowledge that persisted in the different national systems. What distinguishes the enlightenment era more than anything is the significance of emancipation - that knowledge could be for the empowerment and cultivation of the individual. This is when the ideal of *Bildung* becomes the catchword for university-based activities, at least in Germany where the influence of the nation state was not as strong as in France. Emancipation, in this sense, means that the personality of the educated person is about to transform into something better. This idea took on different shapes in different parts of Europe, in the Anglo-Saxon tradition it was expressed as the gentlemen ideal, in France as a sort of revolutionary citizen and in Germany in a metaphysical sense, unworldly and separated from society.

A useful reference here is Immanuel Kant's *The conflict of the faculties* published in 1798. Kant argued for the advantage of philosophy as the highest faculty. The other ones - theology, medicine and law - educated mere businessmen and were in the service of the state. Philosophy was to be governed by the laws of reason, not by any state defined utility as was the case with the higher faculties. The difference between reason/philosophy and utility can be conceptualized as knowledge as an end in itself or knowledge as a means to an end. Knowledge as an end in itself was connected to the idea of emancipation, and utility was when the university

educated practical skills to be used for various purposes. The emancipated men were, however, educated for being servants of the state, why knowledge as an end in itself also had a utility oriented purpose. The difference says something about the conception of knowledge, whether it is valuable to use knowledge for emancipation and by so doing creating and fostering ideal citizens fit to govern the state. The value of the human subject increases, from the state's perspective, as he (she) becomes emancipated. This in contrast to seeing the knowledgeable human subject as just a carrier of information that could be given to anyone. Emancipation means that you possess knowledge that may not always be of direct use but that makes you as a person suitable for having a leading role in society, while knowledge as just information does not require any particular higher state of being for the person holding the knowledge. Another person worth mentioning is Herbert Spencer who challenged the idea of philosophy as the highest form of knowledge and instead saw the highest form of knowledge as knowledge that is in some way useful to society (Offer 2010).

## The advent of research – the search for new knowledge

Research, especially the way we know it, has a quite recent history. It began as an activity for "leisured elites" (Manicas 1987:204) who were interested in nature. It was in the 15th and 16th centuries that the natural sciences began to gain influence (Andrén 2013). It was not until the 19th century, however, that the term 'research' began to be widely used, and it was only in 1852 that Swedish universities prescribed that professors should do research (Frängsmyr 2006). Prior to the 19th century, recurring pay for scientific work was unusual, but in the chemical sciences, which had early commercial potential, consultancy work made scientists able to have something like a career and actually earn money from their research (Whitley 1984a).

Natural science was a part of philosophy and not significant in itself, since the main task of the university was to provide education. "Research" for the sake of education - in the humanities, in literature and theology for instance - took place in universities, but not scientific research, not systematic knowledge about nature. Hence, all that which we think of as research in the

human sciences, humanities, was part of the university, but that which we think of today as natural science, or simply 'science' that has become its definition, was not.

The newly established academies played an important part in fostering research activities, from a Swedish perspective (Jonsson 2006). The Royal Academy of Sciences was founded in 1739. Its members encouraged the public to send in their observations and findings, and if the expert community approved them they were published. What is interesting about this is that it is an early version of the peer-review system, one of the cornerstones of the academic knowledge production. Research knowledge is a different form of knowledge; it is not inherent in the knowing subject but lies in the objects of nature that are discovered by the knowing subject. *Bildung* is knowledge that affects the personality of the knowing subject while research is knowledge that lies outside of him or her. In order to do research you did not need to have an emancipatory education. Fostering a certain mode of thinking is quite different from training in the systematized collection of empirical data.

Hence, the university after the middle of the 19th century is a different character than the old universities. It now incorporated research activities along with the *Bildung*-oriented humanities topics of the traditional universities. The result was two distinct knowledge cultures; one culture of broadly educated intellectuals and one of specialized natural science experts. Delanty (2001) conceptualizes this distinction in terms of the liberal or neo-humanist and the modern traditions of the universities. Frängsmyr (2006) conceptualizes the same process as a struggle between traditionalists and modernizers, representing classical education and natural science, respectively (2006:61). The modern tradition, with research in natural science, represented the utilitarian quest for the university, that knowledge is used for something; it is a means to an end. The neo-humanists, or the traditionalists, represent the view of knowledge as an end in itself, where knowledge exists within its bearer, the educated subject.

Natural science research is distinct from humanities in many aspects, of course, the *Bildung* focus of the latter is just one. Another important difference is that natural science research often requires equipment and hence someone needs to fund this equipment. Before its entry into the universities natural scientists were often funded or subsidized by either the state or by wealthy patrons (Manicas 1987), but as its activities became

more frequent their funding required some amount of consistence. Thus, there appears to be a connection between the introduction of natural science into the university system and the development of a nascent form of research policies.

### The university of Berlin – a predecessor

An important event is the establishment of the university of Berlin in 1810. This was strongly influenced by the ideas of Wilhelm von Humboldt, the German university marshal, the very architect of the German university system (Andersson 2010). The university of Berlin has been considered the first modern university and the most influential idea governing it was that of a unity between research and teaching, or as Delanty puts it: "knowledge and knowledge for education (in the more spiritual sense of *Bildung*)" (2001:33). Research was the primary duty of this university, and professors were to communicate their research results to students (Jonsson 2006). The role of the university, then, was not only to educate civil servants but to foster the cultivation of the entire nation. In order to do so it had to be autonomous from the state, but at the same time the state needed to guarantee its autonomy. This pair of ideas, self-cultivation, or *Bildung*, and autonomy from the state but guaranteed by the state, are fundamental for the Swedish university system as well, and noticeable until today. Sweden shares a cultural heritage with Germany, the tight connections between the countries remained until after the Second World War (Andrén 2013).

## The development of the academic system in a Swedish context

The Swedish university system is based on the German model; the Humboldtian ideal of a unity between research and education. This has had a strong influence on the development of the system. Likewise, the idea of the autonomous university has been influential. Autonomy of the university is guaranteed by the state; a sort of state control for the sake of avoidance of state control. Research autonomy, sometimes referred to as the Haldane Principle, was expounded in the Haldane report (Haldane 1918) as a

statement that decisions about what to spend research funds on should be made by researchers rather than politicians. The Haldane report that in 1918 set the standards for university governance was written against the backdrop of the First World War. Research funding had been focused on the war effort and Lord Haldane wanted to counteract this by distinguishing between departmental research on the one hand and intelligence and research for general use on the other (UK Parliament). The Haldane principle was contradicted by the Rothchild customer-contractor principle in 1972 (the context here still being Great Britain). Rothchild stated in his report that "the concepts of scientific independence used in the Haldane Report are not relevant to contemporary discussion of government research" (Cabinet Office 1971). Rothchild's principle made the Government Department or Government Chief Scientist the customer who commissioned contractors to do research. This was a step away from investigator led research (Cabinet Office 1971). Autonomy is a fundamental idea in the first two waves of expansion of the Swedish academic system, but in the third wave, the one beginning in the 1970s, it began to be replaced by non-investigator led principles. In Sweden the shift in focus from autonomous to needs-driven research can be represented by the sectoral funding organs. By this system research funds were allocated through various ministries, the thought being that these would make the right research priorities based on perceived needs for their respective areas (Sandström 2000).

Cuts in public funding of research were also of importance, as the 1970s and 1980s were times when budgets for basic research became increasingly restricted (Hemlin 1996; Hellström 2004; Brooks 1978; Laudel 2006). Europe had experienced vast economic growth in the post-war years, spurred by a Europe recovering from war along with various programs for recovery, the Marshall plan being the most comprehensive (Temin 2002; Alvarez-Cuadrado & Pintea 2009). As the economic wonder of the post-war Europe came to a halt, so did public expenditure on many items, including research. What seemed required instead was a broader role for relevance criteria, as for instance the concepts of strategic research, developed by Irvine and Martin and taken up by the OECD: "basic research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems" (1984:4).

# First wave of expansion of the system - a modest increase in educational capacity

The first wave of expansion of the Swedish academic system began in the 19th century and focused on utility. The aim was to provide more and better educations to fulfil the needs of the evolving society. Concurrently, the old universities transformed and began to look like what we think of as universities today. As I have pointed out, research was not a core activity of the old universities; the focus was on teaching and the transmission of existing knowledge. From the time modern research began to occur on a more frequent basis, eventually being incorporated into the universities, laboratories and observatories were assembled, also within the old universities. Before that research took place within the Royal Academies. The 19th century system was to a large extent utility oriented and with a strong focus on education in practical areas such as farming, engineering and physician training (Andrén 2013).

The Karolinska Institute was founded in 1811 in order to improve and enhance medical education. The technical University Colleges, Chalmers in Gothenburg in 1829 and The Royal Institute of Technology in Stockholm 1827 were both established with industry's needs in mind. In the early 19th century the clearly utility oriented educations of veterinary medicine, forestry and agriculture were established. While they started out as traditional education, research activities eventually began to take place also within these areas. In 1977 the Swedish University of Agricultural Sciences was established, including the veterinary, forestry and agricultural educations (dating back to the 18th century). In Stockholm 1878 and in Gothenburg 1891 two University Colleges were established by the municipalities with the purpose of maintaining the ideal of *Bildung*. They would be nationalized during the first half of the 20th century. There were also the two business schools of Stockholm, founded in 1909, and Gothenburg in 1923, together with a number of art schools. Together they made up a rather fragmented but viable system.

# The second wave - establishing new universities

During, and after, the Second World War the demand for increased research and educational capacity in Sweden began to make itself felt as the war had showed the fragility of being dependent on other countries. Sweden was to a large extent isolated during the war, and this isolation had showed the vulnerability of the country in that respect. This, and the fact that the number of students were expected to rise fast, made an expansion of the system necessary (Hazelkorn 2004). Right after the Second World War plans were sketched out for an expansion of the system, and although governmental investigations pointed out the need to enhance educational capacity in the philosophical faculty as well, the second wave came to focus on natural science and medicine, odontology and technology.

Lund Institute of Technology was established in 1961, Umeå University in 1965. Linköping Institute of Technology was established in 1969 and Linköping became a full university in 1975. Luleå got a school of technology in 1971. The predominance of technological institutes is an indicator that Sweden is a country that takes engineering very seriously. Being a country with vast natural resources, the Swedish iron ore for instance, engineering skills are critical for processing these into economic wealth.

## Research connection – an influential idea

Because of the strong German influence on the Swedish system – the Humboldt model – establishing new sites for education only was not considered an option, the connection between education and research had to be sustained, generating interesting discussions and challenges in the Swedish system of higher education.

In Sweden, every educational institution should also be engaged in research to some extent; even the connection between undergraduate education and research has been emphasised. Exactly how this was to be implemented, however, has been subject to fervent discussions. Should it be that academic personnel always perform both tasks or that the institution in question performs research while simultaneously providing education with teachers who do not necessarily have to engage in research (Andrén 2013)? Roughly

two standpoints can be extracted, that the basis for research association lies in the incorporation of scientific results in education. Or a more general idea of what constitutes a research connection and that it could be accomplished by introducing academic values of independent thinking, curiosity and the ability to problematise (Björklund 1991; Andrén 2013). This discussion touches upon the question of what academic knowledge is; is it about new results, - research - or is it about fostering universal values in the individual? I find it reasonable to relate this discussion to the main divergence of two cultures in the academic system, that between the modernists and the neo-humanists (Delanty 2006), between classical education and natural science (Frängsmyr 2006). In Sweden, however, the discussion was more about practical issues of how the system would be designed to best meet the requirements of high quality academic education (Andrén 2013). In relation to this on-going discussion, a new academic employment category saw the light: the university instructor (lecturer), a university teacher position intended to meet the demand for increased educational capacity.

## Science in the 20th century

The 20th century is really the scientific century, and it is also a century marked by two world wars. Most of the modern universities were established either during the decades prior to the First World War or after the Second World War (Delanty 2001). The natural sciences and the warring economies developed strong connections as the value of the efforts of technical knowledge to manipulate and control nature became more accentuated (Weinberg 1961). The Manhattan project (the atomic bomb) is a trademark for this kind of knowledge making, but so are things with civilian values as well, such as nylon whose first area of application (before the stockings) was as ropes in parachutes (Shapin 2008; Weinberg 1961). When the usefulness of natural science in terms of making artefacts – innovations – became clear, so came the commercial interest in science. Whereas before university utility was that the state had an interest in broadly educated citizens to maintain and support the state and its functions, this new value of science was something else. It was the ability of knowledge to appeal to something outside of itself, and outside of the knowledgeable human subject. The artefacts and innovations of science

could be commercialized, they could be brought to a market and hence university knowledge is connected to a commercial value as well.

Hence in the 20th century the economic value of academic research really came to be realized and connections between industry and universities became tighter. Especially in chemistry, one of the first industry-oriented disciplines, with large firms such as DuPont and Monsanto who advanced because of scientific innovations (Shapin 2008; Weingart 1997). The commercial scientist is a thing of the 20th century in the US, by 1950 there were 750 000 scientific engineers employed in industry (Shapin 2008:109-110; see also Pestre 2003). Thus, according to Shapin, in the 50s the industrial scientist, or engineer, was the norm rather than the academic one.

As Shapin (2008), as well as others (e.g. Pestre 2003; Dickson 1984), show, there is nothing new about researchers associating with businesses, although the ways to do so have changed. Even before business made its way into academe there were external interests in the fruits of knowledge produced within the university, not the least in the shape of educated state servants. According to Shapin, the post-war period was characterized by large firms capitalizing on the technological progress made by science. Scientists equalled industrial scientists, many large firms had their own laboratories and were keen to keep the best researchers on contract, thus allowing them some freedom of work. Research taking place in the firm did not differ that much from university research. Furthermore, there are close bonds between the emergence of modern science and the progress of industrialisation (Barnes 1985; van den Daele 1978). In contrast to the broadly educated citizen of the *Bildung* ideal, the benefits of modern natural science could be calculated and expressed nomologically. There was a general great faith in the benefits of basic research, something that is also shown in the research policy of that time; the Bush doctrine.[7] In general, sciences at this point in time represented a progressing movement towards a bright future; the possibilities of natural science research could easily be seen as infinite. The

[7] Vannevar Bush, who was head of the US Office of Scientific Research and Development during WWII is mostly famous for his report (to the president) *Science: The Endless Frontier* (1945), in which the value of basic research is highlighted. The report was highly influential for research policy all over the western world.

picture began to alter with the rise of the environmental movement emanating from the publishing of Rachel Carson's *Silent Spring* in 1962.

If there was a conflict between the academy and industry in the 20th century, it was about the "moral economies" of the two spheres (Shapin 2008:111). The idea was that the university represented a higher moral, a dedication to free knowledge in contrast to the mere economic interests and cold calculations of the firm. There was a need to separate the operations of the university from the similar activities in corporations, and it was done by reference to moral. Hence university science is constructed as being less directed towards utility, in comparison to company R&D. At the same time the cultural sciences represent the opposite side of utility research from an academy internal perspective, where science represents utility. The original idea of the university knowledge - that it is not for utility – seems to be important to sustain in order to create a boundary to industry, while at the same time utility is an integral part of the motivation of the scientific endeavour.

In terms of policy this time is marked by what is usually referred to as the linear model (Elzinga 1995; OECD 1997; Godin & Lane 2013; Schilling 2005) - the 'endless frontier' contract (Bush 1945; Hessels et al 2009; Caracostas & Muldur 2000). The main component of this contract was the faith in basic science and its eventual impact on society. Hence, significant amounts of money were spent on basic science during the time of the linear model, on the premise that basic research would result in applied research, which later would be transformed into new products or processes.

The linear model eventually came into disrepute for a multitude of reasons. From a policy perspective more multidimensional models seemed more accurate in explaining how innovations came about than the linear model. These can be grouped under the umbrella of the concept of innovation systems; approaches embracing the systemic character of innovation (Godin & Lane 2013; Caracostas & Muldur 2000; Biegelbauer & Borrás 2003; Larédo & Mustar 2001; OECD 1997).

All in all policy developments can be interpreted as contributing to the emergence of two academic cultures, expressed as systems of validation of knowledge; the internal system, pertaining to what takes place internally in the university, and the external system, pointing to knowledge receivers external to the university. One is oriented toward research accepted and

validated by colleagues and the other is oriented toward agents of the applications of academic knowledge.

On the part of the research and education institutions, the relevance criteria have resulted in hybrid research communities. Hybrid research communities may develop when political direction, commercial applications, or other policy-relevant areas of application of the research give mandates to academic knowledge production (van der Daele and Weingart 1976; Elzinga & Bohlin 1993; Elzinga 1993; Bonaccorsi 2010). When the external relevance criteria shape quality perceptions, the result can be what Elzinga (1985) refers to as epistemic drift. Non-academic actants not only participate in the processes of making, distributing and using knowledge, but also in validating its claims. In such hybrid research communities, distinct reputational patterns, with different literature and methodological preferences, may develop. Knorr-Cetina (1982) uses the notion of transepistemic arenas to point to a similar tendency. Multiple funding sources is a fundamental characteristic of this situation.

# 4. The knowledge economy, a shift in policy and the Swedish third wave of expansion - regional universities are established

This chapter connects the theory of the knowledge economy, to which a critical account is given, to the shift in research policy that has taken place since the 1970s and the subsequent consequences for the organisation of the making of knowledge. The Swedish third wave of expansion of the system is connected to the increasing economic significance of academic knowledge and is given a thorough description.

## The knowledge economy – and why firms are so interested in academic knowledge

> A knowledge society is not simply a society of more experts, more technological gadgets, more specialist interpretations. It is a society permeated with knowledge cultures, the whole set of structures and mechanisms that serve knowledge and unfold with its articulation" (Knorr Cetina 1999:7-8).

Knorr Cetina points out that the knowledge society is not shaped by the outputs of knowledge, but rather by knowledge as a norm in society. The term "knowledge society" simply refers to the fact that knowledge becomes

the most important constituting factor for society; while the industrial society was conceived of predominantly in terms of labour and property, or capital, the knowledge society is conceived of in terms of knowledge (Bell 1974; Drucker 1994; Lash & Urry 1994). Benner and Widmalm (2011) use the metaphor of the laboratory to contrast today's knowledge society to the industrial society and its factory. For companies, knowledge becomes the most crucial competitive factor and knowledge worker is the configuration of the employee (Drucker 1994).

Philip Walsh (2013) tries to delineate the various attempts to conceptualize and understand the knowledge society, for the purpose of sketching ways forward for the sociology of knowledge. Walsh starts from what he calls the knowledge-society-equation, which is about, on the one side, the constitution of knowledge by the social subject, and on the other side, the role of knowledge in the constitution of society. What he means is that these two have been treated separately. Walsh writes about knowledge in general, not academic knowledge specifically, but the point he is making is important. In order to fully understand knowledge in society, the two sides of the knowledge equation cannot be treated separately. While sociologists have been preoccupied with either of the two sides, economic theorists "took for granted the idea that [knowledge] could be conceptualized as a product, commodity, or capital good, and without bothering too much about the various kinds of knowledge these concepts were applied to" (2013:407). This captures the way I interpret some of the contributions to the field of research policy, it simply deals with 'knowledge' and its effect on society/policy, or the effect of society/policy on 'knowledge' as if there were no differences between different types of knowledge. The issue will be further elaborated in chapter 6.

Walsh (2013; see also Block 1990) arrives at the conclusion that Daniel Bell's (1973) post-industrial society theory well captures the state of affairs because it manages to see both sides of the knowledge-society-equation. While pre-industrial societies are mainly preoccupied with farming and agriculture, industrial societies produce goods. The different economic systems bring differences in the ways human life is structured. For instance, in the pre-industrial society life is structured by nature, the seasons, the days etc., whereas in industrial society life is structured according to clock time, which is chronological, evenly distributed and very solid. The differences can also be conceptualised in terms of skills. In pre-industrial society skills were (are) broad, the peasant knows about every step in the 'production

process' of agriculture, whereas in industrial society skills are broken down into components, the connection between scientific specialisation and distribution of labour is noteworthy (Barnes 1985). The engineer is the most significant figure in industrial society, creating machines that replace human power. Eventually this leads to the post-industrial society in which there is no longer any need for the energy in the human body, the machine is doing the heavy work. Post-industrial societies are largely based on services, and thus the economy is personalised in a way. The basic unit of competition in the industrial society is the organisation, the private firm, in post-industrial society it is the individual, and the main means of competition is information. It is not, however, the effects of knowledge on the social structures that are of interest here, but the changing role of knowledge when its role in competition between firms is accentuated. The question thus is how to interpret knowledge as an asset, as a competitive advantage and as a force for change.

Alvesson and Spicer (2012) describe an economy of persuasion, in which the creation of demand for the product is becoming central at the expense of the actual product itself. This is because there are no spontaneous demands for most products produced by companies in developed economies; demands have to be fabricated. In post-industrial society knowledge intensity seems to have become the number one buzzword in the corporate world (Grant 1996; Bordum 2002). But what does it mean that a company is knowledge intensive? Could it be that it is more relevant to see knowledge as a dominant ideology of society than a sort of nature-given structure of the economy (cf. Remtulla 2007)? As Alvesson and Spicer maintain, knowledge is seldom defined in this context (2012:1195; see also OECD 1997). The claim of knowledge intensity implies, together with the entire knowledge society thesis, a change from how it was before. Alvesson and Spicer criticise what they call "one of the central leitmotifs of contemporary organization theory," namely that "firms thrive on the basis of their knowledge" (2012: 1195), and the fact that, despite this, it is seldom defined exactly what knowledge is. The general assumption is that knowledge is the main competitive factor for firms in the post-industrial society, it is the message from management gurus and business developers, not to mention the hegemony policy discourse aimed at fostering knowledge transfers from university to industry. Alvesson and Spicer, however, claim that organisations also thrive on what they call functional stupidity. Basically "[f]unctional stupidity is organisationally supported lack of reflexivity,

substantive reasoning and justification. It entails a refusal to use intellectual resources outside a narrow and 'safe' terrain" (2012:1196).

The concept of functional stupidity counters the mainstream discussion that emphasises knowledge as a competitive factor and smartness among employees in firms. It points to an understanding of knowledge as a competitive factor and, as in the knowledge society, as more of an ideology of current society than an actual description of the state of affairs.

Hence a possible interpretation would also be that all the talk about knowledge and the worth of it functions as an ideology, and one that is required in order to foster economically correct behaviour among companies and others. For the thing is that knowledge is a very important factor; much of the value of consumer goods comes from the immaterial values that are added in 'developed' economies. Knowledge is naturally involved in the making of immaterial values, but it is also essential for the production of material goods. The difference is that in immaterial assets knowledge – creativity - is the only actual value; knowledge is applied to knowledge, as Drucker puts it (1994). In short, the economic system in which prosperity mainly came from the processing of natural resources came to a halt sometime in the 1970s. Orio Giardini is head of the Club of Rome, the same organisation that launched the *Limits to Growth* report in 1972. According to Giaradini (2013) three events are essential for the end of the growth paradigm: the end of the Gold Standard[8] in 1971, the publication of *Limits to Growth* in 1972 and the oil crisis in 1973. When these events had taken place, the shift of focus from natural resources to intangible values like knowledge that gradually began after WWII became a major strategy for sustained growth. Not in the way that someone decided that now it is time to change the focus of the economy, but that, on a company level, in order to sustain profits other competitive strategies had to be worked out (Bordum n.d). Broadly it entailed a greater focus on services, experience values, design etc., which are created around the original consumer good (Urry 2003; or the "economy of signs and space" Lash & Urry 1994), to such an extent that large automobile manufacturers label themselves service companies. What I want to point to is a general

[8] I.e. the Bretton Woods system.

tendency; a replacement of competition based on tangible values to competition based on intangible values, which is connected to natural resource crises. In the *knowledge economy*, coproduction projects with academia can be seen as investments in knowledge for firms. That knowledge is considered a competitive advantage is obvious when looking at policy documents from the OECD, for instance, but also on national levels. But the moment knowledge is motivated by its contribution to something that lies outside of its pure academic purpose, with innovations, economic usefulness that renders it a commodity status, certain types of knowledge are deemed more significant than others. Knowledge with economic potential is favoured when the innovation factor is brought to the forefront. Humanities, not generally considered economically useful knowledge, is sometimes deemed significant because breadth is a good thing, but mostly it is left out of the knowledge for innovation landscape. Humanities are sometimes also exhorted to come up with better offers to industry (Hearn & May 2008). All in all, however, there is little room for human and parts of social sciences when academic research is to contribute to fulfilling a direct purpose that has to do with profits. From an economic growth critical point of view, one could ask how the *knowledge society* influenced policies toward research would change if the political goal of sustained growth was abandoned, if knowledge would not have to motivate its existence by reference to the economic value it possibly brought about.

## The university in the knowledge economy

The development of the knowledge economy has been accompanied by shifts in policies governing the university. As previously mentioned goal-steering has partly replaced autonomy and innovation oriented policies has replaced the linear model. All in all these developments – resulting in two distinct validation systems for academic knowledge – carry a major transformation in terms of funding, steering mechanisms and organisation of academic knowledge production (Gibbons et al 1994; Rip 1994; Slaughter & Leslie 1997; Mirowski 2011; Tuunainen & Knuuttila 2009). Rider et al. compare it to such events as the Gutenberg press in terms of its radicalism (2013:1). Below a number of consequences of the shift for the making of academic knowledge will be considered.

The Gibbons group has, deploying the label of mode 1/2, identified the general tendencies of knowledge production in society, based on modes of working, networking, and interacting in and around science. The major contribution of the Gibbons group is to point out five areas that differ between what they term mode 1 and mode 2 of knowledge production, as follows:

| Mode 1 | Mode 2 |
|---|---|
| Academic context | Context of application |
| Disciplinarity | Transdiscipinarity |
| Homogeneity | Heterogeneity |
| Autonomy | Reflexivity |
| Peer-review | Novel forms of quality control |

Knowledge production is an increasingly socially distributed process, according to Gibbons et al. The academic way of doing research, with its perspectives, methods and techniques, are spreading to other institutions in society that seek legitimation by means of knowledge and competence (1994). A possible interpretation is that the boundaries between university and society are being blurred.

Mirowski (2011) points out that while the university has always had commercial contacts with trade and industry, the newness is that the constitution of trade and industry has changed. Knowledge has become the most important source of competitive advantage and this alters the relation between universities on the one hand and trade and industry on the other. The Gibbons group is far from the only attempt to diagnose current academic systems. Ziman (1996) points to a similar development and refers to it as post-academic science. He points out that science has become team work, a model far from the solitary researcher who was the norm in the ‘academic’ age. Henry Etzkowitz introduced the concept of a “triple helix” in 1990 (Etzkowitz 1990). A triple helix is when university, governmental agencies and businesses work together to form, create and use (economically) valuable knowledge. Etzkowitz and Leydesdorff (1995) developed the concept further. Post-normal science (PNS) is an attempt, by Funtowicz and Ravetz, to merge the ecological economics perspective with

policy making, or to enhance and enlarge the economic science to better fit with the challenges of our times. "PNS has been developed as the appropriate methodology for integrating with complex natural and social systems" (2003:2), which means that these systems cannot be tackled by academic researchers alone but that the integration of civic society is required. Weinberg retains a rather jaded attitude toward the new, as he claims that "authors of mode 2 and similar schemes are looking at phenomena on the surface and, for lack of theoretical depth, dramatize them" (1997:592).

The consequences of this development for the academic system and knowledge making vary across sites and institutions. Hessels et al. (2009) refer to a symbolic compliance strategy when scientists modify their research in communication with agents of power to make it look as if they work on commonly set goals while instead they just work on what they are interested in; adjusting to currently popular discourses going on in policy circles in order to make one's research proposal look relevant, where 'gender equity,' 'sustainability' and 'innovation' are examples of such discourses.

The engagement of academic researchers in various kinds of commercial, or generally external, activities can be analysed in terms of boundary work. In general the concept refers to ways by which academics demarcate what they do from other activities, especially in contrasting it to other knowledge-producing but non-scientific intellectual and technical activities (Gieryn 1983; Guston 2001). Boundary work is played out notably in situations where academic researchers purposefully engage in non-academic activities, such as attempts to commercialise knowledge outputs (Tunnainen & Knuuttila 2009; Kinchy & Kleinman 2003) or industry-funded research (Blumenthal et al. 1986). One may also see the technology transfer office as a boundary setting institution (Bercovitz & Feldmann 2006; Guston 1999). Tunnainen and Knuuttila (2009) write about boundary *maintenance*, since boundaries existed in their cases (a biotechnology research group and a language technology group, both starting spin-off companies) but these were unclear. An important conclusion is that it is generally not as contingent and strategic as is often assumed. Since most universities are public sector organisations they are subject to rules and regulations about engaging in commercial activities. In Sweden secondary employment is regulated. Hence, boundaries are already set up for academics working in

public universities, but they are not necessarily established in practice and may need to be negotiated.

The consequences of the shift in research policies can also be described with reference to a shift in academic norms. The scientific norms constitute a kind of 'cognitive actants' that govern the knowledge process, fostering researchers to relate to them, and becoming aware of them, or some version of the ethos which they describe, even though they may not always act in accordance with them (Elzinga 1995).

In 1942 Robert K. Merton published *The Normative Structure of Science* and presented what would become one of the most widely used accounts of scientific practice. The norms of Merton are Communalism, Universalism, Disinterestedness and Organized Scepticism, forming the acronym CUDOS. The CUDOS norms have been subject to continuous critique over the years. In an early critique, Ian Mitroff analysed the everyday conduct of scientific inquiry, finding a great discrepancy between ideals and practices (Mitroff 1974). As a replacement for the original CUDOS, now also including the norm of Originality, Ziman proposed the inverted acronym PLACE: the norm of communalism is replaced by the keeping of results for the purpose of commercialisation, 'proprietary'. Instead of being universal, knowledge production today is local, taking place within a 'local context,' while it "may have wide theoretical implications, it is not shaped by a preference for unification and generality" (1996:71). The norm of disinterestedness, always hard to sustain, has been replaced by the norm of 'authority', it is 'commissioned' rather than original and the 'expert' replaces the sceptical stance (Ziman 1996; 2002; cf. Hasselberg 2012).

Ylva Hasselberg suggests another set of norms that describe the current state of knowledge production. Her version, COUIC summarizes the normative foundations of science, where communalism is replaced by 'competition', universalism by 'ownership', originality by 'utility/appropriateness/demand,' disinterestedness by 'interest' and scepticism by 'consensus/agreement' (Hasselberg 2012:33). All of these critiques deal with the impact of the ever closer relations between the university and the market and contrast the current state to a former state, thus implying that a shift has taken place; the norms become a tool by which the state of science is diagnosed. Overall these norms are intended to highlight the characteristics of internal academic knowledge production today, how it is expected to be and how it relates to the normative account

of how it should be and also how these norms change when changes occur in the conditions for knowledge production.

## Making knowledge accountable

The general tendency of seeing the social usefulness of academic knowledge somehow makes it more accountable, but accountability is about more than just the social and economic needs for knowledge. The inclination to *account for*, in a broader sense, can be seen as a feature of current society. Michael Power has elaborated this in his book *The Audit Society* (1997). One of his main theses is that control has replaced trust in all kinds of social relations. In terms of university autonomy the belief in academics to make their own priorities in regard to research orientations is declining and being replaced by auditing of activities (Hemlin & Rasmussen 2006; Van der Meulen 2007; Cozzens 2007). In the traditional academic system, academic findings are constantly evaluated within the peer-review system (Zuckerman & Merton 1971), and not only results but applications for grants and positions are reviewed in a similar way. What is new is the evaluation of the impact or usefulness of knowledge outside of academia, and the fact that knowledge is evaluated by non-university academics, governmental authorities and research administrative agencies, such as the Swedish Research Council or the National Science Foundation in the USA (Hemlin 1996). Evaluations are used to increase the predictability of research funding and research policy, by pointing at impact patterns and relations between different types of policies and certain outcomes. Hence, evaluations can be considered an interface between the science system and the science policy (Gläser & Laudel 2007). Evaluative practices may also have unintended, negative, effects on the research which it attempts to improve (Genua 2001; Hellström 2004).

Citation analysis can be considered part of the auditing regime in science policy. Through citation analysis something about the impact of the piece of research in question can been said. By counting the number of citations a journal article has, it is thought that the impact – sometimes interpreted as the quality – of that article is measured (Leydesdorff & Amsterdamska 1990; Van Raan 2005). This implies a contrast to the traditional peer-review where peers qualitatively evaluate each other's research (Nelhans 2013). Citation analysis can be seen as part of the science of science – in contrast

to the sociology of science that takes into consideration aspects regarding the content of science (Wouters 1999).

There are two aspects of the influence given to bibliometrics. First is the journal impact factor, based on the total number of citations during a certain time divided by the number of articles published in that time. The higher the impact factor the more valuable is the publication for the individual researcher. Secondly there are measures of the productivity and impact of individual researchers, research groups and institutions. Productivity can be the number of publications, and impact is the number of citations of these publications.

One set of criticism is aimed against the practice itself and its claim to be an objective measure. Wouters (1999) argues that citation analysis is a second representation of science. Citation analysis build on scientific literature and scientific literature is a representation of science[9], a first representation. Citation analysis is therefore to be thought of as a second representation of science, the real object which it represents is the literature, not the actual content. Wouters argue that the citation used in bibliometrics is not identical to the reference produced by the researcher, because we know too little about referencing behaviour to equalize the reference to the citation.

Another critique is aimed at the way bibliometrics may become an object of manipulation. Hessels et al. (2009) argue that bibliometric measurements have the effect that publishing, rather than being a means of communication, is becoming an end in itself. It is more important to produce many publications with many citations than to actually contribute valuable knowledge and insights to either the academic community or the surrounding society (cf. Weingart 2005; Campanario 1993). It may also be that an article with a high citation frequency simply manages to describe something in an easily understandable manner (Werner 2015).

[9] Representation, not in the sense of mirroring reality but in the sense of acting on behalf of. The latter approach is realist and critiqued by Wouters.

## Academic knowledge as a commodity

There is a huge difference in perspective between the instrumental accounts of mode 2, triple helix etc. and the critical accounts of Ziman, Weinberg etc. The academic capitalism approach, too, is outspokenly critical. In academic capitalism monetary interests have taken over the previously so innocent and highly moral search for greater insights into the nature and living world of human beings. Science has become commodified (Hasselberg 2012; Mirowski 2011). Sheila Slaughter and Larry L. Leslie (1997), amongst others, have analysed the rise of academic capitalism. In their version, the concept refers to institutional- and professional market or market-like efforts undertaken to secure external funding for research. According to them, increased global competition forces companies to align with universities to develop beneficial scientific knowledge. Along with the fact that public funding of university research is decreasing, this is the primary stimulus of the development of academic capitalism. Hence, academic capitalism is one interpretation of how the development of the knowledge society/economy affects the university. Academic capital can be thought of as a type of human capital possessed by academics and also a strategic resource for firms acting on the market. The authors employ the term academic capitalism because, they argue, academic capital has been commodified, meaning it has become tradable, a product on the market. In this sense it is knowledge possessed by the academic scientist that has been commodified. This seems to be quite correct; it is not the scientific publication that is of primary interest for firms, rather research in this context is done on a project basis and to this the academic researchers might contribute with their skills, training and experience. When academic knowledge is no longer thought to be of universal character, the localized outcomes become more pronounced.

Jacob (2009, cf. Hagstrom 1964) claims that the promotion of commodification and commercialisation is a new means for governing science. She claims that the Marxist meaning of commodification has shifted and that knowledge production processes now are locations in which commodification processes exist. Commodification is defined, with reference to Marx, as “instances in which knowledge is exchanged for money where knowledge is packaged in a form so that the buyer can use the knowledge without the intervention of the producer” (Jacob 2009: 392). According to Jacob the academy has been characterised by functioning

according to a gift economy where services are given voluntarily. It has been an economic system without the involvement of money.

From the perspective of this thesis, knowledge can be both making/context and output, and the two cannot be separated other than for analytical purposes. Hence it intriguing to distinguish (analytically) between knowledge as commodified (alienated) labour and knowledge as product commodity. Knowledge as labour is the work as a researcher, the process of creating. This is in line with Slaughter and Leslie's interpretation of knowledge as a kind of human capital. Knowledge as product commodity is the very outcome of that process. In Marxian theory commodification refers to the process by which something is provided with an exchange value, be it labour or goods (cf. Marx 1867). Thus the internal scientific output, the publication, is commodified in the sense that it is provided merits which can be traded for more funding or a more stable position in the academic system. The bibliometric system works in this direction. The external output is commodified in the sense that it comprises a buyer-seller relationship through which the knowledge output is provided an exchange value (Jacob 2009; Gibbons & Wittrock 1985).

## The third wave – the university colleges are established

The post-industrial society and the knowledge economy place new challenges on the academic system. Thus, the direction of the development of the system in Sweden shifted compared to the first and second waves of expansion. Questions that are external to the academy are taken into consideration, leading to what Elzinga (1993) calls epistemic drift. In the third wave of expansion of the Swedish system, focus is not only on education and research for utility but to a much larger extent utility for economic purposes.

The concept of university branches was first mentioned in a report from the so-called "p-group" (prognosis; planning), a governmental advisory group, whose task it was to find out ways to enhance the educational capacity of Sweden. The proposal for university branches was a way to extend the system to new locations, cities with no previous academic representation. A

makeshift solution that was intended to be sustained for a shorter period, but, as contradictory as it may seem, they were also meant to be permanent (Andrén 2013). The branches would have a 'mother university' that would be relieved of some of the teaching load, and at the same time the research connection could be sustained (on paper if not in practice) in that the branches were connected to the research oriented mother universities.

The first four branches were established in 1967, in Linköping, Örebro, Karlstad and Växjö, with the mother universities Stockholm, Uppsala, Gothenburg and Lund, respectively. The branches did not receive resources for research independently, since this was thought to lead to a fragmentation of research resources. Among employees at the university branches, however, there was hope and ambition to find a more independent and stable role in the academic system (Andrén 2013).

The university investigation in 1968 (U68) (SOU 1973:2) is important in many respects. It suggested which locations would be suitable for the establishment of university colleges. First, it was based on existing education, and, apart from that, it was suggested that the education should match the specific trade and industry of the cities. For instance, it was suggested that Västerås/Eskilstuna (home of the embedded systems research centre of this study) would have engineering industry and construction oriented education. According to Andrén (2013), however, the need for a thorough profiling of the cities, in regard to their knowledge requirements, was not really fulfilled.

A Home Office bill in 1972 (prop. 1972:111) further specified the cities to which new educational and research investments were to be connected. They were presented as primary and regional centres. Primary centres with universities and already established educational institutions, and the regional ones to which the academic system was to be expanded. It was also stated that these new locations should not be given appropriations for research, they were to be strictly education-oriented institutions. In 1975, however, parliament decided to make the university branches independent university colleges instead (Linköping even became a full university). Still without any sign of resources specifically designated for research, however, a condition they sought to change. The 1975 bill suggested that twelve new university colleges should be established, and in 1977 these began to take shape (Holmberg 2012). At the same time the so-called *fakultetskollegiet* (faculty assembly) was established. This can be seen as an organisational

innovation with the aim to sustain and even tighten the connections between the new university colleges and the old universities, integration between university researchers and college personnel. In 1983 one deliberation from the work group 'research at minor university colleges' stated that R&D activities shall be part of the activities of small university colleges. Hence the connection to the regional trade and industry was further strengthened, This may be natural as they both lack resources and are supposed to contribute to the prosperity of the regions in which they are located, but perhaps harder to motivate from an academic quality perspective.

## And they become research institutions…

The university colleges gradually found their role in the higher education and research system in Sweden. From having a rather supportive role in relation to the universities, as education providers, they became more and more independent, and they gradually began to increase their research activities in the 1980s (Benner 2008). In 1985 the mobile resource was launched, with this researchers at the new university colleges could apply for space to do research as part of their positions. The model with 'mother universities' meant that college professors as well as PhD candidates were formally employed at the university, but located at the college in question.

With the 1993 university reform the university colleges were entitled to graduate students at the new magister/master level (Benner 2008). In 1995 they were allowed to establish professorships, subject to approval of the National Agency of Higher Education. The 1990s were also characterized by the introduction of the doctrine of new public management within the Swedish university system. Reduced state control through clear directions and the relying on market mechanisms was supposed to result in higher quality research (Bauer et al. 1999). Politically this is construed as increased university autonomy, an autonomy that is at the same time constrained by incentives, benchmarking exercises, quality assessments etc. New public management is sometimes considered corrupting to quality and reliability (Hemlin 1996), but from the point of view of policy makers it is a way of enhancing control over public resources by means of decentralised and more opaque control.

With the Bildt government 1991-94, two research policy directions were crystallised, toward large-scale environments, with concentration of

resources in order to receive high quality, the "research at the absolute forefront" (Sörlin 2005). But, on the other hand, large investments in multidisciplinary environments where the connections to industry were stressed; environments with an externally defined subject matter; focusing on relevant and real world research problems.

The Knowledge Foundation (Stiftelsen för Kunskaps- och Kompetensutveckling, or KK-stiftelsen in Swedish, hereafter KKS) was established in 1994 and with this the situation of the university colleges became more stable as the funding agency compensated for part of the lack of state funding. With this the new universities and university colleges were able to engage in research activities on a more regular basis. An unintended consequence of having the KKS as a main funding agency for university colleges was that education and research becomes separated. The mandate of the KKS was programmatically utility-oriented as the precondition for funding was matching support from industry, and thus they favoured research of relevance to firms, while the educational commitment of the university colleges usually was primarily focusing on professional training outside the realm of industrial relevance (teacher education, nursing etc., but also to some extent the social sciences and humanities).

Following a government bill from 1996/97 all university colleges were also to have their own resources for research. The colleges do, however, get far less than the old universities. In 2011/2012 this was developed to also give the university colleges money allocated for research education. They are now organisational replications of the old universities, except that they are much more focused on regional utility and receive fewer fixed resources.

## The coveted university status

Of the three cases I look into in this study, two are university colleges and one, Karlstad, is a university. The situation is by and large a result of inconsistent policies and somewhat unclear ideas about the Swedish system of knowledge production. On the part of the university colleges there were requests to get clear guidelines for how to be promoted to university status, there were demands for more resources, of course, but also for permission to train PhDs and hire professors. From the second half of the 1990s the social democrat government opened up "an institutional career path" (Benner 2008:116, author's translation) for the university colleges in order to capture

the university status. The economic crisis of the 1990s called for new measures and the regions that were home to a university or a college were better off than those without. Politically the argument was a lot about economic growth; the university colleges were thought of as 'growth engines' in their respective regions, and the university status was thought to further increase this aspect.

As a step on the way, the concept of scientific area (*vetenskapsområde*) was introduced. Scientific areas were thought to replace the traditional faculties; the university college could apply for clearance to establish one or more of the humanist/social science, medical, natural science or technical scientific areas. Within these they would be given the right to establish professorships and to graduate PhDs. The research effort did not have to span the entire area, but in a few related topics both research and education should be of broad and specialised quality, reminiscent of a university. Scientific area is both a utility focused measure in that it allowed for the university colleges to leave disciplinary boundaries and put together relevant topics and research areas that fit the demands of their external partners, and it was practical in that most colleges did not manage to develop capacity within all the disciplines. This was not, however, an issue without conflicts, not at least because the National Agency of Higher Education wanted to keep the boundaries clear between universities and colleges (Benner 2008).

Of the newly established institutions it was only Karlstad University College that was assessed to reach the qualifications set, according to the National Agency of Higher Education. Its assessment was overruled by the government, which made the decision to also promote Örebro and Växjö to the status of universities.

A change of course took place with the parliamentary investigation "Research 2000" (*Forskning 2000*). In this the newly established university colleges were deemed to bow to the same requirements as the universities in regard to organisation and quality control. What is noteworthy is that the value of regional competiveness is toned down and university autonomy and scientific quality is highlighted (Benner 2008). In the early 2000s the new universities received increased public funds, as do the colleges with scientific areas. At this time the Mälardalen University College received scientific area in technology and is granted 15 million SKR for the period 2002-2003.

In 2005 the focus shifts somewhat from a regional dimension to national competiveness. Now the ambition is rather to focus resources in order to enhance the Swedish position within the international research community. The concept of strong research environments that gain support instead of entire universities or university colleges can be seen as a strategy to bring Swedish research to the front. In general, focus is shifted towards consolidation and collaboration rather than extension, and in 2006 the government makes it clear that there will be no more university promotions.

# 5. Research funding in Sweden, the Knowledge Foundation and other funding agencies

In the following chapter I will look at the different historic funding models that have prevailed in Sweden, and also briefly describe the funding agencies that are of importance for the research centres in this study. The Knowledge Foundation is dealt with lastly, and it is given a rather thorough description, because of its significance for the newly established universities and university colleges.

It was not until the Second World War that the first actual research policy took shape in Sweden. The first policy was more of a general wish to enhance the country's research capacity (Frängsmyr 2006). Seven different research councils were established in the 1940s; for medicine, natural science, social science, agriculture, building research, engineering research and atomic research (for the humanities, a fund for research had been established already in 1929). In 1977 the structure of research funding was reformed, the research council reform. With this, three large basic research councils were formed, one for medicine, one for natural science and one for social science/humanities, complemented with a council for the planning and coordination of research (FRN). The research council (vetenskapsrådet, hereafter VR) was established in its current shape in 2001. In 1993-94 a number of research foundations were established using money from the wage-earner funds, these will be further examined in a section below.

The most influential shift in ideas was when government university regulation was replaced by goal steering in the 1990s. This is especially visible in the 1993 reform of higher education (Holmberg 2012). From now on there is an act of balance between autonomy on the one hand and utility on the other. The concept of strategic research indicates the direction, as it

can be seen as a way for policy makers to integrate different policy goals into one (Blume 1981). Strategic research is "basic research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems" (Irvine & Martin 1984:4). The concept began to gain acceptance globally as well as in Sweden in the 1980s, but it was genuinely introduced with the Bildt government in the early 1990s.

To sum up it could be said that Swedish research policy has shifted from regulation of universities, their organisation, number of persons on department boards, allocation of work hours for different employment categories etc. to regulation of the expected research outcome – the goal steering model. The third wave of expansion of the Swedish academic system has been characterised by ideas of the utility of academic knowledge, and quite a direct implementation through the establishment of regional industry–university college connections.

There is also a tendency that the new university colleges and universities work toward becoming academic actants in a more traditional sense. The old universities are the role model here and the strong utility orientation of the new ones are counteracted. If not becoming universities, all the new educational institutions have strived to at least gain more stable and serious positions within the system. Meanwhile policy makers and politicians have continued to highlight economic utility as the main reason for establishing new sites.

# Funding agencies in Sweden

The newly established universities and university colleges, which host the research centres analysed in this study all depend to a large extent on external funding. Even though they receive direct governmental appropriations for research, this was, and is, much less than those for the old universities in absolute terms. This makes the funding agencies important actants in their operations. The overall funding picture differs among the centres, and it shifts over time. The funding agencies of Sweden have different roles in the knowledge system; they differ in mission, aim, operation and strategies and thus affect the researchers and research they finance. While the agencies dominating the funding landscape (VR, Forte

and Formas) rely on research-initiated applications, there are also requirements for relevance in the funding landscape. Relevance is usually paired with peer-review of applications, though, resulting in various combination models. In the following section I will, very briefly, go through the relevant funding agencies and point out where they are to be found between basic research, autonomy or internal academic quality criteria, and utility, or social/economic relevance. The KKS is dealt with at the end. It has a special relation to the newly established university colleges and universities in that it functions as the provider of large sums of funding, not only on a project-by-project basis but in forms that from time to time have resembled fixed resources.

The Foundation for Strategic Research (*Stiftelsen för Strategisk Forskning*, SSF), is one of the "first generation" foundations funded by the wage-earner funds and whose capital is dependent on returns from investments (in contrast to tax money). Because of its limited funds, a number of areas for research funding are prioritized. These are life science, life science technologies, material sciences and technologies, information, communications- and systems technologies and computational science and applied mathematics (www.stratresearch.se, translation by the author). Hence, the SSF programmes are relevant for the Embedded Systems research centre at the Mälardalen University College, but not for any of the other centres in this study. Furthermore, the SSF maintains that the research they choose to fund must be of the "highest quality" but at the same time valuable to society. The future competitiveness of Sweden is mentioned. The foundation aims at all sides of the basic-applied scale, "the research grants may include both pure basic research and applied research, and not the least, the areas in between" (www.stratresearch.se, translation by the author).

Forte (earlier FAS) is the research funding agency for "people's health, working life and welfare" (www.forte.se, translation by the author). It is a government agency under the Swedish Ministry of Health and Social Affairs. Forte funds research about the labour market and this makes it an important funder for the CTF, the service research centre at Karlstad University. Forte has no special requirements of coproduction or special designs for the research projects they fund.

Vinnova is the innovation oriented agency (not the only one but perhaps the most pronounced), they "develop Sweden's innovation capacity for

sustainable growth and benefiting society" (www.vinnova.se). Vinnova is the innovation agency whose mission it is to increase Sweden's innovative power. This is accomplished through a number of programmes aimed at both universities, colleges and firms; firms can apply for research and/or development grants from Vinnova. Vinnova is not a research council but a public authority under the Ministry of Industry, Employment and Communications. Vinnova has similar policies of company engagement in research projects as does the Knowledge Foundation and they thus represent a target-oriented form of funding.

The Swedish Research Council (VR) is a governmental agency under the Ministry of Education. Its mission is to distribute funds for basic research, but also to handle research infrastructure, work for equality in the education system and promote communication of scientific results and social understanding of the usefulness of research (www.vr.se). VR was established in 2001 and replaced the former four subject-specific research councils. Instead VR includes all research areas, and four subject councils and three committees maintain it. Funding from the VR is considered a sign of quality, the amount of their funding indicates the academic quality of the research within a unit, a university. For instance, Benner (2008) uses the amount of VR funding as an indicator of the quality (or at least recognition) of universities and university colleges.

## Ending the wage-earner funds – introducing the research foundations

The wage-earner funds emerged out of a social democratic, or socialist, idea about how to increase the power of the workers relative the owners of capital. The aim was not to increase the economic well-being of workers but rather this construction had a much wider purpose; to achieve a shift in power elites in society (Zetterberg 1982). This was to be accomplished by enhancing capital formation in Sweden. The labour movement of the 1970s and 80s witnessed a vibrant discussion about corporate power and the disparity between workers and capital owners, questioning who is in charge and why, the critique of the fact that power elites inherited much of their power and how this balance could shift into a more egalitarian setting. To challenge the ownership, the very idea of property and the power that comes

with it, was radical, although at the time it was part of not only social democratic but also of liberal ideas (Pontusson 1992).

It was Rudolf Meidner (1914-2005), one of the most influential economists of the labour movement, who devised the wage-earner funds, commissioned by the Swedish Trade Union Confederation, LO, and its congress in 1971 (Meidner, Hedborg and Fond 1975). Meidner was associated with LO as an economist for most of his working life. The wage-earner funds were established by the social democratic government in 1983. The funds functioned as collective shareholding funds, with the purpose of providing influence by workers on company decisions (Pontusson & Kuruvilla 1992).

The takeover by the conservative Bildt government in 1991 put a final end to the wage-earner funds. For the government, ending the funds became an important symbolic issue as they wanted to eradicate what they thought of as a remnant of socialist politics (Holmberg 2012). The wage-earner funds were phased out and parts of the money were used for research, among other things (as in prop. 1991/92:36 and 1991/92:92, in Holmberg 2012). There were intense discussions about what to do with the accumulated capital; the idea of simply returning them to industry was mentioned, but deemed unfeasible. Finally an agreement was reached that ordered the money to be used for long-term knowledge development through basic research and post graduate education in order to stimulate economic growth. Strategic research was important here; it was articulated as a meeting point between public research and private corporate interests (Sörlin 2005). The wage-earner funds were therefore to be repaid to industry, just like the Bildt government wanted, but it was framed as research for productive purposes.

The three first research foundations that were established using the money of the wage-earner funds were SSF, Mistra and one foundation for cultural science, later integrated into the Bank of Sweden Tercentenary Foundation. At the time of the establishment of the first three foundations the value of the fund 92-94, in which the wage-earners' money were momentarily placed, had greatly increased and the government decided to establish seven more research financing foundations. These were the Foundation for Internationalisation of Research (STINT), Vårdal Foundation for Research in Care and Allergy, the Foundation for The Culture of the Future, *Innovationscentrum* and The Foundation for Baltic and East European Studies (*Östersjöstiftelsen*).

### Why foundations?

The very idea of creating foundations for the purpose of handling public money can also be interpreted as political. It can be considered to be in favour of privatised politics and as a means by which capital can be withheld from state interference. The Bildt government wanted to repay the wage-earner funds' money to trade and industry but realised that it was not practically doable. Instead several foundations were established, and their organisational forms make state interference impossible. Furthermore, by their statutes the foundations would still be supporting trade and industry by means of funding of collaborative or application oriented research by adding a new layer of funders operating in a form different from those of the public funders. The organisational form could be seen as a way of keeping capital from the state by inventing a public good purpose (Holmberg 2012:54).

While governmental funding agencies are ultimately funded by tax money, the foundations were given an initial amount of capital, to be invested on the stock market (or in other forms according to the prerogatives of the foundations' boards) and the returns from investments provide the source of funding, to be used in accordance with the statutes of the foundations. In the case of the KKS, this function was internalised and run by the foundation itself rather successfully. Initially the fund manager Hans Mertzig was recruited, he was earlier the manager for the fund 92/94 in which the wage-earner funds were placed until the foundations could be formed (Holmberg 2012). The KKS capital base is 50 per cent larger today than at its inception (KKS 2011).

## The Knowledge Foundation – last in line

Recently Daniel Holmberg, former employee at KKS, chronicled the development of the KKS. I rely on his work to a large extent in my own description of what is commonly referred to as "the foundation." The KKS was established in 1994. According to Holmberg the establishment of the foundation was done according to the same logic that characterised the first generation foundations, that is a strategic focus by which research is to enhance the competitive power of (national) trade and industry (Holmberg 2012:58). The KKS was initiated in an economic policy manner, not only

because of the source of funding – the wage-earner funds – that should, according to the conservative government, align with the interests of industry, but also because of a general economic situation in Sweden with structural economic change, hitting some regions particularly hard. Hence, they were a structural economic actant just as much as they were an academic actant. Apart from this overarching aim, the mission of the foundation appeared a bit like a hodgepodge of different goals, indeed reflected but not really coherent. The statutes of the foundation were not subjected to any deeper discussion. In the original statutes of the foundation three aims are mentioned:

- To support the exchange of knowledge and competence between, on the one hand trade and industry, and on the other universities, university colleges and research institutes;
- To finance research in small and medium sized university colleges within specific profile areas; and,
- To encourage the use of information technology.

The first two are consistent and can be combined; the third is more loosely coupled. The explanation is that the KKS, according to Holmberg, could be seen as a bit of an add-on from the money that was left over when all the other foundations had been established; their establishment was not preceded by an inquiry and there was no circulation for comments, which is why a cohesive knowledge policy based evaluation was missing (2012:54). The second aim, however, means that the KKS should finance research at smaller university colleges without permanent floor funding for research. Thus it was also stated that this funding should be permanent, i.e. that the KKS was only allowed to use the returns on their investments for this purpose. Hence, the purpose was to create a durable partial financing of the university colleges in their collaboration with local firms. In government bill 1993/94:177 demands were made of financial contributions from trade and industry in the funding of the research. Furthermore it was stated that it would be desirable if monetary contributions came from local firms. The intention was that every newly established university college would develop a demarcated research orientation, of some depth, together with nearby trade

and industry, thereby breaking the decline in economic prosperity and at the same time turn the newly established university colleges into respectable research institutions (Holmberg 2012).

The establishment of the KKS had significant consequences for the newly established university colleges; they were acknowledged as real participants in the knowledge system, and they got an advocate in a funding system dominated by old universities with a long-standing and cumulative advantage.

## Torn between conflicting missions

The two dominating models for research funding in Sweden at the time of the establishment of the KKS were the sectoral research and the research council model, respectively. The research council model based evaluations mainly on peer review and looked at internal academic quality, as defined in peer processes and normally along disciplinary lines. Although research councils did, and still do, not focus on basic research only, their mandate is predominantly freed from governing ambitions. The sectoral research funding model is much more focused on utility and the enhancement of trade and industry by the production of application oriented research generating useful results. In this model there is an ambition to govern, to steer the research into a certain direction deemed necessary by policy makers and other stakeholders. I interpret this division as being between (in lack of better concepts) utility and autonomy. The autonomous university is one in which academic interests govern the direction of research, and the utility oriented research is about values that may not be predominantly academic but for a purpose that is to be found outside of academia, i.e. policy relevant science. Furthermore, these two purposes may be conflicting.

The KKS found themselves straddling these two broad purposes. At the one hand, it functions as a quasi-research council and aim at funding research of high academic quality. For this purpose the NSF (National Science Foundation) has been engaged as expert peers for the review of proposals. On the other hand it has come to interpret its mission as dealing with remedies for structural changes of the economy. The context in which the KKS was founded highlighted economic growth policies as well as high quality academic research. The balance between these two missions has

shifted during the history of the foundation, due to various internal and external conditions (Holmberg 2012). For instance, the state of the Swedish economy – in deep crisis at the time of the establishment of the KKS - should be taken into consideration in order to understand the foundation.

While the mission of supporting high quality academic research can be undertaken in accordance with well-worked out structures - the peer review system, the mission of creating utility for trade and industry is not as easy to interpret. Rather this mission has been characterised by gingerly steps in different directions. Another consequence of the uncertainty associated with the dual mission was what might best be described as a strong desire to prove the usefulness of KKS using thoroughly worked out means of rules and regulations about exactly what was to be accomplished in terms of industry relevance. This cautious attitude has led to highly variegated definitions of industry, what type of firms are approvable, how many of them, in what branches and located where.

## Different views of economic activity

Throughout the history of the KKS the mandate to strengthen Sweden as a whole, and not just the urban parts, has been interpreted and handled in different ways. Roughly, two viewpoints can be distinguished, and these are also relevant for the analysis of the empirical material of this thesis. The two approaches can be thought of as 'industrial rejuvenation' and 'interactive innovation.' The first approach aims at supporting the industries on which the prosperity of Sweden rested for a long time, production of goods, based on industrial engineering and the processing of natural resources. The latter approach, 'interactive innovation,' is about getting creative people to meet in order for them to come up with new stuff that eventually can become commercially viable innovations. This approach pertains to some aspects of the knowledge economy, the cultural branches that contribute to the creation of content (KKS 2001; Hesmondhalgh 2002) which supplies economic value to consumer goods. Although the KKS does not base its work explicitly on one of the two innovation process approaches, it is tempting to see the similarities with the linear model on the one hand and the innovation system model on the other.

There exists several ways by which to stimulate economic development in a country. In the empirical material there is evidence of various

interpretations of what constitutes economic value and how it can be enhanced. On the one hand there is Mälardalen University College with the research centre Embedded Systems that sees the value of large industrial firms like Volvo, ABB and Bombardier, firms that operate in industries that once laid the foundation for economic prosperity and the Swedish welfare state. On the other hand there is the economy of symbols, of content, of experiences and culture. This is represented by Malmö University College and the Medea case in this study, which is more of a meeting place, or innovation arena attended for creativity, experimentation and eventually business formation. In the late 1990s and early 2000s the symbolic economy was in vogue (Hesmondhalgh 2002; Nielsen 2008; Lovink & Rossiter 2007). The value of making creative people meet, in order to generate ideas for new commercially viable businesses, was highlighted. The book *The Rise of the Creative Class* by Richard Florida (2002) influenced policy context all over the world. The strategy was to create meeting places - "third places" – and not interfere too much in the activities of creative people, and new fantastic innovations would almost magically pop up. The cultural sphere is essential in this respect; cultural workers are the typical figuration of idea generators and also the creators of the so-called content, the symbolic values that generate the profits of consumer goods (Florida 2002; Lash & Urry 1994; Nielsen 2008).

The CEO/VD Madeleine Ceasar, in offer 1998-2008, embodied the 'interactive innovation' approach. Also, the IT venture in the early childhood of the KKS is similar in its approach. It was done according to a spontaneous application model, through the device of letting a hundred flowers bloom (Holmberg 2012:68).

## The "final" evaluation of the KKS

In the statutes of the KKS it is stated that academies, the KVA and the IVA (Royal Swedish Academy of Sciences and the Royal Swedish Academy of Engineering Sciences) had the right to assess the business of the foundation. The first evaluation (KVA/IVA 1994) was rather casual and did not lead to any conflicts; the second one (KVA/IVA 2002) did ultimately alter the entire configuration of the foundation. The report was funded by the KKS, and was part of the academies' evaluations of the foundations and their activities. It contained criticisms on many counts. The KVA and IVA were

both dominated by representatives of the old universities and they saw the operations of the KKS as unnecessarily messy. The recommendation was to terminate the projects in the IT areas and the investment in the entertainment industry. Especially interesting is the judgement about the entertainment industry investment, "the groups of reviewers look, with considerable doubt, upon much of the reasoning made in connection to the KK-Foundation's investment in the experience industry and are very sceptical about the entire project" (KVA/IVA 2002:23, author's translation). However, the report and the critique that it revealed was about the overall direction of the KKS rather than a matter of whether or not it operated in accordance with its statutes. And the answer was firm; according to the report the activities of the KKS were sprawling and should focus more on support of research education. It was, as an example, mentioned that the KKS would enhance its credibility and legitimacy if it employed administrators with PhDs and personal experience with research. The KKS felt deeply misunderstood, it never intended to be a clean research council but had a much more complex mission and mandate. Despite this the evaluation led to the entertainment industry investment eventually coming to an end (Holmberg 2012).

In 2009 Madelene Sandström took over as foundation director and her aim was to restructure and reform the KKS by tightening up its sprawling activities. The ending of the entertainment industry investment was one expression of this, another was the withdrawal of the knowledge environment ventures. These were designed as arenas on which different actors, from within and outside of the academy, would meet (elaborated further below). The need for the KKS to ensure the value of what they were doing led to a stricter interpretation of how to accomplish economic development. Projects should preferably include large industrial firms, and this was expected and internalised by the applicants.

# The funding models/programmes

I now move on to a description of the various steering and funding mechanisms developed by the KKS.

## HÖG

The first programme for the newly established universities and university colleges was the HÖG programme; it was modelled as a grant for individual researchers and PhD candidates. No specific research areas were pointed out, but social relevance was an important criterion, involving companies in the process of knowledge making, primarily via co-funding. The purpose was to a large extent to increase academic quality and for this purpose particularly technology-heavy environments at the newly established university colleges were catered to as they were typically doing "research" with low academic status but with considerable funding from industry. The critique from the colleges, through the New University Colleges Rectors' Convent (Nya Högskolorns Rektorskonvent, NHR) amounted to the heavy burden it would be to apply for grants project by project, especially for smaller university colleges that lacked resources (Holmberg 2012:74).

A key concept in the statutes of the foundation is trade and industry, and this was, in relation to the launch of the first HÖG programme, defined as companies engaging in commercial business (Holmberg 2012). Publicly funded companies were excluded from the definition but eventually, and after having received heavy critique from the target group of the grant, a compromise was reached in which also municipal energy companies were included. Another critique was aimed at the predominance of local firms; the newly established university colleges strived to become international actors and tried to oppose their prescribed role as regional growth engines. There were also discussions, in the KKS, about whether only limited liability firms were to be approved, but finally it was decided that all sorts of commercial firms, sole proprietorships excluded, were to be considered valid collaboration partners. Hence non-profit organisations, as well as publicly funded companies (except for municipal energy companies) were excluded from the trade and industry definition. A side effect of the effort, perhaps unintended, was that it primarily targeted technology and engineering, and not humanities and social science as it is more common for

the latter to work with various not–for-profit organisations (Cassity & Ang 2006; Hughes et al 2011). The first round of HÖG granting took place in 1995. The main criteria were, respectively, academic quality, the competence of the researchers and the industrial relevance. The applications were reviewed by two experts - university academics – and their opinions together with a consideration by the programme responsible and two reviews from members of the drafting groups made up the foundation for the decision, and the final decision was taken by the board. Despite the fact that the outcome of the selection process in the first round was meagre – most applications failed - essentially all of the granted projects were within technology, with few exceptions in natural science (Holmberg 2012:78). Holmberg maintains that the domination of technology among the funded researchers and groups was a result of the co-funding requirement and the definition of trade and industry (2012:106).

## The profiles

In 1995 Bjarne Kirsebom was appointed foundation director. With his leadership the KKS becomes more of a policy actor, taking an active part in the business of the newly established universities and university colleges. If in the first period of time the KKS acted more like a research council, with the HÖG and classical peer-review system for quality control, it now aimed to form research endeavours that comprise more aspects than academic quality. This is when the profile support is presented, as a more directed and long-term form of funding. The aim was to provide stability for the university colleges so that they could build up research capacity and infrastructure and develop their skills of working closely with industry. The profiles were supposed to last for five to six years with a total funding of 20-30 million SEK. Except for the new colleges, the art schools and some other institutions without fixed resources were invited to apply, but none of them did. The NSF (National Science Foundation) was involved in the review of the applications in order to guarantee the academic quality and strengthen the role of KKS in the knowledge system (Holmberg 2012). Mälardalen University College was granted a profile in the first round; in 1998 it received funding for the profile Mälardalen Real-Time Centre (MRTC).

## The platforms

The purpose of the platform (for increased R&D cooperation) was to develop research infrastructure and to intensify industry connections in the universities and university colleges that constituted the target group of the KKS. The platform venture was done in collaboration with the government, and the result was 27 platforms in 19 university colleges; in total 195 million Swedish Crowns were spent (Holmgren 2012:104). The majority of the colleges received 10 million, some of the larger ones, Karlstad University among others, received 15 million and some of the smaller 5 million. The platform investment was criticised as it deviated from the statutes, it resembled faculty funding too much as it was handed out to the universities rather than to select groups. There were no expert peers reviewing the applications, and no established means by which the industry relevance criterion could be ensured, but the colleges' central organisation was given free hands to use the money the way they found most suitable. The platform was a grant directed toward the entire college, whereas the HÖG and the profile were directed toward individual researchers and research groups.

With the establishment of the platform programme, the profile programme was put on hold in 1997, although some of the colleges that had previously been promised money did get their applications re-reviewed. This is when Mälardalen University College gets its profile MRTC. Although the programme was launched as a selective measure, it was sustained with the platform 2 programme in 1999, mostly because of requests from the government. 27 platforms in 17 university colleges were granted for the years 2000-2001.

## Knowledge environments

The so-called KK-environments (*KK-miljöer*) were initiated by the KKS in 2006. The programme was described as similar to the profiles but with a larger and broader remit (Holmberg 2012:154). The formation of the KK-environments was preceded by substantial analysis; consultants were engaged to elaborate on the constitution of an academic environment with both academic strength and industrial relevance. The main purpose of the programme was to develop the universities and university colleges in

collaboration with their management boards. Academic excellence, here translated to a profiling endeavour by which a tight research direction was to be chiselled out, was highlighted together with coproduction requirements. The construction of arenas for collaboration between academia and industry was emphasised. The grant procedure was complex and elaborate, with several stages of assessment and analysis of the proposals.

The KK-environments were going to be operated mainly by two different measures, management by objectives and results on the one hand, and, on the other, something that was called network governance, designated as a collective process taking place through dialogue. In practice it meant, among other things, that each university college got a contact person at the KKS that was to help them develop their environment (Holmberg 2012). All the newly established university colleges except Södertörn applied and six of them were chosen to pass on to the next round of the application process. Finally three colleges emerged: Mälardalen University College, Blekinge Institute of Technology and Malmö University College.

In 2009 the three environments were granted their first moneys, 3-6 million SEK. A major conflict line lay in the quality guarantee systems that the universities were to develop. The thought was that these would be responsible for the quality of the research by means of an internal system, releasing the KKS from the task. It did not turn out that way, however. According to Holmberg both form and content of the support shifted along the way, and this lead to strong tensions between the actors involved (2012:167). With the shift in focus of the KKS in 2010 the set of requirements changed, with huge consequences for the recipients. In January 2010/2011 the KKS made the decision to dismantle the KK-environments and after some arguing – and sharp critique from the recipients – all three environments were phased out. As a general and interesting aspect, the Mälardalen and Blekinge University Colleges were deemed to lack academic quality while Malmö University College was deemed to have trouble with the relevance criteria, the coproduction with firms. However, new rounds came in after this and the programme still remains.

# The co-production strategy
# - a trademark of the Knowledge Foundation

> Co-production. The word permeates all that the Knowledge Foundation does. In the Knowledge Foundation's world, knowledge is produced by several players – most often the business and academic worlds – and the resulting profit or value is different for the different producers.

This opening quote is from the web page of the KKS (translation by the author) and captures quite well their view on the co-production strategy as a "magic bullet" for limping research endeavours and poor funding of the new university colleges. The foundation sees it as a win-win model, the researchers benefit, apart from the direct funding, from getting access to "real world" data and problems, they get inspiration and they get access to the skills and knowledge possessed by the company personnel. The companies, in turn, get skills and knowledge from the academic site; they profit from the scientific perspective and get access to the contacts and networks of the researchers. The coproduction strategy can be seen as an endpoint or a plateau of KKS attempts to nail down a mission and mechanism, as a merger of the duality of the original mandate, a consolidation of two missions. In its view, it is the most viable way to guarantee both academic quality and industrial relevance. The foundation has managed to create a policy measure that sees to both and generates additional value. The coproduction process can be seen as one in which the agendas of the researcher and the company are given equal weight in the project design and development of research problems. It is presented as a symmetrical process by the KKS, with mutual influence and mutual gain.

# Summary

There is one funding agency that stands out in their significance for the newly established universities and university colleges at hand: the Knowledge Foundation. Being "the colleges' sponsor" it became an ally for the newly established universities and university colleges, providing strategic funding that helped them develop their research capacities and enter the (inter)national scientific community in which the old universities already had an obvious position. The KKS, however, is not only a provider of funding for research but their mandate includes structural economic matters as well. By supporting regional university colleges, whose *raison d´être* largely involves providing an economic boost to their respective regions, it, however implicitly, become a part of the economic policy nexus, in addition to their role as academic sponsor. This is significant for the KKS, as it constantly navigates between the role as a knowledge policy actor and the role as an economic policy actor.

In a similar manner the newly established universities and university colleges are also knowledge actants and economic actants at the same time. The decision to establish them in the first place was motivated from an economic point of view and they are the objects in an economic policy that wants to breathe new life into regions in decline. Hence, what I want to show is how the making of academic knowledge in no way is an internal academic business. By seeing the role of the newly established universities and university colleges as economic actants as well as academic actants, a better understanding of the situation of the researchers can be obtained.

# 6. Theory – knowledge as making and context

The theory chapter should be seen as a compendium over the theories that have proved to be useful for making sense of the empirical material. It needs to be said that the exposition is grounded in the empirical material to a large extent. Another option would have been to make use of one coherent theory and analyse the empirical material in accordance with that theory. The reason why I have chosen not to has to do with my own multidisciplinary background. A number of theories and theoretical perspectives (governmentality, institutional theory, various organisational theories, for instance) have been scrutinised, tested, and rejected throughout the work with the thesis. The aim is not to explain the behaviour of the researchers and companies as such, but to relate their operations - i.e. coproduction of academic knowledge - to a wider social context. The empirical material has generated various knowledge theoretical reflections and these are mirrored in the theory. These reflections are later on, in the final discussion, put together and related to the context of knowledge making as well as to the wider social context in which the knowledge making takes place. The aim is to offer a way to understand and conceptualise academic knowledge production and the theories here provide the ground work for such an analysis. The context of contemporary knowledge making was extensively elaborated in chapter 3, 4 and 5 and this chapter aims at theorising that background and construct analytical tools by which the cases in this study can be made sense of.

The basic perspective is that knowledge can be seen as making and context. These depictions are the theoretical lenses through which the topic of the thesis is viewed, and presented and elaborated in the first part of this chapter. While providing general ontological perspectives, the first part serves also as an introduction to the field, intended for readers who are not familiar with studies of academic knowledge. The credibility cycle links the

context of academic knowledge making with the practice of researchers and conceptualise academic work as a struggle for credibility.

Another central theme is that knowledge cannot be seen as homogeneous; instead its different internal qualities must be recognised. I conceptualize this as differences in knowledge cultures. The second part of the chapter thus concerns the making of academic knowledge; its internal qualities and characteristics. Within this theme the different knowledge cultures – the scientific, the humanistic and the critical - are elaborated and the scientific culture is criticised. The chapter ends with an analytical framework based on Whitley's theories and Habermas' writings on different knowledge interests, intended for the distinguishing of different knowledge cultures. This part of the theory relates to chapter 9 and 10 in which the empirical material is presented and analysed. The presentation focuses epistemological aspects paired with material and cognitive – that have been scrutinised in the earlier parts.

The credibility cycle is vital for analysing the practice of researcher and the context in which the practice takes place. The analytical framework, on the other hand, is essential for analysing knowledge as output, in its epistemological qualities.

# Making knowledge in a context

In addressing the question of what knowledge is, it first needs to be specified that I study *academic* knowledge, not knowledge in general. Academic knowledge can, arguably, be distinguished from other forms of knowledge in that it is constituted within a system that secures, by means of various forms of control, its 'academic' quality: that it is transparent, and results can be tested and reproduced, or scrutinised by others. It is about a dedicated search for knowledge by trained knowledge workers: researchers. It is a methodologically founded search for new insights, in order to, in a conscious way, systematize knowledge achievements and contribute to a common stock of knowledge available to the scientific community (Chalmers 1976; Sayer 1992). In contrast to other forms of knowledge, academic knowledge is validated by means of the peer-review system where academics evaluate each other's claims. Camic et al. (2011) elaborate on what they call TASK (Traditional Approach to Social Knowledge) and how

this tendency has not been interested in looking at practice, thereby neglecting the opportunity to open the black box of (in their case, social) knowledge. According to Camic et al. the TASK approach is characterized by a "(m)onolithic and enclosed" view on knowledge (2011:8).

## Deconstructing academic knowledge

The aforementioned is the ideal picture of how science functions. Opening up the black box means to illuminate how knowledge – facts, truth – comes into being, exploring the process of how scholars, academic researchers and, later on, the public come to an agreement of what counts as 'true' (Hacking 1999; Schmitt 1995). The process by which this happens is then closed; it is black-boxed. Take vitamins as an example: most people know vitamins are good for you, maybe even essential, they are required for certain bodily functions, vitamin A is good for the eyes and vitamin B is good for hair and nails and so on. Very few people, though, know or even reflect upon *how* and *why* we know all this. What is the reason we have this knowledge, what events lead up to the discoveries of vitamins, how were the discoveries made, by whom, what kinds of instruments or tools were used? Why? Did the manufacturer of the tools have an economic interest in selling them to that lab in which the discoveries were made? Were they even made in a lab? And what about the letters, who came up with that idea? Vitamins are black-boxed knowledge; we take for granted their existence and their significance for the human body, paying little attention to the way we came to know about them. To deconstruct the process by which facts or truths are made is commonly referred to as opening up the black box of science. This can be done by studying the practice of making academic knowledge, as in, for instance, the classic laboratory studies (Latour & Woolgar 1979; Knorr Cetina 1981). Such studies focus on the construction of knowledge within the natural sciences, but there are also examples of the deconstruction of social knowledge (Camic et al. 2011). The turn toward studying scientific practice started gaining momentum some time after Thomas S. Kuhn released the book *The Structure of Scientific Revolutions* in 1962 (Camic et al. 2011).

As an extension of the study of scientific practice are various attempts at enhancing the analysis to also include a broader take on the context in which practice takes place. This can be interpreted as a slight shift in focus

from constructivist to postconstructivist perspectives (Wehling 2006). Postconstructivism in this sense thus refers to the inclusion of a wider context, situated material and discursive practices, within the previously mainly sociological study of scientific practice (see also Epstein 2008). Various materialistic approaches to the study of scientific knowledge can be seen as parts of this postconstructivist turn. Materialistic approaches extend the analysis beyond mere practice to also take into consideration all the material aspects required for academic knowledge to come into being (Cressman 2009; Law 1992). The way I understand it, the actual making of knowledge can hardly be distinguished from the context in which it is made. Hence, I adopt a rather postconstructivist, or material, viewpoint.

## Knowledge process as a network of associations

> ANT attempts to "open the black box" of science and technology by tracing the complex relationships that exist between governments, technologies, knowledge, texts, money and people. It are [sic] these connections that result in science and technology, and by examining them it becomes easier to describe why and how we have the science and technology that we do. (Cressman 2009:3)

In understanding knowledge as a social process, the Latourian concept of society, as a network of associations, is valuable. The ANT approach (Actor Network Theory) can be seen as a theoretical programme rather than a theory as such. Actor Network Theory is a way of analysing particular sets of knowledge claims, technologies, or artefacts by tracing them through the "threads" on which they are anchored to other actants (Latour 1993; Latour 1996; 2011; Law 1992). Although I will not pursue a full network analysis I do embrace the understanding of society that it entails (cf. Joyce & Bennet 2010). Latour (1993; 1996) opposes the view that something can be "social" as in the social construction of knowledge, because knowledge is in itself social; the components of knowledge are the same as the components of society. Saying that something is social implies that there are things that are not social, which Latour claims is false. Even the most pristine natural preserve is social when we experience it as social beings. The Latourian

understanding of society is important for the analysis of the research centres in this study. It entails the concepts of 'flat ontology' and of 'actants' and these are sufficient for making sense of the interaction of social, cognitive and material aspects of knowledge making. An actant is an agent that is not necessarily human; other entities, living and not living, could have agency. An actant is "something that acts or to which activity is granted by others… An actant can literally be anything provided it is granted to be the source of an action" (Latour 1996:373). Flat ontology points to actants, and points out that every aspect of a sociality can be given equal weight in theory. The way I understand it is that there is no need to point to different levels of analysis. An organisational structure can be considered an actant just as well as an idea about the workings of money from a particular funding agency. They can all be considered actants and analysed by their influence on the process of knowledge making. According to Latour, material objects are used to trace social associations, to make objects talk, understand what they do to make others act (2005:79). I use the concept of actant to point to the agency which non-human things have on the process of making knowledge. The most obvious one is money; without funding, participation in the academic system of knowledge production/creation is difficult to enact, hence money can be said to have agency (which is not to say that it has intentionality in and of itself). Historical materialism is also important in the significance it gives money, *capital*. Historical materialism stresses that material conditions influence the organisation of society and the economy (cf. Marx 1867). Research funding and research policy form highly relevant material conditions for academic research. While research funding patterns have the agency to alter, or at least shape, practices in academia, including academic knowledge production, they are far from the only factors of influence. Research policy can be seen as a tool through which control over academic knowledge production takes place, but work in the academy is also affected by general social tendencies, current ideas, ideals and macro-level social currents.

Latour has been criticized for not being sufficiently critical (Bennett & Joyce 2010), as his account of society does not include an analysis of power and because all the actants are given the same weight in principle. Hornborg argues that "Latour's own neglect of technological systems as social strategies of exploitation reflects his lack of concern with global inequalities" (2014:119). This is one reason why I hesitate to make a proper actor network analysis. Adopting a flat ontology as an analytical tool by

which non-human actants are granted agency seems feasible, but at the same time it has to be acknowledged that power is also exerted through and within this network of actants. While acknowledging the power of actants is important, I also believe, however, that a power analysis can complement the ANT-inspired approach, for instance by adding the historical materialist perspective while keeping the relevant concepts of society as a network of associations, actants and flat ontology. The historical materialist perspective provides the hierarchy between different actants that makes the analysis more relevant and sensitive to the power structures that are inevitable parts of the knowledge making process.

A distinction can be made between new materialism and historical materialism (Bennett & Joyce 2011). New materialism relies on the ANT-approach (with its absence of power analysis) while historical materialism builds on the works of Marx and includes a power analysis. The latter approach sees productive forces, such as money, as constitutive factors, and superior to other factors because they illuminate the workings of power; money is an equivalent of power in capitalist society. What distinguishes the newly established university colleges from the traditional universities is their funding situation – they receive far less core funding from the state and relatively limited resources from research councils, and are often in need of forming alliances with firms and regional authorities to raise money for research.

Materialistic approaches take many shapes. They may be deployed for analysing materiality, buildings, bridges and large scale technological projects in general (Bennett & Joyce 2010). The materials interwoven in knowledge, and knowledge that comes from materials, can shed light on how knowledge, with its intangible character, actually takes part in the constitution of material items. One illustrative example of this is the post-colonial interpretation of knowledge as it looks at the many plants and animals taken from their original location providing the basis for the mainstream Western school of medicine. Materials have moved from so-called peripheral locations to the centre of power, further increasing the strength of that centre (Brockway 2011).

Thus the purpose of the previous chapter's exposé of the historical relations between university and society has been to situate knowledge production and making it meaningful by anchoring it to the past and tracing the evolution of the social usefulness of academic knowledge. Not only for the

universities as such but also for the idea of knowledge, it's purposes and its relation to social structures outside of the university.

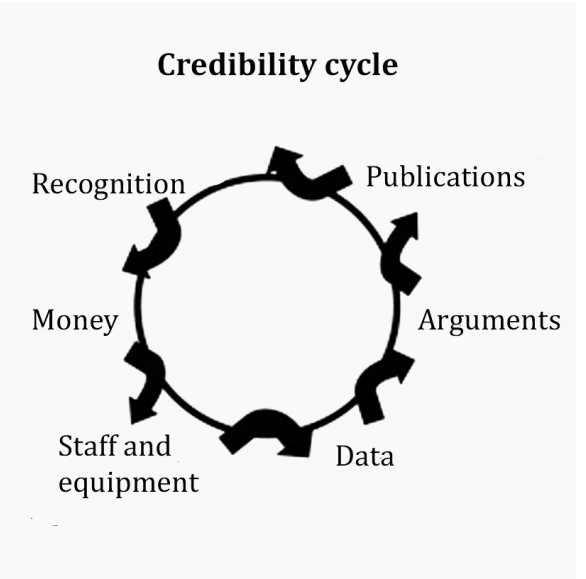
## The credibility cycle: how researchers gain authority in academia

The credibility cycle was developed by Latour and Woolgar in relation to their laboratory studies as a way to integrate material and cognitive aspects of the making of knowledge. What makes researchers reliable knowledge making subjects can be described as a certain authority within the academic system. The credibility cycle (Latour & Woolgar 1979/1986; Hessels et al. 2009) thus provides a tool and a framework for analysing how researchers gain authority in academia, i.e. what resources are required in order for the knowledge produced by a researcher to be deemed true or correct, and thus adequate for providing the ground for further knowledge developments. In the credibility cycle, cognitive as well as material components interact, or are traded against each other in the process of making knowledge and building credibility.

I have right from the first interviews been tempted to conceptualise coproduction in terms of forms of capital or currencies. The argument is that researchers are part of an intricate interaction of exchanges of different capitals, or currencies. Money is a telling example, as it comes in different shapes and with different expectations attached when translated into funding for research. These money forms can be used to create knowledge whose appeal is to either the academic or the external system of validation (or that appeals to both in the same project). If funding requires some sort of industrial collaboration in order to be disbursed, it typically leads to industrial validation, but it can also be converted into articles that provide the researcher some academic credibility. Latour and Woolgar maintain that "credit has all the character of a currency" (1986:192). Hasselberg (2012), too, uses the notion of 'currency' to analyse the role of academic publications among researchers in two different epistemic settings.

The credibility cycle can be seen as a way to schematically describe the struggle for credibility by researchers in their daily work (Hessels et al. 2009). Whitley (1984) has recognized reputation as the main driving force for researchers. The concept of credibility bears resemblance to reputation in this sense, although it pertains to more than just the actual achievements in terms of research. Furthermore, credibility can have various figurations,

such as money, data or staff. The cycle can be pictured like this (inspired by Latour and Woolgar 1979; Rip 1994 and Hessels et al. 2009):




The different components of the cycle, such as money and staff, are converted into other components in the process of building credibility. Hessels et al. stress that the researchers cannot achieve credibility independently; in each step she/he meets formal or informal structures that influence the trade-off between different forms of credibility (2009:392). Hessels et al. further recognize that the actual components of the cycle may change. The model is an appropriate tool for understanding scientific practice, but it also requires sensibility as to what it is that is actually converted and how this is restricted or facilitated by the structures surrounding the research activities.

In the context of the present thesis, the credibility cycle can be used to look at the internal academic system and the way researchers act to be recognized as academic researchers. The researchers in this study are subject to two validation systems that are quite unlike each other. This does not, however, mean that there are no points of contact between them and that components leading to credibility do not travel between the two validation systems. Hence, an analysis is required in order to see how the external validation affects the credibility cycle. The cycle has previously been used for such

purposes, as, for instance, by Guston (2000) who looks at the relations between researchers and a particular category of policy makers.

What distinguishes the work for recognition in academia today is that the ability to get grants - grantsmanship – is essential in order to receive recognition (Rip 1994). Not only does the research outcome have to fulfil the criteria for good research, so must the projects' proposals for grants. Then the research needs to be communicated in such a way that its value becomes clear for funding agencies before the actual research takes place. Furthermore, the relevance criteria and the introduction of non-academic receivers of academic knowledge impinge on the credibility process in ways that will be elaborated in the empirical chapters.

## Knowledge and its internal qualities

I set out to analyse knowledge as output and the actual, or presumed, impact it has on parts of its network of associations. In order to look at knowledge as output, I make a distinction between that part of the network which is internal - the intramural academic system - and that part which is external or extramural to the academic system - society (cf. Gustavsson 1966 for an extensive elaboration of the concepts). To clarify: everything is society, but 'society' here means that which is not the academic system of knowledge production. Actants that belong to the academic system (researchers) are termed internal and actants that belong to 'society' are termed external, the concepts of intra/extramural substitute when appropriate. Likewise, validation can take place internally, by peer-review of results that are communicated to the academic community, or it can take place extramurally, that is they are validated and evaluated for their contribution to something that lies outside the mere internal development of the sciences. In the following section the internal qualities of knowledge are in focus.

## Knowledge cultures – distinguishing different forms of knowledge

The academy internal knowledge can be divided into, categorised and related to various academy external subject areas. The varieties of academic knowledge are, however, in most instrumental, policy-directed theories, squeezed into one entity, 'knowledge' (Walsh 2012). This is problematic, not the least because knowledge in this sense is equalled to scientific knowledge, its organisation, methods and work procedures are taken to be the norm for all academic knowledge production. So when the coproduction process is thought to consist of a smooth, conflict-free, combination of researchers' and companies' agendas, what is hidden is that the respective agendas may vary considerably. Corporate agendas are restricted by the logic of profit-making, while the agendas of researchers are more complex and cover both the need for internal legitimation and for external backing (funding, resources, etc.). An essential component of analysing coproduction is thus to pinpoint various academic knowledge cultures. Hence, the assumption is that academic knowledge making is shaped by cultural differences. Not only in terms of different disciplines, but also in terms of relation to the subject of inquiry, methodological preferences and the mobilization of external support. In the following section university cultures are scrutinised and their relations to society is critiqued.

## University cultures emerge

It has to be said that the phenomenon of research, of actually creating new knowledge in a systematic way, was quite revolutionary. When research emerged as part of the output of the modern university in the 19th century, a new epistemic regime emerged (Delanty 2001). As research activities became institutionalised in the university, the role of the natural scientist researcher was professionalized, and his (as it was at the time) expertise was unquestionable (Ben David 1971). As industrialisation advanced, the value of science for economic purposes also started to come to the fore. The development of natural science, and the organised search for new knowledge about nature, and the *Bildung*-oriented traditional humanist knowledge structure were clearly two very different ways of doing knowledge, in terms of perspectives, methods and work modes. When natural science was institutionalized in the university, two academic

knowledge cultures, existing side by side, but not always without conflict, shaped the university.

In the 20th century science in this modern form (experimental, expensive and based on large teams) has become established within the university and universities gradually become more associated with research than with broad, character-building education. This has fostered an intense and seemingly never-ending debate on the articulation between the humanities and the sciences. Chemist and novelist C.P. Snow held a famous lecture in 1959 about the two cultures, humanities and natural science. His point concerned the inability of the two to understand each other, "the non-scientists have a rooted impression that the scientists are shallowly optimistic, unaware of man's condition. On the other hand, the scientists believe that literary intellectuals are totally lacking in foresight, peculiarly unconcerned with their brother men, in a deep sense anti-intellectual, anxious to restrict both art and thought to the existential moment" (Snow 1959/1998:5). Snow located the problem in the failure of the humanities to recognize the prospects of science. In a famous passage in the ensuing book he elaborates on the reason why people considered true intellectuals do not know a basic scientific fact such as the second law of thermodynamics, the equivalent of having read Shakespeare, and how this is considered perfectly normal while it would be an embarrassing circumstance for a natural scientist not to have read Shakespeare.

I would like to, again, point to the distinction between knowledge as a means to an end and knowledge as an end in itself (where the second law of thermodynamics can be seen as knowledge as a means to an end and Shakespeare as an end in itself). The distinction goes back to antiquity, a time when knowledge was considered an inherent quality that enhances and heightens the soul of the bearer. This kind of knowledge was not to be used for practical purposes (Gustavsson 1966). The opposite viewpoint, that the decisive purpose of the existence of knowledge is to be found outside of its bearer, is often associated with Francis Bacon. Bacon famously said that 'knowledge is power' and by this he meant the power to control and manipulate nature in predictable ways, a sort of engineering power (Gustavsson 1966; cf. Bacon 1627). The distinction is also suitable for analysing technological development; does it take place through mere fascination for the technology as such or does it take place in a way so that the technology is developed with an already defined socially motivated purpose in mind? Is the motive for development technologically inspired or

does it incorporate more aspects, such as philosophical or sociological considerations of the artefact in question?

## The science critique

Clearly Snow viewed scientists not merely as utility oriented experts but as intellectual leaders of society, the scientific culture was to be implemented everywhere. He was a technocrat in the sense of seeing technical solutions to every problem that could possibly arise (Barnes 1985). Scientism is the belief that natural science is superior to other forms of knowledge (Sorell 1994) and that other forms of knowledge have to be more scientific in order to become valid. Accordingly, scientific perspectives are suited not only for intra-academic development but for addressing social issues as well, resulting in technocratic endeavours equalising social and cultural development with technological development.

Technics is a concept used by Lewis Mumford (1964), the philosopher of technology, and it refers to skills and knowledge central to a technological society.[10] Technology requires not only developers of technology – engineers, infrastructural systems etc. – but it requires a society in which habitants relate to technology and incorporate it into their lives. Technics appeals to a multitude of skills, while the concept of the *megamachine* refers to a technological society in which the skills deemed most important are technological skills. The engineer is the finest and science is the highest form of knowledge. Megamachine refers to how science and technology have become ends in themselves rather than means to serving human needs. For Mumford technology in itself determines social development in megamachine societies. Technological achievements put into use become more important than their actual applications so that if something is possible to make it has to be made, regardless of whether there is a (social) need or demand for the thing in question. The interconnectedness between science and technology reveals how science, by virtue of its ontology, has become an instrument of domination over social and ecological relations.

[10] Technics corresponds to the ancient Greek concept of ”Techne” which incorporates not only technologies or technological artefacts but arts, skills, dexterity etc., i.e. the interplay between social environment and technological development.

Mumford's work can be seen as a harbinger of the material turn of later years (cf. Bennet & Joyce 2010; Alaimo & Hekman 2008). In his works Mumford highlighted the significance of food, clean air and water for the functioning of the human body, stressing how we as humans interact with our surroundings not just through cognition but also through our bodies and the material compounds of these, muscles, fibres, microbes etc., and how the surrounding world also impacts us by its interaction with our material bodies (see also Bennett 2010). In short, we are nothing without the world in which we live, we are our world and technics in the shape of the megamachine works to estrange us from our world. Mumford's (1964) concept of *biotechnics* functions as a description of an ideal state in which technology works for human and environmental needs instead of against them.

Academic science is distinguished by its method of "prediction and control" (Manicas 1987:200). Testing of hypotheses serves as a certification of the validity of scientific theory and as a sign of prediction, of being able to repeat tests and obtain the same result. Therefore the concepts of explanation, naturally the aim of science, and prediction, being based on the same logic, can also be said to be the aim of science (Chalmers 1976). For Manicas, then, "to predict or, by virtue of this, to generate effective technologies, are the most adequate marks of a science" (1987:200). From this follows the connection between science and technology. The fusion of science in this technical understanding (which is far from uncontested) and technology fits well with the concept of technics, where they both form part of a reductionist way of equalling the development of technologies with general technical development.

The view that the natural sciences create, or discover, truth by virtue of its method has been criticised by Feyerabend (1975) and many in his aftermath (for an overview, see Brante 1980). Feyerabend points out that the major discoveries of the natural sciences were not founded on the methodologies and ontologies that have become normative within the field. If there is a certain method by which academic knowledge is made – or it is not one method, of course, but several – scientific knowledge is made according to the scientific method, and scientific can mean many things depending on discipline etc., this is not, however, the same method by which the discoveries in nature upon which the sciences rest were found. The thing is that the scientific method of today, 'prediction and control,' is rather a way to control nature by means of exact predictability (Habermas 1967/1988).

Science has gone from being an experimental way of discovering the world – the value of the thought experiment is also mentioned by Manicas (1987:202) – to being subjected to a solid method that, undoubtedly, has led to many valuable innovations but where the focus is perhaps more on robustness than on new discoveries. Manicas also admits that 'prediction and control' is virtually the same as domination, power by domination (1987:206).

The risk society (Beck 1992) is a concept dealing with how risks have become a general awareness among people in contemporary society. The risk society refers to the risks and hazards that come with scientific knowledge and industrial development, and which pose threats of an irreversible character to the life of plants, animals and human beings. Whereas in traditional modernization risks and hazards came from God or nature, in late (post-)modernization they are a combination of scientific and social constructs.

The risk society puts the sciences in a delicate situation; not only are they expected to solve the problems the world faces, they are also the cause of these problems. In the words of Beck: "Science is *one of the causes, the medium of definition and the source of solutions* to risks" (Beck 1992: 155, italics in original). The belief in development and confidence in the future that was characteristic of classical modernization slowly begins to fade, entailing a lack of faith in scientific expertise (van Zoonen 2012). The realization that scientific progress may not only be for the good and the insight that science can also be harmful (Beck 1992; Beck et al. 1994) leads to a contradictory role for the sciences.

In order to set the course toward a society that is more biotechnics than megamachine, perspectives and insights from the humanities and social sciences are required. Also the fact that science is connected to industrialisation (Manicas 1987; Barnes 1985) increases the tendency; science, technology and the current mode of capitalist production reinforce each other. Manicas goes so far as to call this tendency the fundamental problem of our time.

The dominance of science over humanities can be illustrated with the Mertonian norms, elaborated on page 50. The fundamental distinction is that science is constructed as extricate, as knowledge that stands outside of the knowledgeable subject and thus norms such as communalism and organised scepticism apply. For the other knowledge ideal of seeing knowledge as

intricate to the knowing subject these norms make little sense. I would particularly like to point to the norm of communalism; that knowledge is shared and that, correspondingly, all knowledge made relies on previous knowledge. It is a system that constantly enhances the total amount of knowledge, improves it, questions it, tests and verifies it, thus making it even more robust (Cole 1992). This norm presupposes a view on knowledge as something external to the knowing subject, a contradiction to the emancipation based humanistic knowledge inherent in the person. If academic knowledge was not made available – communicated – to the scientific community and to the public it would be difficult to imagine that it exist at all. Distribution is essential and in this shorter contributions in the shape of journal articles are favoured.

## Sociology and political economy – on the origins of social science

The two cultures identified by Snow neglect the 'third' knowledge culture, that of social science. Social science can be seen as a result of influences both from natural science and cultural science and humanities. The term social science was established by Condorcet, one of the architects of the enlightenment ideology (Delanty 2001). The science about society emerged in the 19th century, a time in which a society different from previous structures emerged and required interpretation. Industrialisation and urbanisation spurred a shift from social relations organised in *gemeinschaft* to a society in which *gesellschaft* is the main structure. Ferdinand Tönnies, the architect of these extensively used concepts, was a German economist and philosopher (Asplund 1991). The roots of social science can be found in political economy and business administration (Delanty 2001; Therborn 1974). Those topics were both about the then-emerging economic system, political economy on the macro level and business administration on the micro level. Business administration developed in the British Empire where it served to support and administer the colonisation projects. When sociology emerged, it was, by and large, as a field highlighting the consequences of the workings of the capitalist economic system – either in the form of rationalization, modernization or social differentiation. According to Wagner, "(c)lassical sociology was, first of all, a response to political economy and, then, to neoclassical economics" (2001:12). With this, two strands of social sciences emerged, one economic and one sociological.

In its nascent phase, sociology was not institutionalised within the university, but the first sociologists were not "leisured elites" but usually scholarly professors with chairs in philosophy, economics, law, history or medicine (Wagner 2001). The attempt to develop a science of society did, by necessity, have to relate to the immense growth of natural science and its fundamental philosophical figuration. In sociology, the first science of society, there are traces of positivism, the epistemology of the natural sciences, and of historical analysis. Epistemologically these are different, even opposite, by virtue of their relation to the subject or phenomena they research. Habermas addresses directly the duality in the social sciences, or sociology, to be more precise. The duality is constituted, on the one hand, by the nomological sciences, sometimes equated with the natural sciences, and the historical or cultural sciences on the other. The difference can be conceptualised as being between explanation and understanding. The nomological sciences produce technical knowledge based on empirical uniformities. This is the basis for "causal explanations that make possible technical control over objective processes by means of conditional predictions" (Habermas 1967/1988:12). In natural science (nomological science, according to Habermas) theories can be controlled by the outcome of the investigation to which they are applied; either they will contribute to the validation of the hypothesis or they fail to do so. This is so because the objects of the investigation are typically well understood, standardized, isolated (Whitley 1984a). In the cultural, or hermeneutical, sciences this is not the case. The hermeneutical sciences, with which Habermas is occupied, i.e. sciences dealing with the understanding of meaning, are not concerned with finding laws. Instead they are concerned with understanding certain events, as such, not as results of the operation of natural laws. Another way to conceptualize the difference between nomological and hermeneutical sciences is to relate it to labour and interaction. Habermas sees the nomological knowledge interest as naturally occurring since it is based in labour and labour is a fundamental prerequisite for human existence. In this sense fishing and hunting can be seen as early ways of manipulating nature for the sake of human benefit. Understanding – the hermeneutic knowledge interest – is equally essential to human existence for without it there would be no interaction between people and thus little prospect of succeeding in the manipulation of nature. The two life areas of labour and interaction are the most basic fundaments of human existence. Labour provides material prerequisites and interaction provides cognitive or emotional prerequisites.

Social science, on the other hand, constitutes a conflict area in that it incorporates elements of both.

Lepenies (1985) sees the social sciences and sociology as oscillating between natural science and literature. He uses the words *cold reason* and the *culture of feelings* to capture the conflict immanent in sociology. The utopian novel of the 18th century can be seen as one of the first forms of sociological analysis. According to Lepenies, sociology was, in its nascent phase, closely connected with literature and it had to distance itself from this in its struggle to become an accepted discipline in the academic system. This is also the reason why they imitated the natural sciences, which began to reach a dominant position within the academic system at the time of the development of sociology. The effect of sociology's imitation of positivism was that it drifted further away from literature and humanities. Sociology became a sort of third culture between the natural sciences on the one hand and literature and humanities on the other.

In short, sociology wanted to be a natural science of society, but society is composed of human beings who act irrationally and hence there can be no natural science of society. Hermeneutics – sensitivity to feelings – must be part of any analysis that deals with society. Alienation of the human is the dangerous result of treating society as a system functioning in accordance with laws that can be revealed by virtue of the logic of the experiment, according to Lepenies. Habermas maintains that the rationality of science and technology is, already from the start, a rationality of disposal, for the exercise of power. Hence, when the technical/nomological knowledge interest begins to dominate, it leads to a world in which fellow humans are viewed as enemies who can, and thus should, be dominated (Habermas 1968/1984:67).

## The critical school of sociology

It would be too large of an undertaking to sketch the development of the social sciences in the 20th century. In this context, I will settle for an account of the critical theory emanating from the Frankfurt School, since this has bearing on the forthcoming empirical analysis.

The Frankfurt School is associated with a rather progressive research institute in Frankfurt, established in 1923, the Institut für Sozialforschung.

In 1930 Max Horkheimer becomes the head of the institute and the intellectual Frankfurt School commences. Besides Horkheimer, Herbert Marcuse and Theodore W. Adorno are usually considered the core of the school (Therborn 1976). The institute became a site of critique for which there was no place at the traditional universities (Horkheimer 1979). It is not an easy task to summarize the critical thought of the members of the institute, as these are diverse and covered many fields. However, there is also contingency and traces of a coherent social theory in the many writings of the institute (Jay 1979).

The critical theory of the Frankfurt School was influenced by the most philosophical parts of western Marxism, or neo-Marxism (Therborn 1976). It dealt specifically with the relationship between theory and praxis and the awakening of the German working class. The institute was deeply affected by German Nazism, not the least because the founders of the institute were Jewish. During WWII the institute immigrated to New York and California and returned after the war to a Europe that was fundamentally altered.

What is noteworthy with the critical theory of the Frankfurt School is that it is in many ways an opposition to the positivist theoretical epistemology. The critique of modern science boils down to the way positivism settles with the current state of affairs and how it contributes to the creation of a society that is governed through the administration of unfree citizens. In the administrative society the logic of modern natural science functions as inspiration for other sectors as well (Bertilsson & Eyerman 1976). The basis for critical thought, thus, is to be found in the questioning of what is taken for granted, which is essential also to Habermas' critical knowledge interest. The later institute, of which Habermas is one of the most influential figures, is also more concerned with critique of the modern scientific perspective and its effects on social order. In the present thesis the critical thought emanating from the Frankfurt School provides both a critique in itself of the workings of modern science, as well as an analytical entry-point through which empirical findings of critical research can be made sense of.

## The colonisation of the life world – why the market leaves its mark on the university

Another major contribution from Habermas is the theory of the systems and the life world. The recent changes affecting the university system, elaborated in chapter 3 and 4, serves to be seen through this theory. Systems – the public sphere and the market sphere – are characterised by strategic rationality. The systems are governed by money and power, respectively, and those steering media render subjective action meaningless. Steering media are anonymous and when they function as they should they are capable of coordinating large and complex systems.

The public sphere – the political-administrative system - is traditionally governed by power, exerted through hierarchies of authority in which positions and charges set the framework for individual action. In the system it is not the human being who is important but the position or function held by this person. The market sphere – the economic system - is governed by the monetary medium and market mechanisms. In this system it is not the subjectivity of the individual that is in focus but an anonymous steering system through which the activities of individuals as well as of companies are determined. In recent times the two spheres melt together, and the monetary logic also comes to dominate the public sphere (Gamble 1979; 1994).

The life world on the other hand is the world as the individual subjectively experiences it. Life worlds are governed by communicative rationality. The life world is, according to Habermas, being colonised by the system. The steering mechanisms of the systems are applied to more and more areas of life that were previously determined by communicative rationality (Habermas 1982/1987).

Policies are created on a systemic level, but they pertain not only to the system but to the life world as well. Jasanoff's (2004; 2005) concept of coproduction is interesting in this sense. According to Jasanoff distinguishing between the world (natural and social) as we know it and the knowledge we can gather about it, becomes meaningless. Her empirical work concerns mainly the creation of knowledge and the creation of policy guidelines and the way in which these practices interact and mutually influence each other. The point is that research taking place in accordance with certain policies contributes to the shaping of certain world views so

that when policy construct academic knowledge as a means towards economic prosperity this contributes to a life world in which economic thinking dominates.

## Distinguishing between different forms of academic knowledge – an analytical framework

Very much has been written about the difference between the natural sciences, on the one hand and the arts and humanities, or human sciences, on the other (Hallberg 1997). Philosophers such as Ricoeur, Dilthey, Foucault, Gadamer and Max Weber have all contributed to the understanding of the differences between science and the humanities. Academic knowledge production is structured into disciplines as a first level of specialization. Emanating from the four faculty pattern (philosophy, law, medicine, theology) the disciplines have become more numerous as specialization increases. Ziman (1996) describes scientific disciplines as invisible colleges that train the researcher in the work of making knowledge according to various principles, norms and ways of conduct (see also Crane 1972). In the words of Ziman (1996:69), disciplines entrench "theoretical paradigms, codes of practice and technical methods that are considered 'good science' in their particular discipline." They furthermore differ in terms of how communication is done, and their publication patterns may vary across an emphasis on books, articles or conference proceedings as ways of communicating results to the wider academic community. Increasingly, disciplines in this compressed sense have begun to dissolve and research tends instead be structured around subject matters that incorporate several disciplines, or subdisciplines (Ziman 2000, Gibbons et al. 1994, Ravetz 1997). Barnes (1985) highlights the connection between increasing scientific specialisation and an increased division of labour, which is a central feature of the capitalist mode of production. Another way of conceptualizing the difference between different strands of academic knowledge is the hard/soft divide. The so called 'hard' sciences deal with quantitative measures, whereas the 'soft' ones are dealing with interpretation and comprehension.

In his account of scientific practices, Whitley pinpoints scientific fields instead of disciplines. He sees them as reputational work organisations, in which researchers struggle to obtain reputation in a ”system of knowledge production and validation controlled through the competitive pursuit of public reputations for contributions to collective intellectual goals” (1984b p. 332). Differences in scientific fields can be derived from two dimensions; first, the degree of mutual dependence between researchers and, second, the degree of task uncertainty. The degree of mutual dependence concerns how contributions from one researcher relate to the work of his/her fellow colleagues. It can be divided into functional and strategic dependence, where the first explains the extent to which researchers have to refer to claims, results, ideas and procedures made by other researchers within the same field in order to be considered a competent contribution, and the latter refers to the extent to which researchers have to persuade colleagues of the significance of their own problem formulations and approaches that they apply to the field in question. The two are connected in such a way that a high degree of one rarely occurs together with a low degree of the other (1984:88-89). The human sciences generally show a low degree of mutual dependence because of, among other things, the diversity and plurality of their audiences, the users of knowledge. Sometimes high reputational novelty can be obtained by a single researcher making a groundbreaking contribution to his/her field, as is the case in social/human science, whereas in physics, for instance, such individual contributions hardly occur. The second dimension, varying degrees of task uncertainty among scientific fields, is, however, more interesting for my thesis. Task uncertainty relates to novelty and the fact that only novel contributions can lead to high reputation. Furthermore it relates to already existing knowledge so that in order to know what is new one needs to be aware of what already exists. Whitley distinguishes between technical and strategic task uncertainty. Technical task uncertainty refers to the extent to which work techniques – methods – produce reliable results. If it is high, methodologies tend to be plural and results are subject to varied interpretations. When it is low, there is an arsenal of well-established research techniques that involve little amount of tacit knowledge. In fields with low technical task uncertainty research results are more predictable and replicable. If a particular problem is to be scrutinized, researchers can rely on formal ideas about how to tackle it, what methods to use and how to interpret the results. Technical task uncertainty thus relates to the variety of problems and tasks to be performed (the equivalent in business is the standardization of raw materials and

variability of objectives), so that "the development of 'pure' elements and homogeneous stable phenomena" (p. 122) has been crucial to the development of the natural sciences and their relatively low task uncertainty. It is difficult to have well-established and understood work procedures without having the same understanding of the objects being studied. Standardisation of research methods requires that the object or phenomena to which they are applied are standardised as well. Sciences marked by the nomological knowledge interest can be characterised by their isolation of phenomena into variables that can be tested and scrutinised. According to Whitley, the use of a particular standardised technique requires "descriptions of the object being analysed which are commensurate with the procedure and this requires restriction of its properties and uniformity of features" (p. 122). Hence, a proper analysis can be obtained by looking at the "variability and fluidity" (p. 122) of the research problems and the techniques applied to investigate them. Likewise, there is a difference between aiming to reduce the complexity of research problems, to be thought of as a kind of objectification of complex phenomena, and addressing and acknowledging the complexity of a research problem.

The degree of strategic task uncertainty refers to the extent to which there is uncertainty about research problems, its significance and how to tackle it. It is also about uncertainty as to what reputational pay-off will result from using different research strategies. Scientific fields with high strategic task uncertainty deal with a large number of problems that are formulated differently and which importance is conceptualised differently. Furthermore, there is uncertainty about what use or value these problems will have for possible audiences. A key aspect is uncertainty about appropriate goals; are there any commonly agreed-upon research goals at all, are there many and are they ordered into some kind of hierarchy? According to Whitley scientific fields show one of three variations when it comes to technical and strategic task uncertainty, either they are high in both forms, or they have a low technical but high strategic task uncertainty, or they display low uncertainty in both. The humanities and social sciences in general belong to the first category (1984:126). In these fields research skills are typically tied to certain topics or areas, it is also localised to a larger extent than what is the case with the natural sciences. Furthermore, in fields with high degree of strategic task uncertainty there is usually insufficient coordination of common objectives, there is also variation in the assessment of the worth of contributions and thus also regarding the kind of

reputation that can be awarded. This is typical for trans-epistemic fields in which problems are partly decided by actors outside of the scientific field in question. The more diverse and diffuse the cognitive objects of a scientific field are, the less agreement there is on research priorities and the significance of research results. Likewise, if there is a variety of funding agencies, task uncertainty tends to be higher. There is a noticeable consequence regarding publication pattern of differing levels of task uncertainty within scientific fields. Technical task uncertainty relates to publication characteristics so that high task uncertainty often leads to longer articles, or even books, because the language with which results are communicated has to capture the ambiguity of interpretation of results and there must be room to explain the research procedure when this is not highly standardised. In fields with low task uncertainty results can be more effectively communicated using shorter space.

Also the knowledge interests found in the writings of Habermas (1967/1988; 1968/1984) are important for my understanding of how to distinguish between different knowledge cultures. Habermas conceptualizes the difference as one between different knowledge motivating interests – nomological, historical-hermeneutic and critical/emancipatory – which in turn can be related to different disciplines, or fields. Habermas' knowledge interests also have a more thorough societal dimension, and in general his theories serve well to problematize the hegemony of a technocratic perspective – scientism – profiling instead holistic perspectives about human beings as social beings.

The technical knowledge interest relates primarily, but is not limited to, natural science, technical research and engineering, and is founded on the capacity to manipulate nature in a predictable way (though it may very well also be applied in the social sciences). This assumes that events and objects can be isolated and turned into dependent and independent variables whose causality and regularity can be tested using the method of falsification and verification of hypotheses (Meusburger et al. 2008). The results coming from this knowledge interest have been highly beneficial for humanity, but can at the same time undermine and colonize other aspects of society – particularly when it traverses the border to the human and social sciences. The technical knowledge interest dominates not only the nomological sciences, but also other areas, such as business administration and economics, in which human conduct is often reduced to easily accountable variables (game theory is a good example, cf. Peters 2008) (Alvesson 1998).

The technical knowledge interest resonates with the accountability dictum often summarized under the banner of "the audit society" (Power 1997) in which everything needs to be accounted for, be made able to express with a number.

The historical-hermeneutic knowledge interest deals with interpersonal understanding; with bridging distances between different groups of people, different times or cultures. Historical research is always hermeneutic, because it aims at understanding behaviour leading to certain historical events, according to Habermas (1967/1988). This interest relates to the humanities (or cultural sciences as opposed to natural sciences), even though it is also represented in for instance business administration, organisational theory and institutional theory, often deploying Foucault's concept of power (Alvesson 1998:108).

Finally, the emancipatory or critical knowledge interest is characterised not only by understanding but of explanatory understanding. The interest is about identifying sources of misunderstanding, both within the mind of the person and on a structural level, and to emancipate the person from "frozen dependencies." This interest relates to critical theory in social science. According to Alvesson, critical theory is marked by the stimulation of a broader reflection about established ideas, ideologies and institutions, for the purpose of releasing blockages and relationships of dominance (1998:106).

In the analysis of the empirical material I look among other things at descriptions of research projects, aims, research objects and expected outcomes. This is well in line with Whitley's conceptions of task uncertainty, and Habermas, too, interprets the dualism between nomological and cultural sciences as one between differences in research objects or phenomena. There is, however, another dimension that I would like to add, and it is based on Lepenies' discussion, based on the writings of de Bonald[11], on how natural science (nomological knowledge interest) is dependent on, or intimately connected to, the idea of progress. The great

[11] Lepenies uses three sources of de Bonald, 'Des Progreso u de la décadence des lettres' (1810) in Oeuvres; 'Des Sciences'; and 'Sur la Guerre des sciences et des lettres', in Oeuvres. I have not succeeded in locating these sources in a language I can read and thus rely on this secondary source.

discoveries were, according to de Bonald, already made (he writes in 1810), and the sciences were now engaged in improving and refining what was already known rather than making new discoveries. The idea that the natural sciences progress is thus a chimera. This is also in line with Feyerabend's methodological anarchism, which can be read as a critique of the preoccupation with methods that primarily serve refinement within the natural sciences. The idea of progress is central also to the social movements that accompanied the development of modern science: industrialisation, modernism, the insight that economic development takes place through innovations.

Progress incorporates some idea of what constitutes 'better', what is distinctive of the state we are progressing towards Hence, in the natural sciences progress is equated with greater refinement, exactness etc., and the idea of what constitutes 'better' can be interpreted in this way. The hermeneutical sciences also improve, but there improvement, and progress, has a different character. The hermeneutical sciences create better understanding, and this is different from refining techniques etc. For the hermeneutical sciences, progress is not a forward-facing linear movement but rather a movement that expands in all directions simultaneously.[12] This corresponds to the level of task uncertainty within a scientific field. Many of the nomological sciences work within demarcated paradigms (Whitley 1984a) in which current sentiments about the characteristics of research objects are robust; they are not constantly scrutinized as in more task uncertain fields and different interpretations typically do not exist side by side. Scientific fields characterised by this paradigmatic robustness require for their existence the idea of progress, because improvement is their task - in terms of better techniques – scientific applications – or in terms of gathering of ever more information about a certain object. The equivalent for the hermeneutic sciences would be a perfect understanding of the system that is society; laws would have to be found so that the behaviour of the inhabitants of this system could be predicted. An impossible scenario.

Hence, making more exact is the idea of 'better' in the nomological sciences. In the hermeneutical and the critical science other constitutions of

[12] This is not to say that progress in the natural sciences is straight, it is rather winding with sidesteps and the occasional step backwards (Knorr-Cetina 1999).

'better' exist and have to be analysed case by case. The point is that by looking at the interpretation of the 'good' that comes out of a research project or inquiry, the knowledge interest governing the making of knowledge within that project or inquiry can be revealed. 'Good' or 'better' are concepts whose meanings are subjective; there is no universal good, but it depends on the interpreter.[13] In deconstructing the idea of progress and analysing its components the implicit values that are hidden in the conceptualization of 'better' can be revealed and reflected upon. I do this by looking at the expected results of research projects or inquiries. What is the good that is thought to come out of it? A basic distinction can possibly be drawn between predefined and open-ended studies. The former's expected results may come in the shape of a clear answer, like yes or no, or like a number. These can be termed predefined studies, because they involve testing of hypotheses or theories and come with an awareness of what results might be expected (a hypothesis may be true or false, for instance). On the other hand there are the projects and inquiries that produce results that don't come in the shape of a clear answer. Instead they may be contradictory, unexpected, and open to interpretation. These types of studies may be called open-ended. Hence, the objects or phenomena of research, and the formulation of the research questions/problems are important analytical questions.

The methodology and problem formulations, furthermore, is here believed to reveal the uncertainty regarding the task of a given research effort. Research methods are ultimately about epistemology; what can we really know and how does the means by which we gather knowledge affect the knowledge we gather (cf. Hacking 1999)? Methods are made meaningful, loaded with meaning, because they ultimately are about what kind of knowledge we obtain about the world, about nature and society. Different methods are associated with different disciplinary traditions and cultures in academia, and about different ideologies. A random methodology book intended for the social sciences and the humanities outlines a multitude of methods that are quite different from the methods of the nomological

[13] Of course, positivism would have us believe that there is a universal good, that is the 'good' that the natural sciences produce and that other sciences are less perfect. This is the scientistic principle (See Habermas 1968/1971:4).

sciences (Reinharz & Davidman 1992). In the humanities, or the hermeneutic sciences, there are few traces of prediction and control as the aim is to understand events rather than finding laws that govern them. In the social sciences, the methodological practices of the nomological sciences occur, a result of the familiarity with positivism (Manicas 1987; Habermas 1967/1988).

# 7. Situating, contextualizing and describing the three R&D case contexts

In chapter 4, the focus was on the expansion of the system of knowledge production, as well as the system of funding agencies in Sweden. This chapter turns the focus to the three research environment cases. I have already described the establishment of the new universities and university colleges as resulting from two contradictory forces: economic policy making and knowledge policy making. These forces are also relevant to the understanding of the evolution of the Knowledge Foundation. This means that both the funding agency and the university and university colleges are caught between the request to be of use for industry and expectations of academic credibility. Because of this, the centres interact with their surrounding environments but also the wider scientific communities. The aim of this chapter is to describe the characteristics of the research centres. I illustrate this with brief narratives, descriptions, of the genesis of the research centres and how industry has played an important part right from the start.

The newly established university colleges can largely be grouped into two groups depending on the strategies they apply to sustain and enhance their activities; those who aim for specialized research within a narrow area, and those who aim for breadth. In this study, Karlstad University and Malmö University College (which could be labelled a city college) generally adopt the strategy of breadth while the third, Mälardalen University College, aims for excellent research within a narrow area (Benner 2008). What they have in common is the fluidity of their funding, where resources come from many different sources, and this is also something I highlight in the following chapter. All of the centres have in common that they each have received a large grant from the KKS at some point in their history.

# Malmö University College – urban and new

Malmö University College (Mah) is a typical city college. Careful planning preceded its establishment in 1998. The governmental investigation *Högskola i Malmö* (SOU 1996:36) contains a quite detailed analysis of the city, its citizens, its challenges as well as strategies not to develop something too much like what already exist in the nearby Lund University. The government commission was in fact an organizational blueprint for the establishment of a new university college in Malmö, outlining the form and function of a new higher education institution. The ambition was to build a college that resembles the old university cities of Uppsala and Lund, in which departments are spread across the city centre, in contrast to newer institutions in which the campus area is typically located outside of the city centre in a concentrated area where mostly students and teachers/researchers move. The idea of the value of a meeting place seems influential in the planning of Mah, positioning it as an urban college:

> Malmö can offer land centrally in the city. This offers possibilities for a study environment where the students get rich contact with the rest of the city. They are inspired and stimulated through meeting people of all ages and life circumstances (SOU 1996:36:82, translation by author).

Although Mah was not really built from scratch - there was, for instance, a School of Odontology already located in Malmö (Elzinga n.d.) – it has been established in a planned manner. The other colleges typically grew from teaching and nursing educations and were established as branches of older universities, but this is not the case with Malmö. The college would resemble the character of Malmö. Therefore, and with the fact that Mah is a city college, the very city of Malmö becomes a more important backdrop than just the trade and industry of the region. Malmö was hit hard by the structural changes of the 1980s when the heavy industries moved abroad. The establishment of a college was part of the plan to stimulate economic regeneration (Stigendal & Östergren 2013). By its own rhetoric the city of Malmö compares itself with Manchester, a city with similar challenges due to structural changes. In Manchester the concept of the leisure industry is seen as a way out of the economic downturn that does not require large

investments (Law 2000). A similar pattern is valid for the IT industry, and Malmö seems to have become a magnet for small-scale start-ups in the field, attracted by the low rents and urban qualities of the city (interviewee 1)[14]. Accordingly the areas of media, arts and architecture are prioritized in the education portfolio of Mah (SOU 1996:35). Furthermore, a large migrant population, rather low educational attainment levels and high unemployment rates characterised the city (Stigendal & Östergren 2013). This led to the research profile IMER (International Migration and Ethnic Relations) and, in general, a socially conscious focus with an integrative mission in terms of both research and student recruitment (SOU 1996:36; Elzinga n.d.). However, engineering is also important to Mah given the sizeable role of engineering in its educational profile, but if there is an 'idea´ of this university college, it is captured by the urban profile. The stress on media education is motivated by the new, fast development of IT and the new communicational patterns that follow, behavioural changes among people in general and the relatively high numbers of media in Malmö (SOU 1996:36:54). Technology information, design, from an art perspective that is not covered by Lund University, and arts, are mentioned and the conclusion is that an educational investment should be within the IT area and with a strong user focus (SOU 1996:36:55).

Research-wise, Mah, like all the new university colleges, needs to search for external funding in order to build and sustain acceptable research environments. As a result of the lack of fixed resources a 'Malmö model' can be discerned, characterised by a multidisciplinary and problem-oriented research effort. Instead of building traditional departments, it is organised around project- and problem focus areas involving many disciplines. The role models are foreign universities and research foundations to which researchers are invited for limited periods of time to work on multidisciplinary projects (SOU 1996:36:61).

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[14] The concept of the leisure industry is taken up by the KKS in the shape of upplevelseindustrin (literally experience industry, but usually translated entertainment industry). Entertainment can be seen as part of the service economy; it is not production of 'real' values, but intangibles, and thus the production of economic values is apparently disconnected from 'real' world based resources in this kind of economy (Lash & Urry 1994; Hesmondhalgh 2002).

# K3 and Medea Collaborative Media Initiative

The research centre Medea belongs to the department K3 (*konst, kultur, kommunikation* – art, culture, communication) at Mah. K3 represents the arts and media focus of Mah, and at the same time the social focus is constantly present, as shown, for instance, in the acknowledgement of social innovation and social entrepreneurship (interviewee 1). Many of the researchers at Medea are based in the K3 department and their activities resemble each other, albeit Medea focuses on research. The three persons who can be considered the founders of Medea were also involved in building up K3. In the words of a Medea interviewee:

> We were six persons who got the opportunity to start from scratch, in a way. We rented an apartment at Adelgatan and together we charted the course for all the educations, for our research strategy, our funding, we planned the house, we did everything. It was the best damn thing I have done in my life. (Interviewee 1)

The interviewee describes the same pioneering spirit that can be found in the other cases in this study. Building something from scratch can be considered an advantage that researchers at the old, traditional universities seldom get to experience. However, when K3 had found its footing and routines, the Medea group began looking for ways to fund a larger research centre. Medea was first funded by a large EU structural fund grant from 2009 to 2012, "*Malmö nya medier*" (medea.mah.se 5). The activities within this project helped shape the direction of what was going to be a successful application to KKS and their environment programme. A larger grant was deemed necessary, not only because of the dreadful task to fund a centre with smaller grants - "you have to invest all your time to apply for and administer these " (interviewee 1) - but also because the rather experimental outlook of Medea required a certain financial stability to thrive. In 2008 Mah was granted money from the KKS to build up a research environment around media- and communication studies and interaction design. The coproduction requirement of KKS was not initially part of Medea's strategy:

> When the decision was made to establish Malmö college there weren't any partners who were strong enough to carry their part of a symbiosis. The situation was that the shipbuilding industry and everything else that had generated employment opportunities in Malmö had collapsed. There was nothing left. (Interviewee 1)

The centre operated on the grant from KKS, but at the same time there was a general discontent with the procedure by which the money was handed out. Medea was required to apply for grants by the same procedure which would have been the case also without the KK-environment (medea.mah.se 1). The KK-environment grants relied on a model by which the colleges were to develop their own systems of quality assurance. According to interviewees at Medea, however, they were instead subjected to the same evaluation procedure as the other programmes. The support was terminated in 2011 by the KKS board, as I describe in chapter 4. This endeavour led to a lot of discontent among the Medea researchers, particularly around the concept and notion of co-production, where different ideals and models clashed. The most sensitive issue seems, however, to be the view that Medea does not produce sufficiently valid and reliable research, as measured by means such as bibliometrics:

> Interviewee: If the current CEO and her staff gradually could come to understand that what we do here is relatively well acknowledged, from an academic perspective, even though it is not within the areas that they have sense enough to judge. That's where it derives from. What we do, it doesn't look very scientific when an economist looks at it with his methodological gaze. […] Unfortunately it may be that he doesn't believe either that the publications we show are top notch within our area, but he may feel that this is complete nonsense…
>
> Me: But of course it's easier to measure it quantitatively, you get a number sort of…
>
> Interviewee: Yes, and this connects to this insane discussion about bibliometrics that I assume you are familiar with?

Me: Yes.

Interviewee: It is just as bad as within the third task. And, really both research and the third task are going straight to hell as long as you push it in the direction toward that type of quantitative measures. That is my opinion.

Me: Absolutely.

Interviewee: I think of it as cyclical, it swings in periods and in the middle of the 00s we had an extreme tailwind, when the entire experience industry was in the news. Investments were made and there was a great understanding, but now it has shifted back, partly because of this bibliometrics hysteria. Because a lot of what we're doing here is not published in traditional ways, in traditional forums but it can be knowledge that is published in the shape of an exhibition or as interventions. Stuff that doesn't fit with the accepted, measurable forms. And when greater weight is on bibliometrics and it's connected to granting of money the researchers who are not good at getting bibliometrics points are disadvantaged, if you want to be a little snide. For us the result is that we have to pick as many bibliometrics points as possible, even though it may not be the most appropriate way to work.

From the point of view of the Medea personnel it is the evaluation requirement that stirs it all up. From the point of view of KKS, elaborated in the previous chapter, the problem was that the entire profile of the foundation was deemed fuzzy and needed to shape up and become more about research funding in a pure form. Ready-made expectations articulated by the foundation had to be matched when it came to publishing, collaboration and organization. Measurable academic quality and the experimental outlook of Medea was not a viable combination from KKS' point of view.

When the KK-environment was ended Medea developed in a different direction. They employed a new director whose focus areas were on networking and fundraising, in contrast to the former director who was an academic professor (interviewee 1). In 2011 they entered into the field of the Internet of Things and started collaborating with computer engineering oriented parts of Mah (interviewee 3; newsletter sent out 120417). In autumn 2014 Mah decided to reorganise Medea, beginning in early 2015. Existing research projects proceed as planned, but future research projects are to be organised by the faculties. The supportive activities of the centre

are relocated to the Department of Innovation and Development. The story does not end there, however, as Medea will reboot as an experimental research lab in the autumn of 2015, relocated to a new building. The new Medea will be relevant to many researchers from different departments at Mah, focusing on collaborative media and how these can be used in various processes throughout the disciplinary spectrum represented at Mah (medea.mah.se 2).

## The culture of Medea

Medea was strongly embraced by the identity of Mah as a carrier of a new concept in Swedish higher education and research. As an example, the former vice chancellor of Mah, Lennart Olausson, was very supportive of the experimental, tentative and creative focus of the centre, and the inception of Medea as a profile area of Mah (on the basis of the KK-environment grant) showcased the significance attached to the Medea group.

Medea is a culturally conscious environment, rich in cultural attributions and symbols. It may be defined as a sort of subculture with conscious and social awareness, a social critique expressed through consumption, or, alternately, lack of consumption (Perry 2012). Perry sees in this rebellion a resistance to what is considered mainstream, the establishment (and criticises this by pointing to the misconception of adhering to corporate culture when one wants to resist it). Medea fit into the visual expression of hipster culture, and its members resist the mainstream conception of research in collaboration with firms in the version presented by the KKS.

The academic counterculture is also evident in the location of Medea: an old industrial building where submarines used to be built (*u-båtshallen*). It is airy, and forms an open working environment, reminiscent more of a stage room, furnished with old chairs, book shelves and couches, together with desks and tables on wheels that can be moved around, creating a fluid décor that contravenes traditional academic roles and settings (closed corridors and rooms). Central is a number of rows with red velvet vintage movie-theatre chairs taken from an old cinema. This functions as a small stand that can be moved around, serving as an audience room for lectures and events. On top of it all there is a large number of fitness balls rolling around for anyone to use for training or just to sit on.

Medea also functions as a meeting place where more than the regular employees meet. This is confirmed by one interviewee (3) who says it has been a conscious strategy with which they work actively, as a way to communicate and spread their research to the wider external community. Medea has, for instance, instigated a "Medea talks"-series, lectures that not only address academics but practitioners as well.

## The funding situation

Medea, like the other centres in this study, has to a large extent depended on external funding sources whereas support from the university has been more limited. The resource fundament for Medea was already from the beginning rather mixed, with a combination of funding from the European Union, primarily as part of support for urban rejuvenation, and funding from the KKS (as Medea, via Mah, belongs to the target group for KKS). This has later been complemented by support from research councils (the Swedish Research Council, VR and the Sweden's Innovation Agency, Vinnova).

External funding actually formed the impetus to the formation of Medea. The centre was formed on the basis of funding from the EU structural fund, *Malmö Nya Medier* together with Moving Media Southern Sweden were granted in total 75 million SEK in the years 2009-2012.

At a later stage, the media profile was showcased in an application from Mah for a so called KK-environment from the KKS. The initial expectation was that the KK-environment would form the basis for a new wave of activities in Medea, but eventually the entire arrangement was dismantled and the KK-environment around Medea was terminated.

In 2014, Medea was abandoned altogether as an organizational unit of Mah. The area of New Media did, however, resurface within the 2014 KK-environment profile the *Internet of Things and People Research Centre.* In this the media group of Medea was intertwined with Mah's computer scientists. The profile grant from KKS was given to a fusion of the participatory design models of Medea with the computer science group's focus on embedded intelligence and software development. The Medea environment has also attracted grants from the research council system in Sweden, notably when it was granted 18 million for the five year project *Living Archives* in November 2012. Another funder of significance has been

Vinnova. In May 2014 Medea received a grant of 8.1 million from Vinnova for the project *The Data Innovation Arena*, which is based on a consortium with both internal and external participants working for user-driven innovation.

The funding profile of Medea is therefore mixed, drawing on a combination of broad, societal change projects (EU structural funds), traditional research projects assessed in peer review processes, and broadly structured collaborative programmes with a heavy emphasis on networking and interaction across organizational boundaries. This altogether reflects the mixed missions of Medea and its configuration in a wide variety of contexts: societal, academic and market-based.

## Medea and the mission of social change

The hipster rebellion attitude of Medea is shown in their social pathos; the research environment stresses the ethical aspects of working with a certain project and certain partners. One of the interviewees elaborated on the intention of research projects and how their design and aim should resonate with broader ethical considerations:

> I would not enter a coproduction project with partners that I don't share the same ethical… or where the differences when it comes to moral and ethics would be extremely large. (Interviewee 4)

This expresses a strong commitment that will not be compromised even when prospects of getting funded may be harmed. Competitive funding models, and, moreover, the co-funding requirement, may otherwise have triggered a more considerate standpoint toward the needs of the firms involved. But here conviction comes first. It is, however, sometimes difficult to distinguish rhetoric from reality but my interpretation is that they would be more reticent than researchers from the other cases when it comes to work with morally questionable (from their point of view) organisations. I am also told about the project with the Swedish military that was deemed morally difficult. The project was about submarines and interfaces but the

project barely reached the planning phase and the Medea researcher did not get the opportunity to reject it.

Medea cherishes a tradition of critically questioning taken-for-granted assumptions, and to do it in an encompassing way. According to one interviewee all projects start with the question:

> What is the kind of reality we want to have? Maybe we must redefine, on a higher level, well, how society is constructed, almost. (Interviewee 4)

This approach is part of their identity-shaping narrative as radical social actants contributing to change. Within the centre, there is also a more distinct critique directed at policy makers and funding agencies when it comes to their usage of quantitative measurements and their preoccupation with growth (companies started, people employed, participants in events, measuring wealth in terms of GDP growth etc.).

## Karlstad University – in the heart of Värmland

The story of Karlstad University (KaU) is quite unlike that of Mah. While Mah was planned in detail before it even started, Karlstad began as a university branch of the University of Gothenburg. As such it was established in 1967, and a teachers' education was established in 1968. With this foundation Karlstad became an independent university college in 1977, as a result of the U68 and the 1977 government commission on higher education (SOU 1973:2). Just like the Mah, Karlstad aimed for breadth in regards to its educational portfolio, as is shown for instance in the fact that the Nordic languages, together with German, English and French were represented and taught by foreign teachers already in the late 1960s (Cooper 2009). The university campus is located outside the city of Karlstad, something that was subject to discussions and a contest of wills at the starting point (Cooper 2009). Karlstad applied for university status in 1997 and became a university in 1999, as the first of the former university

branches and colleges to receive the coveted status. They brand themselves the modern university (Henckel 2009).

An interesting aspect of KaU is the model of shared leadership at the level of faculties. At the time of the study, the university had one chief executive responsible for employment and financial issues and a dean who represented the collegial government of the traditional university structure but with no formal power in economic and administrative affairs (cf. Benner 2008). This may be interpreted as a typical response of new universities, caught between the internal and external values of academic knowledge, ensuring that academic respectability and line management are installed in parallel (Stensaker & Benner 2013). The afforded reason why it was not be managed by collegiality alone is that it was, from the start, a too fragile academic environment. External legitimacy, from non-academic organisations, was required in order to sustain and enhance the business.

From the very inception, regional connections were central to KaU, primarily within the IT area (as well as forestry and chemistry), thus resulting in a technical profile distinguished on a basis of the needs of regional business life (Benner 2008). The regional connectivity is therefore not centred on the traditional industrial strongholds of the region (forestry, process industry, etc.) only, but also on emerging sectors. The university had magnificent ambitions when it came to IT, where a business park *Hjärnbruket* (which is a play on words, combining homonyms for brain and iron with mill and usage) was initiated in the 1980s. The plans were comprehensive; it was estimated that in 2004 there would be a large computer institute with about one hundred employees and numerous companies (Andersson & Hidén 2003:196). The idea was to anticipate the structural changes and find new economic activities that could sustain growth. Hjärnbruket was later reorganised and renamed Inova in 1994, by then resembling a more traditional business- and science park.

To establish a research platform, Karlstad University outlined a collaboration-based model – which it referred to as the Karlstad model (Andersson & Hidén 2003). This model included part-time professors from other universities, as well as fundraising from local industry. The idea was to propel research intensity by having professors work part-time at KaU while they were also hired by another university. As an example of this, a local bank, *Länssparbanken Värmland*, contributed 3.2 million SEK in 1986 to hire 15 new part-time professors (Andersson & Hidén 2003:207-208).

They did it as a favour to society, to Värmland, their region - according to their own sources, that is. This shows, however, the perceived value of having a research and education institution in the region.

## CTF – the service research centre and Samot – for public transport

The business school of Karlstad was founded in 2009 and is, by definition, not an organisational unit in its own right but is instead held together by a number of education programmes in economics. The business school represents the educational part while the service research centre represents the research part of economics (broadly speaking) at Karlstad University (interviewee 8).

CTF (Centrum för Tjänsteforskning/Service Research Centre) and Samot (The Service and Market Oriented Research Group) are two research centres within the area of service research. CTF is the largest and oldest one and Samot is specifically about public transportation and is funded by Vinnova[15] (Vinnova 2013). According to the interviewees in this study, it is a matter of two equally well-organised and well-funded centres which go into each other, and some researchers work on projects within both. However, Samot can be a large unit in its own right, or it can be a subdivision of CTF (whereas CTF is not viewed as a subdivision of Samot). In the words of one interviewee:

[15] VinnExcellence 2006

> Interviewee: I have taken part in the development of the other centre that we have here, Samot. Which is a centre of the same stature as CTF but depending on what perspective you have it's either a program within the CTF framework, or it's an independent centre, depending on who you talk to.
>
> Me: And what do you say?
>
> Interviewee: It depends on who I talk to (laughter)… internally it is a little tulip-rose, when you speak to the sponsor we are an independent, a centre of excellence. We have the exact same organisational structure as CTF, with a board, we have partner companies, this entire infrastructure. (Interviewee 10)

CTF, founded in 1986, played a central role in the institutionalization of research at KaU. The CTF's founding father, also one of the first professors at KaU, Bo Edvardsson, convinced the then vice chancellor to try out a new organisational form, a centre, as an alternative to the traditional department and topic based organisation. The purpose was to give the service research area a special position. CTF has, without doubt, been one of the most successful centres of KaU. It has engaged both personnel and founders, established close contacts with businesses and, what is probably most important, has a clear focus on a new area that came to be important for the entire economy. Work-life research was one of the first areas of research to be established at KaU and it provided the basis for investment in service research.

A key element behind this successful institutionalization of CTF was the visionary relation to new research opportunities. When CTF was founded, an important event was the very identification of the rise of the service sector and the service economy (cf. Inman 1989); internationally the field was garnering increased attention but in Sweden it was still underdeveloped (source 1). Hence, the focus on services was the result of a planned effort to find a suitable area to exploit. CTF initiated a series of seminars in 1985 where researchers were invited to formulate their point of view on the issue. In parallel, contacts were made with companies, of which Telia (the major Swedish telephone company) has remained an important partner throughout the history of the centre. The knowledge interest of regional firms regarding services was growing as a response to changes in the structural composition

of the economy (source 1). The co-evolution of research issues and societal change reflects the foundation of CTF: "we are defined by what happens out there [in society]" (interviewee 11). A trend was identified and a research area and centre emerged as a reflection of it.

CTF is part of the business school in Karlstad. The centre shows a typical university atmosphere with corridors, offices and lecture halls. Doors are locked between the areas where the students hang out and where the offices are. CTF is shaped by its many external alliances, reflected in the forest of roll-ups that meet visitors. One interviewee explained that the roll-ups are switched; when representatives from Vinnova come to visit the Samot and public transport roll-ups are presented, and when the KKS visits the CTF and service research roll-ups are showcased (interviewee 10). This is a reflection of the significance of external funding for the centre, as well an 'ownership ideology' on part of the sponsors, where each funding agency wants to feel that "their" centre is visible and successful.

## The funding situation

CTF can be said to be built on a four-layered funding model: support from the university, project funding from research councils, network support from KKS, Vinnova and the EU, and various sorts of commissions. The funding streams reflect different articulations of the centre with internal and external stakeholders.

As mentioned, CTF could count on support from the university and from the regional resource mobilization for the university already from the beginning. More recently, the university has increased its profiled support to specially designated centres like CTF. In 2014, CTF was singled out as an "excellent research environment" by Karlstad university, thereby receiving extra support – in addition to the basic appropriations – of up to 15 million SEK annually for five years. The extra funding is used for PhD recruitment, visiting professorships and post-docs, with the intention of propelling the international reputation of CTF. Hence, university funding is used primarily for positions and for recruitment.

CTF holds a number of grants from the different research councils in Sweden, notably the Swedish Research Council and Forte (usually of normal research council size, around 1 million SEK annually). Such projects

are generally related to issues of organizational dynamics and more generic issues of organizational interaction with customers, suppliers and the like. They therefore reflect the more general scientific ambitions of the centre rather than its engagement within broader networks.

Such networks instead form the basis of the support from the KKS. CTF is currently hosting a so called research profile from KKS, drawing on support from companies like Tetra Pak, Ericsson, Volvo and Löfbergs (4.5 million SEK annually from KKS and a similar sum from the collaborating companies). Prior to this, CTF also had one of the first research profiles incepted by KKS. CTF, via SAMOT, is recipient of a VinnExcellence centre for research on transportation. SAMOT funding has been combined with other more specific projects funded by Vinnova on service innovation in transportation. EU funding is another network-based stream, similar in focus and composition to KKS and EU, with collaborating companies (mostly recruited from the local network of CTF) and international partners. Currently (2015), the CTF runs one EU project within Horizon 2020, Service Design for Innovation.

CTF also has a considerable number of commissioned research projects of a more applied and short-term nature, for instance from the Swedish Social Insurance Inspectorate, the Swedish Tax Agency and the Swedish Social Insurance Agency.

Altogether, the funding profile reflects the multifaceted nature of CTF. It has got a strong position within the university, as an internationally attractive environment and the project support reflect its recognition in the Swedish research community. Participation in network programmes mobilises relations to adjacent branches and commissions of more practical nature all together reflects its variegated relations to the Swedish society.

## CTF/Samot and a cautiously critical stance

A recurrent aspect of CTF is the preoccupation with ideological issues. The centre consists of two groups; one of self-identified critical researchers and one that espouses the mainstream innovation discourse where corporate development is at the core. In the critical group there is, among other things, a questioning of dominant beliefs in the market economy and the hegemony of the economic growth paradigm. In a research setting with close contacts

with firms and markets this criticism is played out in innovative ways. Sometimes it is fairly outspoken. One interviewee, for instance, argued that the funder, KKS, focuses too much on growth and too little on sustainability in its priority-setting. Mostly, however, the criticism is motivated by reference to real-world experience. One example is the discussion of values that I have with one of the interviewees. In the service economy and in an individualistic society in which collective values are decreasing, it is the individual's right to define what is valuable to that person. This interviewee has been working with values together with a not-for-profit organisation and maintains that what people really care about are things such as comfort, compassion, voluntariness, and "when such values are considered, the economic growth… it's not relevant. At all" (interviewee 12). Hence, it is the participants in this project that make the researcher realize that economic growth becomes obsolete as a general goal, it is perceived as a somewhat 'objective' research result rather than a reflection of a personal ideological standpoint. Furthermore, some of the interviewees have a specific interest in sustainable development. By using the sustainable development discourse, even the rather unspecific definition by the Brundtland commission[16], a platform is created from which critique can be directed toward the activities of companies without the involvement of ideological argumentation. This can be thought of as an "application oriented critical approach"; well-established ideas are used as platforms from which criticism can be exerted. Another example is when the concept of innovation is used to present alternative views on social and economic development. The mainstream discourse on innovation holds that an innovation is something that creates an economic value; it is something for which someone pays (businessdictionary.com). In contrast to an invention, which is just something new, an innovation is when something new is turned into a commercially viable product or service. In CTF/Samot the concept is sometimes used to point to new ways of doing something, like involving employees for greater democracy in an organisation, or encouraging people to use public transport instead of driving cars by 'innovative' measures. Like one interviewee puts it:

[16] The Brundtland Commission sees sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN 1987).

> The concept of innovation, I use it to highlight, not radical in the sense of weapons and porn, but radical, from an innovation perspective, ways to develop something. (Interviewee 7)

In these cases the meaning of innovation changes from being something that generates an economic value to something that may contribute social change and point to novel ways of handling issues.

## Mälardalen University College – robots and workshop industry

The story of the university college of Mälardalen is different from the other two. It did not start out as a university branch but as a regional college, as an outcome of the 1977 higher education reform. The University College of Eskilstuna/Västerås covered the two county councils and cities of Eskilstuna and Västerås (which was the name of the university college until 1993) and subsequently had the name changed to Mälardalen University College (Mdh). The most characteristic feature of the Mälardalen region is the heavy engineering industry that is located there. Firms like ABB (before 1988 named ASEA) and Bombardier became important partners to Mdh from the very beginning. Industry articulated a need for competent labour, which the university college responded to, instigating educational programmes with relevance to industry. Hence, the embeddedness in the local economy with its industrial strongholds and engineering tradition shaped the direction and identity of Mdh from the very beginning.

Mdh gives the impression that engineering is its primary identity, but another stronghold is the area of public health. At the very start of Mdh, the foundation was also constituted by educational programmes for teachers and secretaries, which are not at all part of the identity shaping narrative of Mdh. It is technology and engineering that they are really proud of. The technology focus, especially in the early years, gives the college a certain masculine outlook, but worth mentioning is that Lillemor Kim was the first female vice chancellor in Sweden, appointed in 1989. “[I]n order to make it even more clear, I had the vice chancellor’s room decorated in white, with

pink coverings and flowered curtains" she explains in the anniversary book from the Mdh (Mälardalens högskola 2007:30, translation by author).

Mälardalen never had the ambition to become a university like the other two cases and even terminated an effort to merge with Örebro University in 2004 (which would have transformed Mdh into a university, albeit in a merged form) (Benner 2008). Instead it aims at being indispensable to its surrounding trade and industry. The "Mälardalen model" embraces close relations with regional industry and a rather narrowly defined focus area at the core of the operations. The almost mimetic proximity to industry also resulted in some clashes with traditional academic norms. The explicit effort to be relevant to firms means that the college distances itself from the traditional academic community. The business of commissioned education is a good example. ASEA (which in 1988 merged with Brown Boveri to become ABB) bought commissioned education in the early 1980s, and by so doing contributed essential funding to the industry relevant engineering area. But the contract education was also a costly business and allegedly drew resources from other areas than the technical one. This was recognised by the student union who filed a report with the Ombudsman (Mälardalens högskola 1977). This also plays out in the conflict-ridden relationship between Uppsala University and Mdh, with a bickering attitude toward the "introverted academics" (interviewee 19) in Uppsala. Uppsala is the closest university and many of the Mdh researchers started their careers there, hence Uppsala University has become a reference point against which Mdh compares itself. The issue of conflict is one between utility oriented - useful - research and the basic, and not based in real-world-problems, research (interviewee 19). The conflict is, however, on a joking level and not to be taken as a serious conflict.

## Embedded systems

Tight bonds with industry have characterized the Mdh right from the start, especially within the area of engineering. The Mdh model consists of close connections to industry and an application focus on the research effort. In this model, the research centre of embedded systems (ES) represents one major specialization, supported and co-funded by regional business in Västerås and Eskilstuna (Benner 2008).

Mälardalen University College is organised in four different academies, one of which being the academy for innovation, design and technology (IDT) and it is within this academy that the centre ES is located. The area of embedded systems is a so-called target area in the college, meaning that its research is highly prioritized in university internal policies (shown, for instance, in allocation of internal resources). Embedded systems is an overarching research profile consisting of a number of projects dealing with aspects of the phenomenon. A central aspect of ES is that it has adapted to the KKS and organised the research in profiles to fit with the expectations of KKS. Mdh got a profile grant for MRTC in 1999 and when it ended in 2005 the staff board prepared to apply for yet another profile grant, but the call did not come and the profile investment was replaced with the KK-environment (interviewee 15). As a result, the IDT consisted of a number of profiles. Lately, however, the overarching projects have been replaced by research areas. These are: dependable systems, real-time systems, robotics and avionics, sensor systems and health, software engineering and verification and validation. The different directions vary in size and consolidations: real-time systems form the historical core whereas others (such as sensor systems) are more recent. Within the larger environment there are several research groups and smaller projects. In general it could be said that the research group is the basis for the activity. Research groups typically consist of one professor, a few seniors and/or post-docs and a number of PhD students. According to their webpage (May 2015) the number of research groups is 14, and the number of active projects is 46. Cross-group constellations across the research groups also occur, but usually for smaller projects.

ES has a basic narrative presented on their webpage and in interviews. The narrative is about four men - academic entrepreneurs - who managed to build up an “excellent” research centre almost out of nothing. The group has developed from minimal recognition to now holding grants from the Swedish Research Council and EU-consortiums. It is a story about underdogs, under-recognized researchers who found their own way. They were self-supervised, as one interviewee puts it. When the members of this group decided to start doing research in addition to their teaching, they enrolled as PhD students at the Royal Institute of Technology in Stockholm but remained at Mdh and financed their research by doing commissioned work and contract education for firms in the region. Hence, they managed to fund their entire research education, and proved themselves useful to the

firms. These founding fathers provided the groundwork for a research centre of an indispensable value to companies. “Coproduction is the air we breathe” as one of the interviewees put it (interviewee 18).

The centre is located in Västerås at the university college campus. It is a distinct part of the building, something that signals an independent research centre rather than an education-based institution. Two things are striking about the environment; first that everything seems to be centred on the common area, the cafeteria and the coffee machine is where you meet. The rest of the building is characterized by narrow corridors and offices, and there is not really any place to interact except for the lunch area. The other striking aspect is the comparably large number of meeting- and conference rooms. They come in all sizes, from conference tables for twenty persons to small rooms with two armchairs, as a reflection of the multitude of external contacts that call for designated areas for this purpose. Almost all of the people I interview have made reservations for rooms so that we do not have to sit in their offices.

## The funding situation

ES is an organizational umbrella of different research directions, with a total annual turnover of 76 million SEK (2014). However, the template outlined by ES is that each of the research directions should have a turnover of at least 10 million SEK annually. All of the directions are heavily imbued in external collaboration. The funding composition of ES is more broad-based than for Mdh as a whole. About 50 per cent of external funding at Mdh come from KKS, with Vinnova as the second largest funder, whereas in ES the composition is more mixed. The most important external funding source is the Swedish Foundation for Strategic Research (SSF), one of the key events in the formation of ES was when it was granted – as the only new university and university college in Sweden – a centre from the SSF. KKS also represents a significant funding source, but lower than for Mdh as a whole (25 per cent of total external support). The KKS supported ES from very early on, through support of MRTC (Mälardalen Real-Time Centre) between 1999 and 2005 via the KK profile programme. Later on, KKS has supported, among other things, a graduate school hosted by ES, and a research profile within the area of sensor systems for the health care system (establish 2013). SSF awarded, as mentioned, ES a so called Strategic

Research Centre in 2005. One member of ES was also awarded a career grant ("research leader of the future") from the SSF.

It should be noted that ES plays a disproportionately large role within Mdh, as it alone obtains almost as much external funding as the rest of the university. The dominant role of ES is reflected in the research strategy of Mdh, where ES is singled out as the only field in which the university college intends to be internationally excellent (mdh.se 1)

Altogether, a number of features stand out in the funding portfolio of ES. First, it is composed primarily of grants of considerable size (centres, programmes, profiles), and most often based on collaboration with industry. Second, funding is variegated, and KKS funding, while significant, is not decisive to the identity and direction of ES, at least not in the self-perception and communication of ES. Here, it is instead profiled as a centre which can compete also with research environments from older and more established universities, as well as with European counterparts.

## ES - peaceful coexistence with industry for mutual benefit

ES is not marked or shaped by discussions about the purpose of the network of activities surrounding the centre. It is a technology oriented research centre. The outlook is adamantly technology-optimistic where technology and its seemingly endless opportunities for technical solutions to any type of social, economic or ecological problem are highlighted. This reflects the centre's approach to coproduction, where the needs and interests of firms form the starting-point. Research projects are sensitive to the needs and requirements of the companies and adjust to the logic of the company, i.e. profit before people, as Noam Chomsky would say. There is, however, in some interviews, an expressed desire to contribute to a better world, and a belief that technology can be a force for good. As an example, one interviewee compares engineering to cancer research saying:

> I think it's a little sad that there aren't any higher purposes, there are no higher, honourable goals with this kind of technical research compared to research in medicine or life science where they more concretely want to help people. (Interviewee 19)

The interviewee further mentions research on robots that can help taking care of the elderly as a possible altruistic area for engineering. The point is that no higher purposes exist; he talks about a deficiency, not about a current scenario.

# 8. Academic actants in the real world

The new university and university colleges are located in a market context in which companies are expected to make use of academic knowledge as a competitive advantage. As a consequence, universities develop various strategies by which to integrate with companies and other external actants. A central aspect of this is the nature of the external actant with which the universities collaborate and seek contact. The type of company (sector, approach to knowledge and logic) obviously has an effect as the companies' knowledge demands vary on the basis of these differences. Accordingly, I will look at two aspects; the strategic work by the research centres in relation to companies and other external actants, and the constitution of the research centres' networks.

## The strategic work

All three research centres are sensitive to their surroundings and reflexive about the needs of their present and future partners. This means taking part in various events and networking exhibitions, and taking a step into the world of the companies in order to assess their current and future knowledge interests. I have studied the centres at a point in time when they were already established and their relations with external organisations largely institutionalised. I have therefore not studied the process by which contacts were established, but rather the way contacts have been reproduced.

For Medea it is part of its identity to interact with the city, to engage and take active part in social activities more broadly, not merely those of industry, commerce or politics. Such engagement is not seen as additional activity but rather an integral part of its action research oriented method and

identity. The location in the middle of the media/entertainment industry in Malmö has given the centre access to, and intensive contacts with, that industry. Medea researchers also interact with external actants within the academic setting, for seminars and other events. The centre accordingly employs coordinators and facilitators working with communication and planning as part of its core staff. The focus on extramural relations has been essential for Medea from the very start, but as a response to the termination of the KK-environment grant in 2011, networking and fundraising activities were further profiled to secure the financial underpinnings of the centre (Interviewee 1).

For CTF/Samot researchers, keeping track of the issues their collaboration partners deem important is a core activity. To a large extent, this has become an organisational routine as the centres have well-established relationships with firms and take active part in various branch-specific events. Such meetings are frequently attended by the Karlstad researchers working with, or toward, companies (interviewee 5; 7; 10). Especially for the Samot researchers who work toward the specific field of transportation (public transport) it is valuable to take part in branch-specific meetings and events – it is an integral part of its identity to engage with, and be visible at, such events where the centre as such is branded as a collaborative partner. For CTF collaboration with specific companies seem more important than interactions with an entire industry.

The centre that takes strategic planning of external relations most seriously, however, is ES. It runs a "coordination department," with three employees whose task it is to keep track of incoming calls and issues that are not directly related to research, including contacts with trade and industry, all subsumed under the label of "portfolio management" and intended to function as a service and facilitator for the researchers at the centre. According to one interviewee "we have drifted into being more and more of a sales department" (interviewee 15), a natural step given the large amount of external funding and the number of projects to keep track of. In addition to project management, the department engages internationally when it comes to building consortia with a multitude of actors. In sum, the coordination department forms an integral part of the centre by managing contacts with external partners and streamlining issues of co-funding, collaborative structures and partnerships.

All the centres are embedded in dense networks of other organizations, academic and non-academic. They all nourish relationships with current or prospective partners, drawing on that for both their research programmes and for financial and other inputs into their research activities.

## The industrial environment

All three centres are based on co-production strategies, but that does not mean that co-production follows a predefined model. Instead they draw on different 'surroundings' when they coproduce knowledge. The environments are shaped in different forms by the constitution and the specific logics of the trade and industry with which they interact. Deciphering these structural properties is essential to understanding the specificities of knowledge production. The centres relate to three distinct types of industrial environments, which influence co-production and hence research.

A key theme in the interviews is the depiction of structural change as a motivating force behind research collaboration. A recurrent theme is that the branches that seek collaboration are in transition where companies strive to embrace change and adapt to new environments. I will not make a full examination of all the external actants associated with the research centres, but will point to some aspects that influence the prerequisites for knowledge production.

## Medea

Parts of Medea's operation were directed toward traditional media companies, such as newspapers and television broadcasting enterprises, firms that face major structural changes with the development of ICT and the proliferation of ICT-based media. In this, Medea "tries to make a small contribution by trying to understand, trying to sketch ways forward in collaboration with these big actors" (interviewee 1). At the same time, the centre defines itself as representatives for the supposedly "new" media branches, and in finding business models that fit with the new ICT

environment. Another part of Medea's network is made up by small companies, often sole proprietors or entrepreneurs who work in networks with other people in similar situations, a pattern which is common in the media branches (Malmö Nya Medier 2009). The industry can be defined as including cultural producers, artists and designers who in one way or another use media in their businesses. This segment of the media industry also includes larger firms, and some of them engage in collaboration with Medea on a frequent basis (interviewee 1).

Hence, among Medea's collaborators there are, first, big companies in traditional media that undergo transitions. A second group of collaboration partners are small companies based on a different logic and representing not merely a branch in transition but an entire economic system in transformation. What is striking about the firms in Medea's network is that they do not fit the common description of companies, or entrepreneurs. In another work I have described them as ideological entrepreneurs because of the fact that they don't see profit making as their ultimate goal (Fischer 2010). Instead they stress their ideological conviction of social change and meaningful social and economic activities. In other words, they are ideological actors rather than rational in the strict business sense. They are incredulous about hiring employees, because hiring inevitably means responsibility for employees, and with responsibility comes long-term planning for consistency and thus less autonomy. This permits a certain freedom to try out and an openness to experimentation. This difference is also recognized by Medea personnel:

> No, but I think there is a damn important structural difference. When you reach a certain point, a company like that, in order to continue to exist it must become profit focused, profit maximizing, solidity oriented. But when it's about one or two enthusiasts the risk is so damn low. If they go all in to what they really want to do and they fail, they don't get that scholarship, they don't get this customer, they fail, it's really not a big thing. They just go bankrupt and then they start something new. And it's no worse than that. We can call it the old kind of companies and the new kind of companies. (Interviewee 1)

The risk taking aspect is emphasised here and how it also helps with the research endeavour. Medea has an experimental outlook in its corporate networking where risk taking and failure are seen as unavoidable and perhaps even valuable. One interviewee highlights another aspect of working with small, risk-taking companies:

> Companies in this branch do not study a phenomenon for three years and then they know they do the right thing but you make twenty things simultaneously, nineteen fail, you never know which one. Hence, quality assurance looks completely different. (Interviewee 2)

The time frame in collaborations with these companies is quite distinct from those of big firms. Whereas large industrial companies generally plan far ahead, companies of this sort do not. One of the Medea interviewees elaborate on how hard it is to get companies to sign coproduction contracts, as research projects are based on a long-time commitment:

> But we don't know if we exist in six years, it was really as if they couldn't sign a contract for six years, so we had to write it for three years, and that too seemed too long for some of the companies. (Interviewee 3)

Compared to the narratives from the other centres on research collaboration with industry, Medea's mode of operation is quite different. Instead of lowering risks associated with research collaborations, aiming to try out new things and find innovations dominates. This stems partly from an ideological conviction that the kind of small companies with which they collaborate constitute a new and important, yet underestimated, part of the Swedish economy. There is constant concern about how funding agencies and other policy makers do not understand this nor acknowledge the importance of this new type of firm:

> Many of the companies I work with now don't see profits as the foremost, they think other values are important, they want a meaningful job […] becoming the new great company may not be on top of the agenda. (Interviewee 4)

In addition to the dense networks with the media industry, Medea has developed similarly rich interactions with social movements, such as a women's organization and street level activists.

> Our work in that area [social innovation] necessarily is about coproduction with actors who are not traditional Swedish limited liability companies but who represent activist movements, social reform movements, public sector. Those who are responsible for social development. And maybe, above all, with focus on underprivileged areas in Malmö. We have done a lot with Rosengård and the movement Gatans Röst och Ansikte[17]. (Interviewee 1)

Researchers at Medea engage directly with organizations like this and avoid an objectivist stance, which, as one interviewee put it, "breaks with the traditional role of the researcher" (interviewee 1). This model for interaction departs from the traditional view on co-production held by funding agencies, turning them into social agents rather than a research centre.

## CTF/Samot

There is a great breadth of companies involved in the two research centres in Värmland. Roughly, they can be divided into two groups, depending on the character of their business. First there are the genuine service companies, for which services have always been the main activity.

[17] Rörelsen Gatans Röst och Ansikte (RGRA) is an organisation using hip hop culture to work with adolescents, mainly from neighbourhoods with low social status.

Länsförsäkringar (an insurance company), Västra Värmlands sparbank (a local bank), and Telia Sonera (a telephone company) belong to this category. The second group consists of retailers, ICA (grocery store chain) and Stadium (sportswear chain), mostly service-based but selling goods. There are also some other companies, which do not belong to either group, but unfortunately there is too little information in the interviews to say something substantial about these. One researcher, however, mentions companies in traditional manufacturing branches having to start thinking more in terms of services to cope with changing market conditions. The interviewee uses a plumbing firm to illustrate; skilful in what they do and very far from university-based knowledge, something which may lead to complications in the firm's collaboration with academics (interviewee 11).

The industrial environment of the CTF is also subject to major changes because of the so-called rise of the service economy. In CTF there are specific research projects dealing with this change, "the servicification of the firm" (interviewee 11). This is about how a firm ceases to be just "the classic big company" but becomes a provider of services instead. One example is the big firm that manufactures drilling equipment which it is now beginning to lease out instead of just selling (interviewee 11). In this, as a general macroeconomic structural change, the knowledge produced at the CTF becomes a valuable asset for firms finding themselves in the middle of it. It is telling that it does research about this transformation from a structural level perspective and at the same time helps firms in transition with specific sets of questions.

Furthermore, CTF/Samot works with both the private and public sectors. When I asked if there was any difference between working with the private and the public sector, and one interviewee answered like this:

> There is the difference that people in the public sector often have a little more time. When I wrote my dissertation, I wrote about the county council (landstinget]…or, I did research on it and a quality reform they made. And often they had, the officials, had a lot of time to spend, I must say, the physicians were kind of hard to meet. But at Sony Ericsson on the other hand, it's very hard to find people to interview. I mean, they are consultants who tender offers on billions of crowns and they are very busy, it seems they work day and night and they are a bit like, why am I supposed to do this? It won't help me to get the next offer. In a private firm, like Sony Ericsson,

> you live in a quarterly report economy in a whole other way then you do at the county council Värmland, your are being evaluated and it is another kind of stress. (Interviewee 13)

Not quite surprisingly it seems to be a matter of time, but there is also a big difference in the business activity between a county council and a multinational company that both manufactures and sells products as well as services and also do a lot of developmental work.

In Samot the partners are actors in public transport: the purchasers, the responsible authorities, branch organisations, the companies who drive the buses and trains, taxi companies, etc. These are both public and private, but since the public actors act on the same market as do the private firms, the marketization of the public sector makes them all adhere to the logic of profit making and efficiency. Transportation and transit are branches that keep on doing what they have been doing historically – transporting people – but still experience changes in the way public transportation is viewed. As one of the interviewees explains:

> Before we were transporting a person from point A to point B as fast as possible, but today we aim instead at trying to keep people in the system of transportation as long as possible. (Interviewee 7)

This is supposed to represent a new way of thinking about transportation that the companies have to adjust to. To meet this challenge collaborations with academia could be a viable way to move forward. Increasing public transportation is a political aim, making Samot a clear-cut example of science for policy-research.

# Embedded Systems

The industrial environment of ES differs to quite a large extent from the other two cases. The point made about branches in transition is partly relevant to ES as well, but more than this the companies in their environment are traditional, industrially based, large companies that really constitute a linchpin of the industry of Sweden (Gagge & Österberg 2006). Four companies are frequently mentioned as the most important partners. These can be thought of as 'the big four': Volvo Construction Equipment (VCE), ABB, Bombardier and Ericsson. In addition, smaller firms functioning as technology suppliers for the 'big four' constitute essential partners. Projects are typically designed with one of the big companies and "a slew of small companies who want to take part and deliver something" (interviewee 14). The small companies can be based on a scientific innovation that is marketed toward one of the large companies, the end user. Although much interaction and collaboration can occur with these smaller companies, the big ones own the projects.

These companies are subjected to shifts in technologies that influence their entire business and motivate academic partnerships. By and large, it can be said that the development of ICT, in a broad sense, introduces new challenges to the business of these companies. In the words of one interviewee:

> Many of the firms in the region that we work with are not traditional software development companies but traditional industrial companies that realise that they need to improve within this area. Which also means they realise that they don't have that competence in-house but can really benefit from doing it together with the university. (Interviewee 20)

Another shift that is mentioned is the shift from hydraulically operated to electronically operated steering systems. In general, computers are embedded in construction equipment the way it has been embedded in cars for a longer time. What is also relevant, but not adequately covered by the empirical material of this study, is the structural shift of the entire economy, away from large, horizontally integrated companies toward smaller,

network-based and more flexible firms. The companies of ES' industrial environment can be contrasted with the "new" firms of the industrial environment of Medea in this sense.

An important aspect of the technological shift facing the companies in the industrial environment of ES is that its impact takes place outside of what is the core activity of the companies. ABB, for instance, builds power transmission stations or robots, and the components are what ES develops - not the product per se. This is, amongst other things, important for the secrecy issue; that companies would want to withhold results. In the words of one ES interviewee:

> In a way it was easier to be at [Volvo] because as soon as I came up with something cheeky I could just publish it, because [Volvo] are not interested in applying for patents cause they don't do communication and they won't develop chips or something like that. While if you're at [Ericsson] or in some cases at [ABB]… so it was nice to be at [Volvo] as a PhD candidate or researcher cause there are no… they just go – get it out as soon as possible so that it becomes standard, 'cause then it will be cheaper for us to buy. Otherwise it might be a problem, you don't get to publish or you have to wait for it to become standardised. (Interviewee 16)

This affects the prospects of being able to publish. Secrecy is an issue in the kind of technological development of ES-related firms. They work with patents and they do not want results to be published too soon. By working with something that lies beside the main activity of the firm they avoid the trouble of interfering with patenting issues. There are, however, researchers who take patenting very seriously, they are usually a few steps closer to the company as industry PhDs (interviewee 21).

# Summary: industrial environment

The industrial environments of the three cases are summarized in the table below. Two aspects have been found to be of significance for the analysis of the coproduction relation, that is the R&D intensity of the firm and the logic by which the firm operates.

| | Medea | CTF/Samot | ES |
|---|---|---|---|
| Sector | Media, culture NGOs | Service (insurance/finance), retail, public sector, public authorities | Technological engineering |
| R&D intensity | High, mostly informal | Low | High |
| Logic | Non-profit, ideological, traditional | Traditional | Traditional |

The industrial environment of Medea consists of large media companies and small "ideological companies" or entrepreneurs. The media sector is going through a shift as a result of the development of ICT. The small, ideological firms represent a new way to conceptualise the economic system. The industrial environment of CTF/Samot is made up of service companies like banks and insurance companies, or, in the case of Samot, by companies in public transportation and retailers. The companies are subjected to the servicification of the economy and, as such, they have a special demand for knowledge. The industrial environment of ES consists of large firms in technological engineering, and small firms that function as suppliers of technologies to the big ones. The companies are affected by technological shifts and this partly motivates them to collaborate with academia.

# 9. Three centres – three academic knowledge cultures

The following chapter deals with the epistemological aspects of knowledge making in the three centres. The aim is to distinguish differences in knowledge cultures among the cases, based on the framework that has been worked out in the theory chapter. The analytical framework is based on Whitley's conception of task uncertainty and Habermas' typology of three knowledge motivating interests, the technical, the historical-hermeneutic and the critical or emancipatory. On a less detailed level there are disciplinary differences, and various disciplinary affiliations, that relate to externally defined subject matters.

The disciplines and subject matters covered by the study at hand differ greatly. From technological computer engineering to business administration to social science to arts and humanities. Furthermore, all of the centres are characterised by doing research with external relevance; i.e. they do research on externally defined problems rather than pure academic problems. In relation to the internal academic system this poses some difficulties that I also address here. Two of the centres I look into consist of several disciplines, and one consists of the rather large and broad subject matter of computers.

## Medea – disciplines

Medea is an interdisciplinary project; it consists of media- and communication studies and interaction design. In the words of one of the interviewees:

> Nah, what I'm thinking of is that…within our field the big challenge, as we see it, is to marry, or at least get a dynamically and interesting interplay between a traditional social science and historically often descriptive, analytical field, mkv [media and communication studies, author's note], with a design-oriented topic, interaction design, that has, when it's good, critical elements but fundamentally it's about finding new items. And especially digital items, but I mean, it's this engineering, focus on the future, focus on what does not yet exist but could exist and what properties it would have and how it would be received and what it would mean for the world. You know, design-oriented. And then over here [gesticulating] you have mkv that traditionally has been devoted to analysing, reflecting, criticising media, the role of media in society but not in the slightest way suggest changes or improvement or new services. Strictly descriptive. And interaction design, strictly design-oriented, future-oriented, interaction-oriented. Getting these two into a creative synthesis is the core of the challenge we took on ourselves already in -97 when we started sketching this institution, k3. (Interviewee 1)

Thus it can be said that the aim has been the development of a new, transdisciplinary field centred on the subject matter of collaborative media. The subject matter is external, it is not a traditional academic discipline and it has been defined with inspiration from the world outside of academia rather than by looking at internal problems. Furthermore, developing research on media has been part of the overall development strategy of Malmö University College, a strategy aiming for the benefit of the city of Malmö rather than only producing high quality academic results. At the time of my first round of interviews I spoke to two persons who can be considered the founders of the centre, one with a background in interaction design and one in media and communication studies.

## Preferences for types of knowledge

Medea shows a stark methodological diversity. The diversity seems to work in every possible way; because the researchers work with a mix of technological research and social research they may do interviews as well as building prototypes. I will start by elaborating the living lab method, it is not the only method used at Medea but can be seen as a feature method. At

the time I made my first round of interviews there were three living labs, all of them founded within the KK-environment (interviewee 2). The living labs are connected to different areas of the city. One of them, living lab The Stage (*Scenen*) is about cultural production and located at the area of Möllevången, a culturally diverse area of Malmö:

> It includes…to investigate together with companies, cultural actors, cultural institutions, new media…how new media can be used in cultural production. (Interviewee 2)

Associated with this living lab are small book, film and music companies. The lab does not have a fixed location but moves around between various places. The lab investigates new ways to produce, promote, distribute and finance cultural products and also how audiences can be engaged in creative processes (medea.mah.se 3)

Another living lab is living lab The Neighbourhood (*Kvarteret*), connected to the area of Rosengård in Malmö, a socially deprived area with poor housing, high unemployment rates and low educational levels (Områdesfakta för Malmö 2008). This lab engages in social innovation and collaborates with the Malmö municipality through the organisation Herrgården's Women's Association[18]. It includes a social agenda, and the rationale described in the quote below resembles action research:

[18] Herrgårdens kvinnoförening is an organisation for immigrant women in Rosengård, Malmö. Their main task is to strengthen the participation of women in society (http://malmo.se/download/18.723670df13bb7e8db1ba44a/1383647238593/Ärende+6.pdf; http://www.svt.se/nyheter/regionalt/skane/jila-brinner-for-kvinnors-rattigheter)

> Not only see processes in the city but make things happen in Malmö, take part in starting processes…establish living labs out in the city to work on social innovation in Rosengård, make the Herrgården's Women's Association not to be seen as a burden but as a resource, help them to develop their business models, for instance. (Interviewee 2)

The activities of Herrgården's Women's Association include food catering, clothing and carpet design- and manufacturing on a small scale. For these activities the living lab investigates how new media can enhance business models and improve the overall activity. From a social innovation perspective the participating women are seen as a resource with skills in languages and knowledge about cultures other than the Swedish mainstream culture. The idea is to take advantage of this by using new media-based methods (medea.mah.se 4).

The third living lab is called STPLN (*Stapeln*, because it is located in the industrial-era shipyards of Malmö), and this is the only lab that remains when Medea in its original shape has been phased out. The building STPLN not only includes the lab but other activities as well, some of which are run by the Malmö municipality culture administration and directed toward adolescents (interviewee 2). The living lab STPLN features a makers space where anyone can become a member and can come build, fix, innovate, develop prototypes, design, and make stuff that cannot be bought in stores (description from STPLN.se 1). STPLN features not only "advanced" technologies but also crafting and sewing machines, a "bicycle kitchen" and screen printing devices. Within this setting Medea runs a fabrication laboratory, a concept emanating from the Massachusetts Institute of Technology (MIT). The idea of a 'fab lab' is to provide a space, tools and materials, where different actants can meet and come up with ideas, elaborate, experiment, design and innovate. The fab lab features Arduino, 3D modelling, prototyping, electronic works, laser cutting and similar techniques. This concept originated with the MIT Centre for Bits and Atoms and its director Neil Gershenfeld (Gershenfeld 2011).[19] The first fab labs were typically located near community centres in order to be accessible to

[19] See also http://www.dn.se/nyheter/vetenskap/ideer-blir-verkliga-i-fablab%5C

anyone. Besides the MIT fab lab the development has, to a large extent, taken place in "developing" countries (Gordon 2011). By providing design and manufacturing tools that used to be available only to engineers at large companies people would be given the opportunity to make stuff by themselves instead of being thrown commodities developed by someone else, producing for the market of one person (Gershenfeld 2011; Gordon 2011). The discourse surrounding the fab lab concept is very much about democratising technology and manufacturing. The democracy aspect lies in the freedom to make one's own items, personalised, instead of buying them at a traditional market. This is especially valuable for "developing" countries, which may not be considered worthwhile markets for investments by large manufacturing companies. Also, the fab labs are often directed towards non-traditional and underserved communities, and sometimes used as part of social programmes for underprivileged youth (Gershenfeld 2011).

The fab lab is just one small part of Medea's living labs but the idea behind the concept can be said to be the inspiration for the other living labs as well. It is not obvious how to describe the living labs in terms of research methods. They do not have one demarcated research subject, but many. Most of all, in academic terms, the processes surrounding the subjects are of importance. Several of the Medea researchers emphasise the value of interrogating the method itself. The labs are highly complex, and the aim is in no way to reduce this complexity, but rather to take advantage of it. The living labs can also be seen as innovation generators in which new items can take shape. The disadvantage then, from the point of view of the funding agencies, is that is that it is an expensive way of doing research. According to one interviewee (1), there are no guarantees at all that there will be any results of value whatsoever.

The living lab methodology has had a fundamental impact on the working ways of Medea, and it continues to be an inspiration also when the living labs have been phased out.

> The methodology, I believe, will live on. Medea will always work with participatory design. Now, when we move into the internet of things and people, the computer scientists are very keen to see the centrality of the human, we don't design for the sake of technology but we always have the user perspective with us. It is some kind of focus on that type of innovation processes in which the user, or user-driven innovation. That's the way it is. (Interviewee 3)

The fab lab concept inevitably leads to an analysis of how technologies are developed. There is room for critical approaches within the critical design concept, (Dunne 2008) and there is room for technological refinement in accordance with the technical knowledge interest. That is the essence of the makers' space, the fab lab and the activity of making artefacts. The activity of investigating this activity might well include hermeneutic approaches as well. Living labs are both the actual manufacturing of items, and the investigation of this manufacturing in terms of how meetings can be facilitated. The way I understand Medea, the living labs can be seen as archetypal in their view on technology. The labs are not for the purpose of developing technologies as such, but rather new fields of application for technologies, and Medea does in fact mainly work with simple technologies. The state of the art is in the application, not in the pure technical solution. In the words of one interviewee:

> You could say that, in general, we work, have done traditionally at K3 and Medea, with as simple technologies as possible. We have not invested in large, expensive technology tools. It is this democracy aspect again, shall we work for everyone? So it's important, if it's a mobile application for example, that it's not only for iPhone but that maybe you can use it with an ordinary phone, you know, like that… (Interviewee 2)

(Author's note: this interview was made at a time when a normal phone was typically not an iPhone or any other smartphone.) This approach points to a way of seeing technologies as a means to an end, not as an end in themselves. It is not the technologies per se that are being researched, but the way they can be made use of in order to fulfil social goals. Hence nomological methods are used for critical or hermeneutic purposes. The

approach is further explained by one of the interviewees when we talk about the relation between social scientists and engineers:

> Internally the social scientists, media scientists in this case, I don't think they feel attenuated or less appreciated and that's because, I think, those who come from the technical side, we come from a topic in which the value of social science has been clear all from day one. (Interviewee 1)

I would like to illustrate the relation between technological development and social goals with another project I am told about by one of the interviewees (interviewee 4). The context is a conversation about different ways of doing research and the interviewee has told me about a project with the intensive care section at the Malmö hospital which was about new media and new forms of learning:

> Interviewee: To be concrete…in this intensive care project they wanted…they had an idea of some classic intranet solution for interactive learning. It was about reading about stuff and then take a multiple choice test, because health care still demands quality assurance and that would be a way to show that…if everyone have taken the test and 80% get through, it is some quality assurance. And that's where we came in and…it didn't result in that kind of solution but in something much more interesting for intensive care, it was about how they could cooperate around their own knowledge production and assure its quality.
>
> Me: How did you do it?
>
> Interviewee: Well, in part we saw that they had a lot of very good projects going on. In order to improve their business. But partly it didn't really come out and partly we saw that they had some problems with cooperation across the professional lines in relation to a concrete question. So, what we developed together with them was a kind of a new learning process in which you actually produced short films about everyday occurrences. And then you watched, and the

> purpose was to arrive at a kind of video instruction, that could be used to double check, if you were to do something that the physiotherapist usually did, but the physiotherapist was not there in the evening, and that type of…And what we saw when we did these films was that they forced people to gather around them. A meeting place emerged where physicians, nurses, care assistants and physiotherapists met and watched and saw, in a very concrete sense, their own reality and this lead to enormous debate. Usually it required that they needed to look over the routines, and they did, and eventually they arrived at some best practice. So it ended in videos they produced themselves and some common learning process across the professional lines. So that was a way to reformulate the initial question.

The subject matter, the quality assurance of knowledge that the intensive care department demanded, was reformulated in the initial phase of the project. A different interpretation of the research problematique appeared when the Medea researcher attacked the problem. Instead of developing a technical solution to the problem, a multiple choice test on the intranet, the subject came to be more about understanding. The first option would have been to find a rather simple solution to a complex problem, but this was replaced by an option in which the complexity was addressed, not by translating it into a multiple choice test, but to take advantage of it and see it as an opportunity for increased learning and understanding among professions in the hospital. The initial question was reformulated, but may have made the project more difficult to accomplish. The intensive care department would probably have been satisfied with the multiple choice test, but from an academic perspective and considering the disciplinary affiliation of the Medea researchers, it was more interesting to investigate complexity instead of reducing it. In terms of project outcomes it can be said that the initial idea of "good" was a technical solution to a problem of quality assurance, i.e. a purpose with relatively low task uncertainty. This first definition of "good" was put into question; a clear definition was replaced with a more fluid and less well-interpreted definition of "good" and task uncertainty increased. In terms of knowledge interests, it can be said to be hermeneutic in that it brought different groups of people together and aimed at increasing the their mutual understanding. It is also emancipatory in that it gave the employees increased control over the

quality assurance of their everyday activity. It may also be argued that multiple choice tests represent an auditing technique that serves to control employees, and by making their own instruction videos instead they were freed from this possibly oppressive control tool. Furthermore the project spread to other hospitals, in both Sweden and Denmark, but, just as the interviewee points out, it is very difficult to find ways by which to measure its impact on the quality of care and thus difficult to make a commodity out of it.

## CTF/Samot – disciplines

CTF/Samot consists of several disciplines: business administration, sociology, including the sub-discipline of working life research, psychology and the sociology of religion. All the disciplines are centred on the external subject matter of services. The Vinnova-financed research centre Samot is specifically about the service of public transportation; thus representing a narrower focus. Even though the subject matter is externally defined, quite clear boundaries are in operation between the disciplines in CTF. They work together and contribute to a fuller understanding of services. According to one interviewee "we make contributions in business administration and in psychology but I don't think we have found a new topic" (interviewee 11). I derive from this that the subject matter of services is an area that can really be surveyed from different angles and different disciplinary perspectives. This is also the reason why there appears to be such sharp lines between the different disciplines, all the researchers contribute their specific perspective to a common subject matter. I asked one of the interviewees about advantages and difficulties with being in a multidisciplinary environment and acquired the following answer:

> Well…often it's the psychologists, they collaborate with each other. We can see that in Samot, there is a cluster within Samot, uh, they have their team, writing their stuff, having their frames of reference, their methods. And then you have, between sociology, or labour research and business administration are very close to each other, organisation theory is often the bridge. But there are no problems, often quite strong similarities in what you do, although you may have different perspectives. I think there are only advantages. (Interviewee 10)

The interviewee highlights how a dominant scientific logic develops, of one discipline that is superior in terms of funding and in terms of influence:

> We have discussed this a lot, and you can say it like this, that it doesn't really get that multidisciplinary but one dominating topic will crystallise. And in this case that topic would be business administration or marketing. And I believe that's one part of the explanation for there is a group, xx and xx that have set the agenda about marketing, and then you can connect, psychology, the methodological skills of psychology can be connected, research about consumer behaviour. (Interviewee 9)

The discipline of business administration dominates, according to this interviewee. It would not be surprising given the subject matter of services that has to do with businesses to a large extent. The psychology discipline, as well as the other disciplines, relates to services and the way they are understood from the business administration perspective.

## Methodological preferences and approaches to knowledge

The methods deployed within CTF/Samot can be captured under the umbrella of social science methods, with all the variety this entails. There are some differences between the disciplines. Business administration, for

instance, has a tradition of working with cases, while psychology works with tests, according to one interviewee:

> It can be that business administration researchers have a very strong tradition of making cases, as investigation methodology, method. While we in psychology are caught up in making experiments all of the time. It can be a bit like…they say –ah, lets make a case here, a case description! And we go haha no way, we have to have a dependent variable here and construct it in two different scenarios. (Interviewee 11)

A significant difference between disciplines lies in their relations to the subject matter. The test tradition in psychology, for instance, relates to greater exactness of the object being scrutinized and to what I term the objectification of complex phenomena. An interviewee from the psychological tradition elaborates on different views of creativity between his/her own discipline and the discipline of business administration:

> I know it sounds a bit dull but I think that the business administrators' perspectives on creativity is a bit fluffier, a little less defined; it is not as well investigated. So, to be honest, I guess I'm quite critical to many business administrators' work on creativity. But basically we mean the same thing. We mean ideas that are new and valuable in a certain context so...If we look at it from a distance it will be the same thing but if you look at how the studies are done, how it has been measured and so, I think there are differences. (Interviewee 11)

The ways by which a phenomenon is measured are mentioned, and aimed to contribute to lesser a stronger definition of the research subject, which here is 'creativity.' The interviewee talks about a difference in perspective, although he/she interpret it as a matter of different qualities.

The research environment CTF/Samot is in a way divided in two. Not formally, but on a cognitive level. Part of the centre's researchers come from the critical tradition and part come from the mainstream business administration tradition. The business administration works with more or less the same methods as does the critical sociologist, but they differ in their

approach. Some of the interviewees declare that they belong to a tradition of critical management, as opposed to the mainstream business administration approach. It is common for the interviewees from this tradition to speak of themselves as critical researchers. This does not, however, define the mainstream approach as 'uncritical'; critical research does not stand in opposition to something else, but belong to a tradition and perspective that can be applied to several aspects. What is meant by critical research is subject to on-going discussions within the centres. On the one hand, it is possible to identify the critical tradition emanating from the Frankfurt school and its Marxist structural analysis (interviewee 5). It is common in what is called critical management studies to apply Foucault inspired frames of reference; as one interviewee points out, going to critical management conferences may be like taking part in a contest about who has read the most difficult books (interviewee 13). On the other hand, there is a general 'critical attitude.' The difference between the two is described by one of the interviewees as:

> Critique in the sense of finding faults and critique in the sense… like theatre or movie or literature critique, in which you engage in a type of advanced analysing discussion about something where you point to different aspects of this phenomenon. Where the question is not good or bad but rather, what is happening, what is taking place in this, what causes do we see, what consequences? (Interviewee 6)

Despite pointing to a variation of critical research, the quote above showcase a hermeneutic approach to research. It is about problematising rather than finding straight answers, adding to the complexity of a phenomenon rather than aiming to reduce complexity.

One of the interviewees at CTF spoke about a project that is done with the purpose of improving the activities of an organisation. The project was in collaboration with a non-profit organisation and it had the clear purpose of improving a specific activity of that organisation.

> So, what I have in this…project, where you do research on how this pedagogic activity could be improved. There is a starting point, in a way, that it could be handled in a better way and then you find the tools to make it better. It is a very applied kind of research. If I were to do this traditionally within a humanities faculty I wouldn't do like that but rather look at what problems does this cause for young people, have that approach where you look at it in a more critical sense, or more open minded, not that it should bring something useful, if you understand what I mean. (Interviewee 12)

The subject matter here – the pedagogic activity of an organisation – is sprawling, it is a complex phenomenon with, probably, little commonly agreed interpretation. Naturally so, because pedagogic activities vary between different organisations and situations and can be tackled by many disciplinary perspectives. The purpose, the aim of the research, is clear however; the pedagogic activity is to be improved, although it is the researcher's task to find out exactly how. Improvement in this sense can hardly be interpreted as a complexity-reducing endeavour, but neither is the aim to add to the complexity. Hence it can be said that the purpose is complex, due to the complexity of the subject matter. Interestingly the interviewee explains that it is unusual for her/him to work with such predefined questions. In the Uppsala tradition in which she/he is trained, this would not be acceptable - or at least very rare. Yet she/he explains further on that she/he finds it thrilling in a way, to be able to contribute directly to something.

The general approach adopted at Samot is similar in that an activity is to be improved - public transportation. The aim is to increase the number of users of public transportation, but exactly how this is to be accomplished is left to the researchers to find out. Another way of approaching it is to do like the researcher who claims he/she "uses public transportation as an engine to stimulate sustainable development" (interviewee 7). The complexity of the subject matter as well as the purpose allows for such agendas. According to another researcher there is an inherent critique against the economic growth paradigm in research on public transportation, "it is done in a paradigm that is anti-growth" (interviewee 12). In this sense the subject matter functions as a springboard from which one's own ideological stance can be developed.

Yet another project description deals with customer involvement and is done in very close proximity to companies:

> The research questions we have are very…often it's empirical phenomena. Take customer involvement…then many companies have said like this –we have heard about this involving customers in the development projects, that it is very positive, but we don't know how to do it in our company. We don't know how others have done it in their companies. So, actually they have a number of practical questions and we have said that we can participate and help out a little. So we make tests, try out one way and then measure it in different ways and then try out a new way and measure it differently. And then we see if it gets more or less efficient. (Interviewee 11)

The process of involving customers in a product development process can be interpreted as a complex phenomenon; task uncertainty is high. This project seems to aim at reducing this complexity by introducing measurements designed to pinpoint efficiency. Making tests usually involves finding variables that can be isolated and measured and in the process some of the original complexity reduced.

## Embedded Systems – disciplines

The researchers at ES work with computers inside artefacts such as cars, industrial robots, or coffee machines; "the hidden computers" (interviewee 18) is a common description of the subject matter. Hence, embedded computer systems are the subject matter within the broader discipline of computer science. As a subject matter it is characterized by less complexity than what is the case at the other two centres. Of course, a computer system is a complex system, but there are well understood and elaborated meanings of this system; there is not much subjectivity involved in determining what a computer system is. There are, however, two sides of knowledge about computers; computer science and computer engineering. These are not to be thought of as disciplines, nor subject matters – both deal with computers but they do so with different foci. An easy way to look at it would be to view computer science as more oriented toward basic inquires and computer

engineering more toward the application part. In the words of one interviewee:

> As said, some people are more into application and others may be more towards applied mathematics where there is a theoretical base in a whole other way. Of course there are different kinds of theory but what I mean is this mathematical tradition. Which is common in computer science. Traditional computer science, datologi, as you say in Swedish, that is more towards applied mathematics, definition, theorem, evidence is the working method, it's deductive research methodology. Then there are others who work in a more inductive way, that's what it's called, right? When you work more like the natural sciences, set a hypothesis that is evaluated. Then we actually have some more social science oriented research where you're out and make studies, interviews, sort of like you do, structured or unstructured and like that… a lot of that research is about the connection between technology and economy. That is, to illuminate, how do you make rational decisions in technology development projects. And these decisions shall be based on economics so to speak, profitability in the business. So that's the connection between the business and technology. (Interviewee 18)

There are various elements represented in ES, all of which deal with computers, both discipline-wise and subject matter-wise, but they still differ to quite a large extent. The most fundamental difference ought to be that between science and engineering, a difference that can be conceptualized as research taking place at various distances from the application of knowledge. According to the same interviewee, most of the projects have synergetic effects so that "the more basic projects lead to applications at a later stage" (interviewee 18). Another interviewee maintains that: "compared to a physics department, for instance, everything in ES is applied, but some of the researchers have money from the VR and this touches upon basic research" (interviewee 15). Another difference is that between different levels of abstraction. Computer systems can be studied in detail, on the level of electrical impulses, and they can be studied as they are implemented by an organisation and being used by people. The rather technical understanding is zoomed in while the software engineering perspective provides more of a panorama view on the subject matter. Another interviewee at ES explains that she/he has softened up a bit. What

they look at in his/her particular project is how a new technology influences the organisation in which it is implemented:

> We have, for instance, done interviews in companies and that kind of inquiry, how does your data management work today, what kinds of problems do you have and who knows what about what data, how do you communicate between departments in your company in these questions… (interviewee 14)

The interviewee further stressed that this project corresponded to the connection between economy and technology, which is also important for ES. The project incorporates a rather broad take on the computer based system, in interaction with an organisation.

## Approaches to knowledge

The computer science/computer engineering distinction and the differences between levels of abstraction correspond to differences in methodological preference. Part of the research at ES resembles laboratory science, but the lab is not a 'white coat and mix liquids in test tubes' kind of place, it is the "we call it a lab but it is an office space, so to speak," according to one interviewee (interviewee 19). Another interviewee puts it like this:

> If you compare us with another discipline, then the computer is the experiment in itself. I mean, a chemist sits with a lot of bottles and stuff and put things on fire and receive things and then it goes to the computer and writes in what it has found. While we actually write our experiments, it's in computers that we are to drive at the end, but these computers are embedded in stuff, the computer in the phone, the computer in the car, in the robot and so on. And so we have various labs here, partly physically here, we have a robot lab with an industrial robot, which students work on in their examination jobs and so on. And wonder if I can say, guess I can, we have an Ericsson-lab with fully functioning base stations on which we lab, and

> they actually put it in their frontline, in what's not yet on the market. (Interviewee 14)

Again, the value of collaboration with a large company is stressed and the significance that Ericsson has placed one of its labs at Mdh, even in the form of a "secret" lab. According to this description what ES does is laboratory science, with the difference that it does not require large scale, expensive equipment the way other laboratories may do. The computers are both the subject of experiments and the tool by which the experiment is done. According to interviewees ES also has connections to several other laboratories in the city of Västerås, as for instance the *robotdalen* (robot valley), which is a triple helix-endeavour focussing the robotics research in Västerås funded by Vinnova.

Another methodological preference is the methods that resemble qualitative social science methods (such as the one mentioned above). This area is commonly referred to as software engineering and it includes every aspect of developing software in a context, i.e. also the human aspects of it.

The rationale of ES is to benefit companies, both in pure technological development and software engineering. The large industrial companies with which they work are governed by the traditional corporate logic of profit making, and they are interested in funding research that may contribute to future business sustainability and profit. This makes the expected outcomes of ES' company-close research projects comparatively easy to comprehend. Activities can be measured by means of it impact on the well-being of the firm. Research that fits into the company's development strategy, making computer systems more precise or implementing computer systems more efficiently are considered 'good' results in this context.

Increasing efficiency is a reoccurring theme in the interviews. The complexity of the research subject can vary between clearly defined and well elaborated parts of the system to the rather complex and less understood parts of it. In the quote below, the interviewee and I talk about how he/she obtains useful results in his/her projects:

Me: Can you describe these kinds of experiments, how do you do it?

Interviewee: Yeah it can be that we have, some kind of algorithm for instance, and you want to find the optimal solution…

Me: Would you mind making an example?

Interviewee: Yes, a concrete example… let me think.

Me: Yes!

Interviewee: One thing could be that in most computer systems you have many programs that drive more or less simultaneously, and then you need to set priorities, which is the most important and should come first. And if many programs want to drive simultaneously you need to indicate which is the more important one. If you set the wrong priorities you get bad performance, or the system may even crash. There is a lot of research about methods by which to set priorities for programs, in order to optimize different characteristics. So, one such problem could be that you have a new method by which to choose priorities for programs and an experiment, then, could be that you have defined some sort of test environment, a number of cases and then you try out your method and compare it to some reference method, yeah, and just compare it. (Interviewee 19)

This defining of environments could be interpreted as a task pointing to the isolation of variables. But tests are also undertaken in a laboratory environment and as such they pertain to isolated events or variables. The research object in the project description above is characterised by low task uncertainty in that it is well demarcated, or isolated. The project outcome comes in a quite easy to understand manner, either it is more efficient or not, a 'yes' or 'no' response. The research endeavour can be said to follow a narrow path, meaning that it would not be possible to achieve unexpected results. Hence, there is little complexity involved in both the research subject and the purpose of the project.

Another interviewee has worked with the problem area of how to measure efficiency, how firms make use of measurement numbers, in a product development process. He/she explains what he/she has done:

> An exploratory multiple case study, sort of…it was much about, I chose the companies we deemed most interesting, and we landed on five of the seven companies. And then I went out, and partly it was much about doing interviews with persons involved in the product development process, key personnel. And then we identified additional people from the key persons. We looked a little on the documentation available, that describes the work process, trying to find a variety of sources and triangulate the results…and then find out about strengths and weaknesses and potential areas for development." (Interviewee 20)

What is striking about this project is that it deals with a rather complex and uncertain object. It is about product development processes and how to make the monitoring of these more accurate. A product development process involves not only the technology but also people, sociality and organisational aspects. By necessity, then, the projects have to deal with complexity at another level than what is the case in pure technological development. According to the interviewee the result is a "softer" way of developing one's product development process, compared to time and money which are more definite.

> Interviewee: Speaking about value in relation to a business case, it is a value that is connected to the way the market changes. So that we can be assured that we are doing the right thing… it is a way to add a value thinking in the product development so that an engineer can realise that this requirement is maybe three times more important than the other requirement…What you get is the value aspect instead of just –now we're late so let's terminate some requirements. And, you know, not just the cost perspective.
>
> Me: And so the result is simply better products?
>
> Interviewee: Yes, or at least a more formal system that can help you determine value creation in the development process. (Interviewee 20)

The way I interpret this is that the complexity of the product development process is being reduced to a "formal system" being used to evaluate and compare values. The aim of the research is to reduce task uncertainty by

formalizing a complex phenomenon. However, the project uses social science methods and also aims to gain a fuller understanding of a complex phenomenon. In this sense it incorporates hermeneutic elements, albeit for a technical purpose. Worth mentioning is that this was a PhD project and, as such, it can be more open-ended as it is about training a researcher and not only generating results.

## Summary: academic knowledge cultures

The aim of this chapter has been to delineate the academic knowledge cultures prevalent in the three cases. The chapter relates to the theoretical framework aimed at distinguishing between different forms of academic knowledge making. By looking at the subject matter – whether it is complex or well-elaborated – and the relation to this subject matter by the researcher, conclusions can be drawn about the knowledge motivating interest according to which the research is done. The results are summarized in the table below:

| | Medea | CTF/Samot | ES |
|---|---|---|---|
| Discipline | Media and communication studies, interaction design | Business administration, sociology (labour research), psychology, sociology of religion | Computer science/computer engineering |
| Methods | Experimental, action research | Social science methods | Laboratory, social science methods |
| Complexity of subject matter | High complexity, well-elaborated (technology) | Complex | Well-elaborated, sometimes complex |
| Knowledge interest | Hermeneutic, critical | Hermeneutic, critical, nomological | Nomological |

# 10. Knowledge as output - making two values in one project

In the previous chapters the three different research centres of this study have been scrutinised. The last chapter focussed on the different academic knowledge cultures that persist in the material. This chapter deals with the mutual making of internally and externally valid values within the centres. The aim is to scrutinize how colleges with different academic knowledge traditions cooperate with their partners, given that these partners also differ to a large extent. In this chapter, two themes are explored: first, what kinds of values are produced within the centres, with regard to the academic system and the extramural system, and, second, with which system do the researchers self-identify, indicated by ways of validation. The themes are closely connected and this division is more for the purpose of adding clarity.

This chapter is loosely based on the credibility circle as an analytic tool. A core analytical issue, then, is to show how the credibility circle changes when the extramural dimension is added to it, i.e. in what ways are extramural relations and research outputs used to build academic credibility.

## Validation by companies or by the internal academic system

> That what I mean with coproduction, for me, it is constructed so that you have a common task but you enter the project for different motives. (Interviewee 10 at CTF)

This section deals with the question of whether the researchers primarily seek validation from the academic system or from the external system. The purpose is not to make a full examination of all the participating interviewees but to show examples of how coproducing researchers interpret their position. The researchers in this study can validate their results vis-à-vis two distinct systems, the internal academic system and the external system represented by companies or other external organisations. The subject matters of the research centres are externally defined, making applicability an essential part of their business. Regardless of this, the researchers also have to gain credibility from within academia in order to sustain funding and authority. The issue is nicely expressed by this interviewee from Medea, who nevertheless asks questions rather than provide answers:

> And what we do, in these projects, I mean, many people in this environment are practitioners too. I mean, that's the idea to work both theoretically and practically so when we enter projects with companies it quickly becomes unclear who is who, in a way. We are as much doers as they are thinkers in some way. And it's interesting with these switches of roles. (Interviewee 2)

## When validation takes place in the external system

The quote below is from an interviewee at ES:

> Me: Are there cultural differences between, like company researchers or developers and university researchers?
>
> Interviewee: Yes, absolutely. I have been doing some work with computer science people from Uppsala University and they are considerably more, at least in some groupings, more traditionally academic. There is a gap, so to speak, in how you receive results or how you measure. If you measure results that reach out to industry or if you measure in academic merits, numbers of publications and such. And this can often be contrary to one another. (Interviewee 19)

What is interesting with this is, first, that she/he considers her/himself to belong to the industrial system rather than the academic system; the validation that takes place externally seems to be more important. Secondly, there is a difference in how results are measured and received and that these can be contrary to each other. The coproduction alliance is contradicted when industrial relevance actually hinders academic validation.

I would like to use another, quite long and comprehensive, quote from another researcher at ES as an example of when the external validation is most important. The quote below is about how to develop research questions and project designs, as they are supposed to be influenced by the researcher's and the company's agendas together:

> It differs. I have been working with three companies, the first one is VCE [Volvo Construction Equipment] and we started our collaboration by, when I was new I got to go there for two weeks and got to see how they worked. I had some questions, interviews, I met people all day, talk to and knowledge transfer… I learned, I laid the foundation for my entire research in those two weeks. I got to paint my own map and it was extremely exciting! […] But that's one way, you take a PhD student and plant them there, for a week, two weeks, a month, something like that. (Interviewee 14)

This shows how the researchers adjust to one system, the external system; the problems of industry become research problems. If one starts from the problems of industry, or a specific company, and translate it into an academic problem, or if one starts from an academically inspired question and try to adjust it to be externally relevant and fit the problems of a company. This researcher laid the foundation for his/her research and now he/she is focussed on the areas in need of further research from the point of view of the companies, and not just the one he/she went to for his/her PhD. Knowledge about branch and technology problematiques forms the starting point from which research questions that are also academically interesting are developed:

> Personally I think it's important that what I do is applicable and functioning. I don't feel like doing research on a, currently, completely useless algorithm that informs humanity of something without practical significance. I know there is such research and I realise that it's very important because it brings the world forward in twenty years or so. But, for my part, I like applied research. You go out and look at, what kind of problems do you have, at this company, what do you need help with, what is it that you can't handle today? And then you take that and move on to a number of companies and from that you make a synthesis that, yes, this seems to be a general problem and there is no good solution to it. And of course I ask questions from my domain, so I can apply my scientific slash technical knowledge, and then you can build something, theorize from it or start a project around it. So, to construct an amazing database that no one wants because I haven't thought about the most fundamental real problems, I would feel like I've failed, even though I may have made a very innovative solution to a non-existing problem. (Interviewee 14)

Clearly, this interviewee finds his/her value as a researcher in validating her/his results vis-à-vis the needs of the company. Note also how she/he points to the distinction between 'real' problems and strictly academic problems, or, his/her idea of the kind of introverted standpoint that characterises strictly academic development. The same interviewee has also been quite successful in contributing technological development to one specific firm, and this particular collaboration has led to strong bonds. The history between the researcher and the firm began as he/she did his/her PhD in collaboration with them. Eventually the firm employed the researcher, together with the product that was developed during the project, for six years. As the researcher returned to the college they continue to help each other and contribute to each other's well-being, the researcher and the firm:

> Eh, then there is company Z, they came in later on in this project. Once we had techniques and stuff we could start implement it at them and it grew to this commercial collaboration. Nowadays I use company Z as a resource, they get new contacts, with research projects they come in contact with new customers, or potential customers. I get a relevant product, a real product in which I can put my research. I make presentations for them, I still go around making PR and marketing for them, I tell about my research and I tell about

> how amazing this product is. For them, but also for my own research, find collaborations and so on… (Interviewee 14)

One reason why it is so valuable for the company to have a researcher talking about them is that when the product is so technologically advanced, it cannot be marketed in ordinary ways but selling it requires a technical expert. The marketing process takes place among engineers, technicians at various firms who speak the language of technology; in order to market an embedded computational database you need to be able to speak that language (interviewee Z). Hence, it is seen as advatageous to have a former employee, who is also a technical PhD, talking about the product in various fora. The researcher, too, benefits from the access to, in lack of a better word, research material. A list of publications that the interviewee deems have resulted directly from the collaboration with the firm reveals one Licentiate degree, one dissertation (from the PhD candidate who later became part of the project), one journal publication, and three conference or workshop publications. Additionally the collaboration has resulted in a number of indirect publications[20], according to the interviewee.

## When academic validation is at the forefront

In contrast to the position described above, an interviewee from CTF/Samot says the following:

> The research requirement, to write for journals, there is a conflict of interest between that and coproducing with companies…For our survival as researchers, it is that you deliver to the academic community, and to journals. That's it. And I mean, if something falls by the wayside, it's the contact with the companies. (Interviewee 10)

[20] A list of publications emanating from the collaboration cannot be displayed here because of the anonymity issue. The author can provide contact with the researcher if there is interest.

This interviewee seeks validation from the academic system. Her/his survival as a researcher is at stake, and this is what is most important to him/her. This is also a consequence of the characteristic of the branches with which CTF/Samot collaborate. These are typically not 'knowledge intensive' and would not be interested in employing an academic social science PhD, unlike in ES and computer engineering with external career paths for the researcher who works with companies. This also means that the subject matters and knowledge demands of the researcher and the companies are not easily integrated, making it more difficult to combine two validation systems.

To know the branch is important for the CTF/Samot researchers too, especially for Samot which works toward one specific branch. The collaboration partners of CTF are more distributed throughout different branches. Hence, the externally defined field forms the basis for more academic research problems and questions, and in order to formulate academic research they need to have good insight into the branch-specific foundation. Part of this is to know about the challenges facing the companies within that branch, as stated by this interviewee from CTF/Samot:

> Well, partly you live in the branch a bit, listen to the talk and stay up-to-date and find out what they're interested in. Then you find something that you think you are competent, and maybe even interested, in and so it starts. It is an interaction between your own ideas, that can be researched, and a certain branch relevance. But essentially it is I as a researcher that define and find out. (Interviewee 10)

The validation here is primarily to the academic system. The branch relevance is a prerequisite for continued funding and sustenance of the centre, but they engage in coproduction from an academic starting point. Another interviewee from the same centre says it is not a matter of companies "ordering research projects":

> The projects' formulation develops, either in dialogue with the companies, that we are at a conference and meet someone and realise that these are important questions that are discussed in the branch and then go home and highlight it as a possible project. Or, it can be that we, as researchers with a lot of knowledge, come up with a project idea. (Interviewee 5)

This pinpoints a delicate negotiation between the academic values and companies' perspectives. Relevant problems become researchable, academic problems are made relevant. The reason why they go to these conferences is to come up with interesting research questions and problems, but also to stay relevant and to motivate the funding they receive from the branch. An externally defined credibility is necessary in order to sustain funding from industry, at the same time the academic validation is fundamental - also from the perspective of industry.

Another example of how researchers relate to companies is provided by a Medea interviewee. She/he describes to me her/his version of the ideal coproduction relation:

> What you do is that you have this external part, and he has his [sic] interests, you are the researcher, you have your interests, which are not about what is immediately industry-relevant but about what is academically interesting. Then you put these two together and rub it back and forth until you find a common interface where you can agree on doing something that can be interpreted like this and interpreted like that. Something that can lead to both ideas for new products and some nice articles. (Interviewee 1)

This actually resembles the ideal picture of coproduction as articulated by the KKS, but, as the interviewee also points out, it is not a cost-effective way of doing research. It takes time. The interviewee has an uncompromising attitude; adjusting to the needs of the company, you would end up as "a state-subsidized consultant with very few possibilities to make research out of it." I retort that a firm like Volvo (from what I have learned talking to Volvo personnel) would probably prefer to fund research that is a few steps closer to product development, not just, as in the example given

by the interviewee, “designing new concepts within this area.” To this he/she responds:

> Then I would answer, if they came to me and asked that, that this is industrial R&D and you need to solve it with your own money. This is not what we shall use the taxpayers’ money for because it won’t provide a scientific height. That’s what I would say…I guess it’s a question of what you believe in, or why…what you think your task is in the context and whose money you’re playing with and what responsibility you have to them who gave you the money in the first place. So. How pretentious that sounded! (Interviewee 1)

Striking in this is the way he/she seems to remain an academic, even in the highly applied and coproduction intensive environment of Medea where the boundaries between industry and academia are rather indistinct. Internal and external values re combined. They are not identical - they are two quite distinct types of values - but both are allowed and maintained in each project. Ideally it would not only be the responsibility of the researcher to see to both values, but of the company as well. It is not only the Medea people who express concern about ending up as state-subsidized consultants, however. This is also valid at ES, where one of the interviewees says the following:

> There is a conflict, and that is if you become too steered by the companies and their influence and demands and wishes so that you don’t pay attention to the general problems, that you don’t generalise and yes, this company has problems with this so let’s implement it. And that’s when you start to wind up, is this research or is it a solution to a specific problem for a company? And then you start to pussyfoot the grey area between research and development. So it is important to use the companies in the right way. (Interviewee 14)

I somehow get the impression that many of the researchers at ES believe the academic world is too far from what they term “real world” problematics.

They have an interest in asserting their status as respectable academic researchers with integrity, but they would prefer if the academic system could adjust to fit their research than adopt to the academic system themselves. This can be illustrated by the discussion of introverted academics, as in the quote below:

> It's easy that these academic fora become a sort of club for mutual admiration. They can be really square in very narrow topics while industry, these specialised parts may be a small problem for industry but one that attracts research if it is a nice area to research, in a way. It may be easy to formulate mathematically or something. I believe there are many questions that are relevant for industry but that are more difficult to research, or at least more difficult to publish. That it doesn't fit perfectly in the box. (Interviewee 14)

The quote above also relates to the discussion about cultural differences between, on the one hand, researchers from different knowledge cultures, and, on the other, between researchers and company personnel.

## Cultural differences

Many of the interviewees talk about the cultural differences that persist between academy and business, though not always as a problem but more like something pretty much taken for granted. One of the interviewees at ES elaborates on his/her project that was done in collaboration with a consultancy company, and how he/she was a bit of an "odd bird":

> They were very focused on…usually it was shorter commissions…[my project] was about creating new knowledge and long-term, but theirs was about how to create change now, if you put it that way. (Interviewee 20)

What seems to differ was the time frame. Academic research, in contrast to development work, is undertaken with a longer perspective in mind. The difference can also be conceptualized in that the interviewee had a scientific approach, although her/his project was still on a highly applied level:

> There you worked more experience-based and 'this is what it used to be like' and it can lead to a crash…it is harder to say that 'this is how it is' haha…I think I was a small crash because I was the only one with a PhD. (Interviewee 20)

What is interesting about this is that the subject matter did not differ much between the company and the research project, but there were differences in purpose. For the firm the purpose was to develop as quickly as possible, while for the researcher the purpose (at least one purpose) was to create new and academically interesting knowledge, in addition to the applicable knowledge. There is still a clear difference between being a researcher, no matter how applied, and being a consultant, or a company developer. At CTF/Samot an interviewee says the following:

> It's two completely different worlds […] First, usually you deal with people that don't have a university degree. Which means, already at that point, there is an asymmetry. Many of them feel inferior to us. At the same time there are those who act a bit snobbish and see us as providers, of knowledge, to them, in a way. But that's on a higher level in the organisation. So there are different attitudes, some of them have a hard time dealing with us and some think it's really amusing. (Interviewee 10).

Here the difference in educational level is highlighted, but also a cultural difference on a more general level, which is about prejudices or preconceptions that company personnel have about university academics.

The difference between industry types and academics is also expressed as a problem of communication. This interviewee from ES explains that he/she has to begin projects by finding a common glossary by which she/he can make sense of her/his research for the company:

> I learned rather quickly that you have to use different word lists. The one that's working in the academy doesn't work in industry… (Interviewee 16)

Communication troubles on a different level is elaborated in the following quote by this interviewee from Medea, where he/she speaks specifically about how to get companies to join in projects:

> It is my experience from all these [coproduction] projects is that there is a period of six to twelve months that is about building an initial trust. It is about, and now I speak of companies that don't have any specific R&D by themselves, that don't have that much experience from research of academic knowledge making but that are mainly market actors. For them it is usually a big step to understand the purpose of research, what's the point, what do we get out of it…till the next quarterly report, you know. Uh, and in my experience it takes somewhere around six and twelve months to reach a point where they feel safe in that they will actually get something, business-wise, when they enter these kinds of projects. Also the kind of project that is not about developing the next generation of products or services and that may not be received within the framework for this year's account and that may not lead to any measurable direct return but that may change our stock of knowledge, or our ways of conduct, or our network in such a way that in a longer perspective it may actually help us. It takes some time to reach that point, you can't just, as a researcher, enter the company and say that if you work with us then this and that will happen. Then they will be like –we don't think so, we had a researcher here and it was completely pointless. (Interviewee 1)

The quote points to the fact that there are two different worlds that are going to meet, and also that this researcher sees him-/herself as part of the academic world. It is also interesting what she/he says about the importance of building trust, particularly in projects that do not result in an artefact but where the output is much harder to grasp, such as designing concepts and elaborating new ideas. The issue can be interpreted in terms of task uncertainty. When this is high, as is the case in the projects exemplified in the quote, the need for trust is likely to increase. If task uncertainty is low then both actants may be assured that they both know what they are doing.

# Internal and external values

Coproduction processes of making knowledge with values for both the intramural academic system and for the extramural system -'society' or 'economy'- are, in an ideal sense, thought to consist of researchers' agendas and the company's agenda that together form the research question. Out of the project comes both valuable applicative knowledge and high quality scientific results. This view is held by the KKS (cf. KKS 2011). The reality of the cases I look into, however, show processes far from that symmetrical. While most projects bring about values that pertain to both systems, it seems to be the researchers who induce them all. I have never heard a company say something about taking time to understand what is scientifically interesting about the problems they encounter whereas the researchers constantly consider how their academic results could be made useful for the collaborating companies.

Values pertaining to the extramural system differ in their composition; they can be in the shape of technological artefacts, or technological process developments. They can be insights into the business of the external organisation or they can be tools or methods that may help the external organisation function better. They can also come in the shape of "human capital," i.e. access by companies to skilled personnel, or future employees. Internal values, on the other hand, are those that pertain to the intramural academic system of communication. Internal values are those that are mainly used for building on the credibility of the researcher, but the external values can also become part of the circle, as will be shown. The academic publication is central, and it can either be in journals or at conferences and is the main way of communication and distribution of results to the wider academic community. The credibility circle is a useful tool when it comes to making sense of the difference between internal and external values. It cannot simply be claimed that external values go into industry and have no bearing on the credibility of the researcher. There are ultimately three aspects of internal values: theoretical development, methodological development and 'fact-based' contributions that may have some generalizability.

## The differences between values

When I asked one interviewee at CTF/Samot to elaborate on the relationship between internal and external values I got the following answer:

> The simple answer would be that excellent research will benefit companies, I've heard that sometimes. I don't know…I believe its antidote would be that you first give a company report and presentation and so on and then you rework it through again. I believe the truth is somewhere in between. (Interviewee 9)

This quote indicates that there might be a conflict between doing research for companies or other extramural organisations and doing research that pertains to the intramural academic system. there are two kinds of 'value adjustments' in the material, although it is not really two categories, more like two tendencies. There is a tendency toward two quite distinct kinds of values, like journal/conference articles on the one hand, and a company report on the other, or there is a tendency to rather produce one value; there is little difference between that which goes into the article and that which is communicated to the company. Another way of looking at it would be to see whether there are big differences between what are considered internal values and what are considered external values. The following quote is from a researcher at CTF/Samot:

> But we write our research, so to speak, that which is going into journals and then we communicate, for instance 'obstacles for employer involvement' to them, and we don't write about that to a scientific journal. There are cases that we could write about that to a more practically oriented journal, but to, for example understand what a service is, that's more basic research character, and the companies don't sit around and think about what a service is… (Interviewee 5)

Here it is clear that two different values are pronounced in the project context. The external organisation gets the knowledge product it demands but this is not sufficient for academic publications. Publications also result from the project, but these are based on results that are not necessarily communicated to the company. An interviewee from Medea afforded a similar example:

> You could say that we work on concrete development projects, but in which the setup is so that they can draw, from this development project, stuff that can be converted to business directly. I can, from the same development project, draw stuff that I can convert into scientific results…What we have done concretely in this project has no news value, I mean the concrete things we've built or the concrete interventions we've tried, the activities we've had with their customers and so on, has no news value. But as a case study it is actually a relevant example on structural changes in these new media. (Interviewee 1)

Clearly two very distinct kinds of output emanated from this project. The academic output is on a whole other level and even focusses on a different subject matter than the external outputs. In the quote below, from an interviewee at CTF/Samot, the difference is highlighted as a matter of communication:

> But of course, a presentation for industry can never be the same as going to a scientific conference. The target groups are different. The message is not necessarily simpler but it is another message. I don't expect company personnel to be able to understand and comment on the articles I write. (Interviewee 5)

The difference could be thought of as one between differences in knowledge demand between the researchers and the companies. In CTF/Samot much of the task is about theoretical development, and it is a kind of theory in which the companies show little interest. The difference can be conceptualised as

theory oriented and practice oriented output. Even if the subject matter is somewhat similar - the company is a service company and the researchers are service researchers – there is a big difference between theoretical knowledge and practical knowledge about the subject matter. Another interviewee says that the companies often don't want that much text – a power point presentation is enough. "They don't want a hundred pages of text so you usually don't have to spend so much time writing" (interviewee 13). This can be compared to an interviewee at ES who maintains that a common way of coproducing knowledge is to write articles together with company personnel:

> A common thing to do is to make co-publications with industry. This means that, this paper that I wrote after my study at Volvo, Volvo is in. They have a writer on the paper and he may not have written so much of the scientific contribution in it but he read it and commented and in that way he has a complete understanding for what we did. (Interviewee 14)

The service companies in the quote above typically do not have an R&D department; they are marked by low levels of formal knowledge/education while the engineering companies that ES collaborate with are engaged in R&D and characterised by a higher level of formal education. Furthermore, the Volvo personnel engaging in R&D projects typically have a similar basic education as do the ES researchers. They are all engineers. In the CTF/Samot context there is not only a difference in the level of education but also in the area of competence.

Another interviewee at CTF/Samot tells about how he/she puts on different hats depending on the level of engagement with companies:

> Interviewee: This thing with coproduction, it's really hard to tell what's the meaning of it. I mean, we are not going to collaborate in a way so that we work as consultants for them, we're not supposed to have that role. But if it happens that they, in practice, need consultancy we have sold our services. Then we have put on another hat and within this secondary employment regulation done work for them. So yes, it happens that we put on the

> consultancy hat, that's coproduction on a whole other level but is not coproduction within the frame of the research centre.
>
> Me: And how do the companies consider this, is there an understanding…
>
> Interviewee: Yes, yes, they see that we know quite a lot and can come and help them, quickly. And they also understand that they can't get it all within the framework of the research centre but that they have to pay for it. (Interviewee 10)

The values demanded from the company here are too close to development to be academically interesting. The researchers express their awareness of the difference and are keen not to cross the line *as a researcher*. In order to obtain credibility there is no point for the researcher to engage in consultancy work, but it can be done for pecuniary reward, or in order to sustain a good relationship with the organisation in question, or for other – non-academic - reasons.

The quote below, from an interviewee at ES, pinpoints a similar difference between the internal and the external results. Although he/she does not speak of consultancy work, it is about knowledge that is too close to development to be done in an academic context.

> A direct implementation, there is no academic height to that, strangely enough. 'Cause it can be a real revolution, a huge knowledge value in understanding how you did, how you solved a certain problem, and no one cares about that but it's more important with an algorithm that is completely useless, and that's very strange. (Interviewee 21)

The most important point in the quote is that the researcher seems to see it as a fault that the "real-world" problems won't lead to academic credibility.

In the Medea context, one may speak of the relation between what is scientifically interesting and viable from an industrial perspective. The interviewee explains that she/he finds a value in taking part in innovation processes and commercial activities, "but then, of course, I don't do it in order to be able to write more papers but I do it with another mission"

(interviewee 1). Again, activities too close to development are deemed not sufficient for obtaining academic credibility. I suggested that one reason was that it would not lead to articles in interaction design or media and communication studies but in technology, to which the interviewee replies:

> No, I don't think so. Because my experience of similar innovation, close to market, R&D kind of creative processes is that what you end up with that is industrially relevant in the products of the next generation, it is almost never new from a scientific perspective. If I'm to summarize it, a simplified summary of the way things are, then my image is that the lead time between scientific results that are sufficient to present at a conference and that the same idea make its way into a product that can be sold to a customer, in my area that lead time is between five and eight years. And so far I haven't been at a table with a company person who says that – we're interested in a concept with a time horizon of about five to eight years. There is no space for that in their R&D budgets, they need to do more pressing stuff, like what's the next big thing. (Interviewee 1)

Here the main difference between internal and external results seem to be the time frame. Even though the subject matter is similar, there is a difference in the distance from application; scientifically interesting results are too recent to fit into product development. A key aspect of this is the attitude of the company involved. VCE is a large company with substantial resources for R&D. As such, they seem to have a thoughtful understanding of the research process. An interviewee from VCE elaborated on the issue:

> The scientific height is important so that, if you don't have scientific height we are not on the leading edge, I mean, if you look a few years ahead. If it's not scientifically viable it is hard to make products out of it too… (Interviewee at company Y)

But the same interviewee also maintains that:

> It is also like, our goal is to do things that we want to do. We shall not just do research for the sake of doing research, it must be something that is useful for us. (Interviewee at company Y)

Even though companies are careful not to fund research not leading to applications, they do have an understanding of the value of this to the researcher and, thus, also of the fact that scientists must engage in basic inquires and not just applied studies. One interviewee at ES stated that, "it all goes into each other in the way that what we do in these more basic projects will eventually come into more applied projects" (interviewee 18). VCE even has the department *advanced engineering* which actually engages in research that takes place on the stage right before development. While this may not be traditional basic research, it is less guided than pure development work. Another aspect is the industrial PhDs that are funded by large companies like VCE. These have to gain academic merits, even though they are highly applied. The reason why the companies fund them is not only because of the knowledge that comes out of their PhD projects but because they can be employed by the company at a later stage. It does, at any rate, point to an understanding of the value of research that is more basic than development, and that this is typical for the R&D intensive organisations with high levels of formal education among its employees. I ask interviewees at CTF/Samot if the companies can see the value in theoretical development too. Here the context is how to motivate companies to engage in coproduction relations, something that the researcher may have to do over and over again as company personnel move on to new jobs and are replaced by people who do not know about the existing university relations of the company:

> Well, of course there are those who think that it belongs to their…in particular municipalities and…uh, partly private, partly public organisations, branch organisations, they can find a value in taking part, observe, you know, support research. Although they don't really know what they are supporting. It's part of their role, in a way. Those who are clean private companies, like [large telephone company], they think extremely commercially, it's much harder for them to invest in research, they need to get something out of it. (Interviewee 10)

The situation is quite different from that of the ES engineering context. Even if there are some organisations that see the value of supporting research without direct implementation value, like the researcher says, they do not know what they are supporting. It is part of their rationale, but not part of their conscious development strategy. Consequently a lot of effort is invested in trying to get the companies to understand the value of academic knowledge. Something which is already done in the case of research intensive companies. In CTF/Samot this is evident in that the knowledge demand of the companies seem to disturb the making of academic values that would also benefit them:

> I've had plenty of time to think about this thing with partnership, and I'm partly very critical of the naïve picture held by the financiers…I believe sometimes we would rather get rid of these companies so that we could do what we wanted. Then we could produce really good stuff, that would actually also come to benefit the companies, as long as we didn't have to spend time on informing, administering and pretending we deliver. (Interviewee 10)

The quote below is from an interviewee at Medea, and it also shows that there is a considerable difference between values that are external and values that are internal. Staff at Medea, however, work explicitly with communication and they have dedicated personnel for it. This could be interpreted as an adjustment to the knowledge demands of the external organisation, to make them realise the value of academic knowledge.

> Yes, but it's very important how we work…if you see how we work with the webpage and such, we do it in a way so that what we do can really be seen, so that people can take advantage of it, even if you're not an academic and so on. But at the same time we have to, even if we do all that we have to publish in the heavy journals, otherwise we lose our legitimacy there. So even if we do other stuff we don't avoid writing articles. (Interviewee 2)

This indicates that the Medea context is more devoted to be sensitive to the values of academic knowledge. It is also striking that the researchers engage

in spreading knowledge to the extramural community without the direct involvement of companies. It is deemed important, although it does not lead directly to publications. This indicates that the credibility circle is enlarged with extramural values. Yet another perspective on the issue is provided by Medea:

> Me: Would you say that these [not profit-maximising] companies are more likely to experiment?
>
> Interviewee: Yes...Yes of course. I do not know exactly how to draw the borders here and how to define things. If we are talking specifically about [a small design company], for example, it is a fact that they have worked with more than a handful of projects that cannot be said to have been commercially motivated, that cannot be said to have been business-like sound, and they would probably not get any investor to give them money if they went out on a IP-round, or venture capital round or so. Therefore, it is very difficult to see what it provides for the return of traditional economic dimensions. But that has not stopped them from muddling up and work on with this type of project, not exclusively but to a large extent. They have, for instance, worked their way into Malmö city in such a way as to be engaged on a regular basis for various forms of concept design and the like. Because Malmö city has had a high regard for their capabilities and their creativity. Malmö city will never be a customer that allows [small design company] to list themselves and retire at the age of 35, it will never happen. This is not the kind of business they're doing. But yet they seem quite content. And it also means that they are examples of a type of company that will be a very, very pleasant partner for us.
>
> Partially because they originate from the same environment, it is concretely so that the guys who started [the small design company] are trained at K3, by me and a number of other teachers. We are then the same people who started Medea here, so there is a network aspect to it. Also they feel a little like an alumni and, in a sense, a bit like a part of us. That is one aspect.
>
> But also their way of working, and what drives them, their motivations are actually very similar to ours. And they are working on things that generally are publishable for a researcher. What they do is much further away from this consumer products, next-generation products, short term what will sell best in spring 2014-thing. And is instead more in the space in which we are moving, more speculative.

> And there are a handful of similar companies…None of the companies will be the next ABB and nor is that the intention…and the group, if there is a group, is extremely handy for us to seek cooperation with, in many cases because they think the same way and care about the same things and have the same...concerns that we have as regarding what should be done in this world.

Many different things connect the research centre with their collaboration partners. The subject matter is one thing. They have the same concern about what needs to be done in the world; they have similar ideological convictions but also an experimental outlook in their activities. The companies can thus be thought of as research intensive, although not in the sense of large engineering-based firms, but in a more open and spontaneous form.

## Building credibility with extramural values?

I have already touched upon the issue of how external values can be used to build on academic credibility, in this section the issue is further developed and deals more specifically with the way internal and external values relate to each other. One aspect is the difference in degree in regard to the quality of the publications. Applied research may lead to publications in lower ranking journals. The lower rank can be compensated by a larger number of publications in these fora. Below is a quote from an interviewee at ES, elaborating on how the problems of industry are not academically interesting:

> It is rarely a problem to publish as such, there are many conferences and journals and so on. But, if you are to, if you really want to reach academic excellence in a way and accessing the best conferences and the best journals and really build on your authority, then you need to identify the rules of the game and aim at accessing, yes, you look at what is publishable and aim for that rather than to proceed from the industrial problems. (Interviewee 19)

According to the interviewee, research, in order to fit in the really high impact academic journals, must be about faultless problems, problems that can be researched in such a way that the results can be presented in a nice and rigorous scientific way. Especially in the case of computer science, a nomological science characterised by low task uncertainty, it is difficult with the complex and messy problems faced by industry. In computer science research problems and objects are to be well-elaborated and a common understanding generally exists. Thus, when the ES researchers present complex and messy problems that pertain to industry, these are not well received and cannot be presented in the best journals and conferences. This can also be interpreted as a reason to aim for a decrease in complexity; an objectification of complex phenomena. At ES it is a problem that the research subjects as such are complex, even though they are attacked within one single discipline. Another problem occurs when several subareas within computer science are combined. An ES interviewee elaborates on academic publishing in applied topics:

> I was thinking about this when I stayed up trying to find a conference for my latest paper. The hardest thing when you have applied is that you have combined a number of techniques, you put them together. While the academic conferences are very partitioned. And if you have a combination, I think that's a problem. (Interviewee 21)

Complexity impeding the prospects of publication is not only a problem for ES, however, but pertains to all kinds of application-oriented problems incorporating several disciplines or subareas. As a recent development, complexity and externally defined research problems have become more ubiquitous, but the academic systems still communicate primarily via disciplines and epistemic divisions. If in ES the difference is in high/low task uncertainty, in CTF/Samot it is a matter of theory-based/practice-based differences. An interviewee at the centre says the following:

> Uh, yes, of course, the higher ranked journals are not that interested in applicability but have a rather theoretical focus…But there are also some highly ranked journals that have a practical interest. It depends on how that ranking is constructed, it builds on the number of readers basically, or its one of the parameters, and transportation is such a large field, international field so journals in transportation are quite highly ranked. At least in comparison to others… (Interviewee 5)

Two things are noteworthy with this quote. First, that academic publications in high impact journals are founded in theoretical development. Secondly, that applied research can be published in academic forums even if they are practice-based and branch specific, but normally in journals and other outlets with lower impact. It appears to me quite unclear what academic norms these types of results follow. They are not as general – universal – as the norm advocates because they pertain to such specific fields. Of course, this is the case with all the disciplines, sociological theories may do little for research in chemistry, but the traditional disciplines are internally defined, transportation is externally defined. There is something really interesting about this, I think. Such arguments about different academic outlets also inform activities at Medea:

> You can always, no matter what you do, I mean, if I were to play around with your Dictaphone for five minutes I would be able to write a paper about it and make sure to get it published in some conference so that the reference looked like an academic article. That's not interesting, what's interesting is to publish in such forums where you know that the quality is consistently high. (Interviewee 1)

Most publications in interaction design, as in computer engineering, take place in conferences, simply because it is such relatively recent fields the maturity of having a plenitude of journals has not evolved. Could it be that researchers sometimes publish in conferences and get a fancy academic reference, but in reality the conference is rather crappy and the research is far from ground-breaking? It is beyond the scope of this text to investigate in detail such thoughts but I do believe it is an interesting issue. From the

perspective of the KKS it must be very self-enhancing to see that a coproduction project actually also gets good academic results but this reasoning questions the quality of these results. When a field becomes "academified," does that mean it automatically follows traditional internal academic values? Computer engineering is a very large field, with many publication fora, but does that mean the knowledge being published has a general value for the further development of knowledge within that field. I believe this is a tendency that raises extremely interesting questions about what exactly constitutes academic knowledge. It is quite obvious that the traditional disciplines are partly being replaced by externally defined subject matters, just like the mode 2 thesis holds, but are these transforming into academic disciplines? Is there even a way of defining what makes a subject matter a discipline, apart from having its own publication fora?

## "Finding the academic height"

When funding agencies articulate the conditions for coproduction, 'academic height' is an issue that sometimes surfaces in debates on the credibility of research. This is because applied research could be seen as lacking 'academic height' and 'academic height' needs to be added to applied results. In other words, in order to make a research problem both socially relevant and academically legitimate there needs to be some generalizability to it. Many of the interviewees have adapted to the rhetoric of the funding agencies and speak themselves of the 'academic height' in projects. As I have shown, values are produced in coproduction projects that pertain to both the internal and the external systems. Finding the 'academic height' can be thought of as working to increase the level of academic merit in project outcomes. Regardless of the concept used to describe it, though, a central issue in coproduction projects is the fitting of the projects to lead to a legitimate academic outcome, or at least publishable results. In contrast to projects designed for academic purposes only, where the academic credibility is at the forefront, in coproduction projects academic height is something that must be devised, piloted, and sometimes negotiated. If not, it could be interpreted as of the preferences of the external organisations shaped the projects. In the quote below, an interviewee at ES tells about his/her project that is done in close collaboration with a number of companies, from the perspective of "academic excellence":

> That's all very exciting and interesting. Before, I was quite sure that it didn't relate to it, now I realise that it's rather about another kind of skill. You need to be clearer in how you…not move too fast in the early phases in a research study. It's easy that you identify potentials, like -here we can do something! And you go out start interviewing people and you begin with the data collection too soon, before you have found your gap so to speak, in how you are going to contribute to our knowledge and publish your results. So I believe it's important to do the iteration correctly, both in terms of what you need to identify practically and coproduction-wise and then maybe be able to turn it a bit and see that you can position yourself in a god way and add the parameters so you have a gap to fill also on the knowledge side…I've been very good at publishing but before there wasn't the same academic height to it, now I feel that it's about doing the preparatory work in a way so that you can create good publications out of what you have. It can be very strong 'cause you're unique when you have access to data in that way. It's like the possibilities are there but it's an additional difficulty. (Interviewee 20)

Another researcher from ES, working with issues primarily defined by industrial stakeholders, maintains, in a similar way, that her/his special applied focus sometimes makes her/him unique and that it can be easier to be accepted to conferences when he is "not in the mainstream but right beside the mainstream" (interviewee 14). Yet another interviewee at ES says the following:

> I believe that this collaboration with industry has made it easier for me to write introductions in my scientific papers. In the introduction you should always deliver your problem formulation and you should explain why it is unique and what is special about it and so on. And if you're into academic research, introductions are the most difficult to write because it can be so theoretical, with so many assumptions that it loses its relevance. It's not possible…in information theory, which is part of what I'm doing that is very theoretical, you can find an optimal solution, I mean that it's so good no-one will ever come up with something better. But then it depends on, that these data packages that you send, they are infinitely long, and they never are. It's like strikingly beautiful problems but it doesn't work at all in reality. And then it's most difficult to write introductions because then you have to motivate and explain that this is a really nice problem but it can never be used in reality, so you need to explain why it's still relevant although it won't work… so that's the heavy part. But then everything else is just dead

> on target and theoretical and beautiful. But for me it's just the opposite. I get limitations that prevent me from using the solutions they have, but at the same time another problem arises and if I manage to solve it, it's just like – yes! (Interviewee 16)

The pattern of negotiating the space for academic height is central for ES because its researchers coproduce in a way where collaboration is executed throguthout the research process. In the other cases it is more common to write articles independently of the output that goes into the external organisation.

There are, however, certain outputs that are fit both for external use and for the building of academic credibility. One such thing is methodological development. Developing methods by which to improve something, a development process, an activity etc., are frequent outputs from coproduction projects. An interviewee from CTF/Samot says that they afford the branch "tools and instruments for development" (interviewee 5). Tools and methods have a certain generalizability that makes them suitable for not just one particular applied problem. If the objective of the project is to develop methods, it is likely that these can be published academically and be communicated to the company with less modification. A reliable methodological development, or a solid interpretation of an existing method, is a way by which the researcher can enhance her/his credibility vis-à-vis the academic system. At the same time a good method can give credibility also vis-à-vis the external system. Developing tools or methods by which to change or improve something in general is a central theme in ES:

> Also this with software development methods, like testing for instance, 'cause most companies are software development companies, Ericsson says they are the world's fifth largest software development company and ABB, which is a boring engineering firm but most of the developers are developing software or make sure that the software is working. And so this entire handling costs an awful lot of money, just to do the products they do. So if it can be made more efficient the company can make great savings of money. So that's why they are very interested in collaborating with us. (Interviewee 14)

Hence, they help companies improve their development and testing of software, rather than developing the software itself. Developing specific software would be too close to product development, but methodological development is an acceptable academic activity. Methodological development is also central for CTF/Samot:

> We look a lot at, it is much about methodological aspects, how to do these kinds of measurements, if you do directly or if there are some recollection of memories… (Interviewee 5)

Methodological aspects, and ways of measuring something, apply to several branches. In public transportation customer satisfaction needs to be measured and in retail companies different actions taken to improve sales need to be better understood and measured.

## Different moneys relate differently to the credibility circle

Yet another central theme in the material is how different sources of funding relate to either the academic system of validation or the extramural system. The funding agencies can be placed alongside a scale from unconditional to conditional funding. Unconditional, 'free' money do not require any partners and only a minimum of final reporting. Usually an economic report is required, showing that the money has been used, but not a report of the results from the funded project (interviewee 9)[21]. Conditional money comes in different shapes, the most 'restricted' form is money that comes directly from companies, but funding from KKS can also be considered restricted as it has a number of restrictions and conditions attached to it. Faculty funding and money from research councils like VR may represent free money. Depending on the source of the money as funding, the research project is closer to, or further from, development work. Different forms of funding relates differently to the credibility circle. The picture is complex, because

[21] For an example, see http://www.formas.se/sv/Finansiering/Rapportering/

the internal and the external credibility cycles can be combined and mutually affect each other in different ways. In ES, the terms free and restricted money are frequently used, and they seem to serve rather different purposes. Even if the outlook of the centre is geared towards coproduction with industry, they express the need to show that their research is also credible in academic terms:

> It is connected to…this more basic funding, it is very important for us in order to get in new results. Have something to offer, if we talk about more direct industry collaboration. You have to have a base, and we have been a little worried, in some periods, that we are lacking this base…We need renewal in the system, we need more long-term projects in which we can think more freely…VR and SSF have been very important in that respect, they don't demand industry collaboration and it has been extremely valuable. (Interviewee 18)

The quote can be interpreted as a description of academic credibility-building on the level of the organisation. The internal and the external systems are so intertwined at ES, they use the credibility they get from collaborating with industry. The systems go into each other, academic credibility is just as important as knowing something about the proximity problems. The reason for this is, likely, that the companies are research-intensive and recognize the significance of academic science. In the following quote, from an interviewee at CTF/Samot, the difference is on the level of the individual researcher:

> I've been involved in these KK-funded programmes but less as a researcher, more as a supervisor, or I shouldn't say less as a researcher because I've been researching too, but I have also had FAS-money during the time so partly I've had another life, so to say. And that depends on how easy it is to be a social scientist and work in this type of coproduction. I believe it's easier for business administration researchers, I got a feeling that it is. You have, as a sociologist with a critical perspective it's like…we do produce, we can produce a new organisation, a new way of working and so on but often we have a critical take to it and…It has proved to be hard, harder as a sociologist than for my colleagues. (Interviewee 9)

The funding from the research council FAS in this quote represents the free funding that allows the interviewee to develop her/his critical approach without adhering to the demands of the companies. Like she/he says, it is another life. Such unrestricted funding is primarily used to be able to develop knowledge which mainly relates to the academic system. Money and funding is essential also in the understanding of Medea. It started out with an experimental outlook within the aforementioned support in the form of a KK-environment. The quote below is from a discussion I had with an interviewee about how it came that the funding was withdrawn:

> Personally, I don't think it only bad, I mean, it's kind of sad that we couldn't turn it into what we believed we could turn it into, but it's about the funding picture. And we knew from the start that it's dependent on this block grant, because it's so speculative and far-fetched in many respects, it could probably not be done at all with shorter grants and in the usual way. We got a chance, and when we realised that that chance was gone we spoke in terms of –shall we end it here or shall we try to continue it and if so what would be required. Then we need a manager who is good at fundraising. And what she did is she went where the money was, she has been successful with Vinnova for instance, the structural funds of EU and the like, which is not research but rather R&D, structural development. Then it's reasonable that what you do is not traditional research, not even traditional research in coproduction. Because at the beginning we spoke in terms of motivating this with scientific ideals, but we chose coproduction as a way to get new types of research questions, new contexts, opportunities to work with interventions in reality, in quotation marks…and also work with new ways to understand relevance, of course. And we, as researchers thought that was interesting enough to take it further. (Interviewee 1)

The environmental support from KKS was first seen as a kind of free funding; later on it became clear that it was not. That sort of transformation is interesting in itself. The same interviewee explains to me:

> In 2010 and early 2011 we were still running Medea according to the initial ambitions and with the idea that we would have a ten-year block grant from KKS…What happened at the same time we decided to establish Medea and

> begin to work in these directions was the KKS switched management and the new management did a quick 180 degree turn, and decided that –now we are not going to be KKS anymore, now we shall be VR light. Now I'm being a bit sarcastic here, but I'm sure I'm not the only one…It was kind of an uphill struggle, we felt as if we were explicitly worked against and it came to an end when the new CEO forced our rector to end the partnership. Because there was a signed agreement about this ten-year grant and their [KKS] way to handle it initially was to say that –we can't pay any large sums but you have to apply project by project but you do it within the block grant, so to speak. And we did, for a couple of years, and finally they didn't feel okay with that either. Because we actually succeeded now and then. Uh, what usually happened was that we formulated something that the external reviewers, the scientific experts gave fives and then they drivel it away in some advisory group that they had and in which they chose to disregard the reviewers, and we thought that was a bit disguising and sort of made an issue out of that, and eventually they got tired of our nagging. (Interviewee 1)

It seems that even though the research would have been useful for academic credibility, it lacked the credibility toward the external system that the KKS demanded.

# The critical programme and extramural validation

The question of critical research is central in the social sciences and the humanities; and it is something that affects the prospects of making knowledge in collaboration with actors external to the academic system. within Medea, there exist a wider variety of critical research perspectives than the critical design-inspired approach to technology. In the previous chapter the health care-project, in which the initial question was reformulated, was mentioned. The project turned out to be about something else than what was initially thought. This is another way of exerting critique by means of academic research. To take the basic conditions, the preconditions that exist in a project, and make something else out of it. To proceed from the first question and find other questions, which go more deeply and, in a way, questions the first question. The interviewee who told about the health care project continues like this:

> Interviewee: It's a redefinition…you start by, well, maybe we have to redefine, more widely, how society is built up, how different actors collaborate. And maybe we have to start by asking, what kind of reality do we want, and then start looking at how can new media, IT comes into the process. So that kind of…
>
> Me: Would you like to develop that a bit?
>
> Interviewee: Yeah but I mean, again, in this hospital project, we backed, we didn't say that yes, it's a technical question. It is something else, a more fundamental question about collaboration and sharing knowledge. And then, sure, something else than intranet appeared, we didn't see it as a technical question, and that technology would remedy something in that way…It's another way of thinking. And it can be extended to other contexts as well. Like, with cars, or transportation, must everyone have a car? Or, I have a transportation demand, but how does that look, and then there is, and could be done better, but car pools and other things that see car driving in another way. The demand for transportation could be organised differently. (Interviewee 4)

The interviewee talks about using technology in order to ask questions of a social character. The pure technological dimension is not at the forefront here, but the critical knowledge interest is.

In CTF/Samot two groupings exist among the researchers, one which can be deemed critical and one of a more mainstream orientation. The critical tradition is distinguished by its theoretical preferences as well as its general approach and embracing of the critical knowledge interest. Being critical inevitably means also being critical of companies and this could, naturally, be a problem when you have to collaborate with them. The critical sociologists at CTF/Samot do not have that much opportunity to exert critical research in coproduction with companies. One interviewee tells me about a former project he has been involved in, as a PhD student:

> Well… when we were in this project with [a Swedish bank] for instance, I pointed out that their business model did not correspond to the social- and environmental engagement they claimed to have. It was what you call greenwashing in a way. Because when it came to the distribution of money, what was profitable and what was not, there wasn't any room for this. And I can tell you, that's why, I would not say that we were thrown out, but it was a message they did not want to hear. (Interviewee 7)

The outcome was that the interviewee had to find another partner for his/her PhD project, and he/she did. He/she did set out to investigate the business of an organisation with an open-ended approach, but it was not possible to do it in coproduction with that organisation. Below is a quote from another interviewee, on the topic of involving partners from the private business world in the kinds of projects this interviewee works in:

> Yes, honestly I believe so. And if I'm to be a bit critical towards the prerequisites for social science, I would say that we don't develop a new patent or a new product but we explain what happens in the relation between agent and structure. Because I believe that people are interested in such a thing that 95% of Swedish staff managers say it's important that you can speak Swedish well. I don't think any company would finance such an investigation. But I think it is quite an exciting result, or ominous, and me

> and my heavy värmländska [a dialect, author's note] is not the only one in trouble…So I believe that it must, where there isn't usefulness in that sense, but usefulness in another way. At the same time I'm well aware that the other half of my time is funded by that kind of funds and it is also fun to be part of it and see that what you do comes to use directly. The extreme is in this Swedish Customer Agency project, there is not even a mediating agency but pure applied research. And you can see that it comes, new requirements, new laws… (Interviewee 9)

The clash with commercial businesses seems unavoidable. Companies, on their side, do not want to fund research that delivers critique rather than fruitful innovation. The highly applied project he talks about, a project about why young people end up with inept mobile phone subscriptions, is also one in which there is room for a critical perspective. The commissioner is the Swedish Consumer Agency, a public agency that would fall under the category of organisations with an interest to fund research as part of their rationale.

The following quote is from another (critical) researcher at CTF/Samot, who discussed the conditions for applying critical sociological perspectives in texts for highly ranked journals in business administration:

> It is very hard to get stuff into journals, there are not so many. I can't take something really critical to [top-ranked] Journal of Marketing, if it is really critical you have to pick journals that are beside the mainstream and they are not so many. This is an important factor. We have an article on review in…an American A-level journal and we write on the same data as this latest book, but we do it from a mainstream perspective. (Interviewee 13)

This quote highlights the connection between publishing strategy and academic credibility. In order to propel one's credibility, as a researcher in business administration, a certain discursive strategy, where the critical perspectives are toned down, is deemed necessary. Another example of the adjustment of criticism and credibility is the following:

> In some projects, in some articles I allow myself to be critical but many times it's very instrumental research and I deliver results that can be of use and stuff. Because, ehm, in order to be able to work really critically and to have a critical perspective, then you must be disengaged, you must…you can't have a partner, it's not that easy to criticise our partners, for instance…That would be to bite the hand that feeds you. 'Cause if I begin criticising [huge public transportation company], for instance, they would not want to have anything to do with me, they might even end the partnership with the centre. So therefore, the space for critical research is really small, just because we have built up the organisation, these kinds of centres in this kind of way. But…at the same time there is a way to work it out, they know little about what we do, these partner companies, I don't think they hardly read our brochures or our information booklets, I don't think they have the time.
>
> Me: And even less the articles you write?
>
> Interviewee: Yes, they don't read that at all, they don't have the slightest clue about what it is so, we can actually deliver some critical stuff to the academic community and write, then put on another hat when we talk to the companies, have a softly-softly approach you know…so there are possibilities to speak with a forked tongue also in this system. And I believe that's what you must do. (Interviewee 10)

Hence, in order to receive the kind of academic credibility desired within the critical social science, they need to be two-faced; one face toward companies and another toward the academic validation system.

## The credibility cycle revised?

The credibility cycle is a tool that schematically shows how different currencies are traded in order for the researcher to gain credibility. Originally the cycle pertains to the academic system and hence an interesting question is what happens to the way researchers build credibility in transepistemic settings with multiple validation systems. In the credibility cycle as developed by Latour and Woolgar (1979/1986) the components are articles, arguments, data, equipment and money (grants) Hessels et al. (2012) add staff to the equipment component. Recognition is essential both

as a starting point and as an end result. Hessels et al. maintain that the actual components of the cycle may change. In relation to the external validation system another component can be added, which can be termed branch insight, understood as an awareness of what problem formulations are relevant from the perspective of the companies and other external organisations. Knowledge about branch specific problems is a way of staying up to date with what is going on in the branch. Branch insight can be converted into money, in the shape of direct funding or cofounding from external organisations. It can also be converted into articles or other publications if the research belongs to an applied field. Computer engineering and transportation are relevant applied fields in this context. Another important component is trust. Trust can be thought of as a form of credibility in itself; it is what makes the companies and other external organisations feel secure that they will get something out of the collaboration. In order to engage in coproduction relations at all, the external partner needs to have some trust in that the researcher will deliver valuable results. Trust is necessary for the relation to function smoothly; it seems to be the case that when trust is missing, the researcher gets less freedom to develop his/her own perspective on the research problems. This is essential for the possibilities to produce high quality results that can be converted to credibility. One researcher from CTF/Samot tells about how control has replaced trust; they need to make booklets and brochures in order to appear trustworthy, instead of actually delivering viable knowledge output to their partners. Seen as a currency, trust has many components. Credibility can also be a means to building trust, held by the researcher. A sort of social capital, previous experience with collaborations, also increases trust. Trust increases over time, which is why well established contacts are preferable to shorter commissions with external actants. This is normally the case in ES, and as a result issues of building trust are less apparent there. In order for trust to reach a decent level in the initial phase of a coproduction project, some communication skills on the part of the researcher are usually required. This can be interpreted as a pedagogic skill without which the researcher is less likely to find collaboration partners. Trust also increases over time; already established, long-term relations are favourable in this sense. Trust relates to academic credibility in the sense that without it there would be no coproduction project and thus no conditional funding to be used for also writing articles. Hence, trust is something which is added to the agenda of the researcher when the policy measure of coproduction is

introduced. In addition to building academic credibility s/he needs to build trust with extramural actors.

Furthermore, the data component of the cycle seems to gain weight relative to the other components in coproduction environments. Access to data is one thing that is considered a valuable result – from an academic perspective - from working with external organisations. Access to data, or as some researchers put it – 'real-world' problems – can make the academic publication unique, and it can be easier to motivate a certain theoretical development with reference to a problem faced by a real actor.

The money currency is particularly interesting as these research centres rely to a large extent on conditional funding. Funding from companies, the co-funding required by KKS in coproduction projects, for instance, can sometimes be converted into academic publications. Some interviewees, however, seem to hold the view that not having to adjust to companies would lead to better publications. The value of unrestricted forms of funding is highlighted by many interviewees, and especially by those who do not primarily seek validation extramurally.

## Summing up: presentation of the results and developing analytical concepts

The purpose of the following section is not to make an evaluation of the coproduction relations and projects of the three cases, but rather to problematize and seek to explain why sometimes the relation runs smoothly and sometimes not. A presupposition is that there is an essential difference between projects that result in two distinct outputs and projects that results in one output. The reason why this is important is because it tells something about the way the researcher can make use of resources coming from the external partner for building academic credibility. Hence, I start out by examining one value/two values and then move on to discuss how the patterns can be explained. The discussion is structured on a number of aspects that I have found essential to understanding why coproduction takes on certain characteristics. A lot of space is devoted to epistemology since the idea is that epistemological issues govern knowledge production to a large extent. Furthermore, epistemology is closely related to knowledge

interest, and it is the question of knowledge interests that takes the analysis to the societal level.

## One value or two values?

In Medea there are projects with two distinct outputs. That is, in projects that resemble traditional coproduction, with academic partners and a number of business partners. The living lab method, however, does not produce easily distinguishable knowledge outputs. The output does not come into a company the way it does with other forms of coproduction and the delivery is more elusive. While participating actants may receive new ideas, concepts, products etc. from the living labs, it is the process itself that is in focus for the academic interest. This leads to a rather experimental attitude toward coproduction, and for that the researchers do not need to strive for a high level of academic merit as something additional to the other values produced in the project. It is also interesting to investigate a failure. In the large media companies facing new challenges due to ICT developments, the object or phenomenon of investigation is collaborative media, in relation to an existing activity. The participating company may get a new concept, product or service, based on collaborative media and the researcher may write about how collaborative media are being used in relation to the concept, product, or service. The development of ideas and concepts is essential here; Medea researchers seek validation from the academic system when they work as academics. There are clear boundary lines between research and development work here. They may also engage in development, but if they do they move out of the role of researcher and take on the role of the consultant.

In CTF/Samot the coproduction of knowledge typically produces two kinds of outputs in one project. The difference between the academic output and that which goes to the companies is interpreted as a communicational difference; a difference in target groups or a different message. Furthermore, the companies are generally neither interested in nor able to read and comment on the academic output produced by the researchers. The researchers primarily seek validation within the academic system. This is particularly the case for the critical strain within the centre. The researchers from CTF/Samot occasionally also take on other roles than that of the researcher in relation to the companies, i.e. they work as consultants.

ES projects typically result in one value, apart from the natural difference between the actual application of a technology and the academic publication describing this technology. It is essentially the same type of output that goes into the company and that is used for building academic credibility.

## Educational level

The first parameter I would like to consider is the educational level among the researchers (unquestionably high) and the company personnel who take part in the coproduction project. There are significant differences between the three cases and their industrial environments. In Medea the educational level among the companies is generally high. Some of the companies are found in the cultural branches; they are artists, designers, music or film producers, etc. and, as such, they typically have a university degree, although not necessarily a research education. The reason why some persuasion is needed in order for these companies to understand the value of the academic perspective is more along the lines of companies being practice-oriented rather than research-oriented. In CTF/Samot the industrial environment consists of companies in service and retailing. These are generally marked by low R&D intensity; if it exists it is informal. Though just because the companies do not have an R&D department does not mean they do not make moves to increase their knowledge about problems and issues that are relevant to them; not having an R&D department, in other words, does not necessarily make the company less knowledgeable. There is, however, a discrepancy between the educational levels of company personnel and researchers. The industrial environment of CTF/Samot is heterogeneous and it is not easy to make generalisations about it. Information from the interviews with researchers does reveal, however, that it is not entirely clear to company personnel what it is that makes an activity academic in contrast to their practical everyday realities. This is an important consequence of collaboration across different educational levels. In ES the companies are characterised by their knowledge intensity and it is not uncommon that company personnel have doctorates. There are, however, still cultural differences between industry and academy people, and the communication of the researcher needs to be adjusted according to the situation.

What is remarkable about these differences and similarities in educational levels is that they have consequences for the coproduction relation and for the prospects of converting resources from the relation into academic credibility. A similar level of education among the participants in a project may make it easier to understand each other. For firms with an R&D department there ought to be a good understanding for the needs of the researcher to do her job. The activities of the researcher won't have to be explained, motivated and defended. The big companies in the industrial environment of ES have R&D departments and there are infrastructure and competences dedicated to handling the situation of having visiting researchers. It would not be far-fetched to assume that the lack of formal barriers makes the research process run smoother. In CTF/Samot and Medea it is sometimes required of the researcher that they explain and justify their project and the activities in it. The communication problems occur when the academic knowledge has to be explained in relation to the kind of knowledge that is of practical bearing for the companies. Working with mostly university educated company personnel can render this communication easier. The difference, however, may not be so much about the level of education as about the nature of that education – knowledge can be tacit or codified, or practice based, in contrast to more theoretically oriented. In transportation, for instance, the bus drivers are educated, but their education is quite far from the formal skills of a researcher. The thing is that companies may have an inclination to engage in research, or research like activities, or they may not. It is a fine line to speak of people as poorly educated as an explanation for why they do not understand the activity of research, but the fact remains that there are great differences in the competence profiles of those involved in coproduction. Then, it need not be a bad thing that researchers have to communicate and motivate their interests, as this can also help to see things in a new light. The point, however, is that the knowledge possessed by the different actants forms a cognitive jungle, which is more or less easy to navigate. Of importance is also the next aspect I would like to elaborate, the area of knowledge.

## Educational area

The educational area of the researchers is typically the same as their academic discipline, but it can also be that they identify more with an externally defined subject matter. The nature of the educational areas can be

closer or further away from the educational area or area of competence of the companies. The area in which the academic partner is has implications for the coproduction, among other things, because different areas have different publication patterns. The decisive factor is whether there exists an externally defined academic field within which results can be published or if results have to be prepared to fit for publication within a traditionally defined academic field. Differences in educational areas or areas of competence lead to a cognitive distance between the researcher and the firm, something that does not necessarily have to be a bad thing, but it does have consequences for the knowledge being made.

In Medea the researchers are within media and communication studies or interaction design and they work in the externally defined field of collaborative media. The companies with which they engage in coproduction are of two kinds. First, the large media companies that are competent in media. The inclination to work with Medea is likely because they see the need to learn more about collaborative media in order to handle the challenges facing them. For the smaller ideological companies and entrepreneurs, collaborative design, collaborative media and cultural production are important areas. They move within rather broad areas that include influences from many different fields and disciplines. Together with the interdisciplinary outlook of Medea, this leads to less discrepancy between educational areas. The companies have a broad range of operations that span several areas and the researchers do not have to relate to a long disciplinary tradition in their topic but have opportunities to open up to influences from other areas. Collaborative media, the way I understand it, is not an established academic field, but the topic ties in with both media and communication studies and i.d.

In CTF/Samot there is a discrepancy between the areas of competence of the researcher and the firm. First, there are researchers who strongly identify with an academic discipline, e.g. sociology, a field in which theoretical development is at the forefront. At the same time it is quite hard to find companies who have their business within sociology, to stick with the example, and therefore the cognitive distance between a sociologist, true to their discipline, and companies, is large. In contrast, the business administration researchers work within an area that is of relevance to virtually every company and the cognitive distance is smaller. There are also differences between researchers who identify as service researchers compared to those who identify primarily with their disciplinary belonging.

In ES the researchers are within computer science or computer engineering, and, while the companies are typically not computer companies, computer science is an integral and important part of their business. Hence there is little discrepancy. Also, of some significance, both companies and researchers come from and belong to an engineering culture, even if their topics differ.

## What kind of knowledge demand

An important aspect of the educational area or area of competence is the knowledge demand of the researcher and companies. Knowledge demand can be distinguished as either theoretical or practice based. It is taken to be theoretical for all the researchers, because theory development is an integral part of academic work. It is reasonable to believe, however, that some researchers also have a demand for more practical knowledge, as a currency to transform to academic credibility in the extended credibility cycle, or because there are academic journals with a more practical focus within their fields. What is suggestive, however, is that the companies differ between having a theoretical knowledge demand and a practical one.

In ES' industrial environment the companies are generally in technological branches and, as such, their business rests on a scientific ground in a completely different way than the other cases. The difference between theory and practice is not to be confused with the difference between basic and applied sciences. In the ES environment the companies demand applied computer science, but it is still very much science resting on a theoretical ground. In ES the researchers use the companies as resources, and the collaborations can lead to values which they can transform into academic credibility. These can be in the shape of access to 'real world' data, technical data that can be experimented with, tested, investigated and analysed in a scientific way. It can be knowledge about relevant problems, not only for the researcher to maintain her or his coproduction frequency, but as a way to be able to write articles in which the research problems can be motivated from a 'real' – in contrast to purely theoretical – problem. It can even be that the technical, theoretical competences of the company personnel give the researcher academic knowledge and insights into a problem. It is telling, and not obvious, that branch knowledge in the case of ES can be converted into credibility. Normally branch insights can lead to

new, or sustained, funding from the company or from an external sponsor, which then can be converted into reputation in the longer run. Access to problems and data, which can be investigated, is also deemed important, but this would arguably also be possible to achieve without the active involvement of companies. In the case of ES, however, branch knowledge and relevance itself can be ways to gain academic reputation among colleagues. An explanation could be that there is a much larger scientific field for applied computer engineering. It is a scientific field in which recognition and reputation among colleagues plays a role. The same ought to be true for the field of transportation; large, externally defined and in which branch knowledge is essential.

In Medea there is an experimental outlook, action-oriented research and a wish to take an active part in social development. This approach is also typical for the ideological companies of the industrial environment. The approach, also on the part of the companies, resembles research to a large extent. The interviews reveal that some of these companies engage in projects with a high theoretical level of social science, and projects with these generate academic results that can be published with little modification. In Medea and their industrial environment the boundaries between practical and theoretical knowledge appear to be less solid. The focus is more on the process. Additionally, a researcher doing something practical can be interesting from an academic perspective.

In CTF/Samot's industrial environment the knowledge demand is primarily practical. The companies are not primarily interested in theoretical development but require knowledge that can be put to use immediately. There is a discrepancy between the theoretical development of a project and the output that goes back into the company. An interesting aspect, however, is that some of the more practically oriented results can be published, either in the field of transportation or in more practically oriented business administration journals.

## The nature of the subject matter - the epistemic aspect of coproduction

Subject matters – objects and phenomena of research and how they are approached - provide a great analytical tool by which the coproduction of knowledge between academic and non-academic actants can be interpreted. The subject matter can be analysed on the level of each project, providing a more detailed analysis on the epistemic level. The concept of task uncertainty incorporates a reflexion of the characteristics of the research object or phenomenon; if it appears isolated or if the aim of the research is to make it appear isolated, or if it is complex and if the aim is to reduce or enhance complexity. This is related to the issue of knowledge interest, which will be elaborated further down.

In ES the researchers work on the same subject matters as do the companies; they all develop computer systems. The difference is in the distance from application; companies generally develop technologies a few steps closer to application while the researcher moves within the same areas but a few steps further away from application. But all the knowledge ultimately builds on the same type of theory. Furthermore, development of computer systems is generally not the main activity of the companies; the result is that the researchers can do their research without having to take into account the entire patenting business. The companies of the industrial environment of ES can be said to work according to traditional company logic. They are profit maximising and, as such, they have an interest in increasing efficiency and to avoid engaging in development work with few prospects of leading to new applications. Clarity and research that proceeds along a well-defined line toward expected outcomes can help satisfy this interest.

An important reason why the collaborations appear to function smoothly in ES and their environment is that both the researcher and the companies work in fields where task uncertainty is low. When research is about subject matters with higher degrees of technical task uncertainty, such as software engineering, complexity is reduced and well-elaborated objects can be constituted. The purpose of such projects usually encompasses the development of variables, which are clear and relatively unambiguous to interpret by the company as well as by the researchers. This knowledge interest of the academic partner thus fits extremely well with the needs of their external partners.

CTF/Samot is noticeable in terms of subject matter. Service is an externally defined subject matter but also an academic discipline with its own journals and conferences. It is specifically about that which is the main activity of the firms surrounding the centre. The field incorporates several perspectives and approaches, mainstream as well as critical. Even though the researchers are service researchers, they appear to have a strong sense of belonging and identify with their academic discipline of origin. Therefore, in CTF/Samot service is a multidisciplinary subject matter rather than a new academic field. In the centre various approaches to knowledge making interact, making the coproduction interesting to look at from the epistemological point of view.

In CTF/Samot there are telling examples of when the approach to the research object or phenomena differs between the researchers and the companies. Companies here are also traditionally profit-maximising and, as such, they want clarity. Not just in the results coming out of research projects – like a small number of facts that can be implemented etc. – but also in the very process of research. Collaboration can be motivated by the presentation of a well elaborated project in which expected outcomes are clear and can be related to the business of the company in the way of an investment. Hence, research projects in which technical, but also strategic, task uncertainty is low are favoured. Methods for measurement are frequently mentioned as an output in CTF/Samot; it can, for instance, be that the company needs strategies for measuring customer satisfaction and how it relates to changes being made. I would argue that the subject matter of service, by its very nature, is a complex phenomenon, as it concerns social beings in a social context. As such, it would be characterised by high degrees of task uncertainty, yet, and because of its perhaps 'natural' connection to commercial companies, the aim of research is often to reduce complexity and to obtain a lower degree of task uncertainty. Hence the technical knowledge interest governs service research. Following the technical knowledge interest is thus fruitful in order to attract company funding. Doing research with the purpose of lowering task uncertainty is fruitful also for the researcher to obtain reputation within the field. The critical knowledge interest exists, but like one interviewee says, critical approaches do not belong to the mainstream (journals, conferences) of the field. The critical researcher consequently moves within a space that is more confined than does the mainstream one, and this ought to affect the capacity of building reputation.

The hermeneutically inspired, or critical, researchers submit their research to freer forms of funding; funding that does not require the involvement of an external actor. Of course, the hermeneutical researchers can also embrace the technical knowledge interest, but that would be a step away from the logic of their disciplines and in order to build credibility they must find ways outside of the requirements of coproduction. For the business administration researchers and the experimental psychologists it is more logical to pursue clearly demarcated projects – experiments – in which the expected outcome can only be found within a range that is known from the start. It is reasonable to believe that this knowledge culture approach is more appropriate for research that is accomplished in collaboration with companies.

Some interviewees tell about "partly private, partly public" organisations that have an interest in funding research because it is part of their rationale. In collaboration with these there are some prospects of also engaging in critical research, or being less steered by a predefined purpose of the research project. This can be interpreted as meaning that these organisations work according to a different logic than the profit-maximising one, or, more likely, that they are less steered by the need to keep up with fast technological developments in order to stay on the market. They must not be able to control the output of the project in an exact sense, in order to be able to value them against the next quarterly report; instead there are possibilities for seeing knowledge as an end in itself.

In Medea the subject matter can be said to be collaborative media. It is complex, but it also incorporates technological development in which the degree of task uncertainty is lower. Normally, Medea does not, however, engage in coproduction projects centred on pure technological development; rather it is the technologies in use that are in focus. As such, the low degree of task uncertainty that characterises technological research is not in force when the user, e.g. sociality component, is introduced. Hence i.d. is to be considered a field in which task uncertainty is considerably higher compared to technological research in general. The interview material does not reveal anything about coproduction projects in which the aim is to reduce the complexity of the object or phenomena being scrutinized, but concluding that they do not exist would probably be too premature. Most of the projects are done in collaboration with actants that do not follow the traditional profit-maximising logic, which is one explanation. There are some exceptions, though, for instance one project with a firm working

according to the traditional profit-maximising logic. The project is told as an example of when coproduction works as it should and both the needs of the researcher and the needs of the firm are fulfilled. In this project the time component is crucial; the contact has lasted years, and the researcher has been given the opportunity to really dig into the business of the company. The researcher has been offered a place on the board of the firm and maintains that this verifies the value they place on the collaboration (although the coproduction in its current shape would then have to end due to bias problems). Another crucial factor seems to be the company's willingness to dedicate personal resources to the coproduction project, something that the researcher speaks warmly about (interviewee 1). The company is a large media company that faces new challenges due to the development of ICT. The project is about finding new strategies, work ways, ways to perceive the new situation. According to the interviewee the company have a sense of getting good things out of the project, even though "they cant always put their finger on what it is" (interviewee 1). Here the case thus appears to be that the company has relaxed its efforts to control the outcome of the investment in coproduction. The reason why this seems to function in an ideal sense could probably be interpreted as an issue of trust.

In CTF/Samot some interviewees maintain that they would be able to make better research without having to deal with companies and their requirements all the time. As one interviewee puts it, they would actually produce results that would benefit the company, but they do not really get the change to do that as they constantly have to "inform, administer and pretend we deliver" (interviewee 10). An interpretation could be that coproduction without all those administrative exercises would imply a risk not worth taking for the companies involved. The production of brochures, descriptions, progress reports, reconciliation meetings etc. can be interpreted as means of reducing the uncertainty of the complex research process for the companies.

## The critical knowledge interest

It is intriguing to see to the critical knowledge interest and how this involves a critique of the growth and profit imperative. Researchers are not just epistemic actants, they are also ideological. Following one's ideological conviction can be more important than building credibility. In the case of Medea some interviewees maintain that they would not engage in coproduction where the differences in terms of moral are too large. For Medea there would hardly be any coproduction at all if they had to work with companies who work according to a traditional profit-maximising logic.

Hence, sometimes the ideological conviction comes before the prospects of building credibility and attempts at receiving continued funding. Difficulties do occur, as when CTF/Samot researchers spell out criticism and the company in question chooses to terminate the project. One interviewee even says that they cannot criticise their partners as that may result in the partner withdrawing their support. In order to use the coproduction project to gain academic credibility the critical result sometimes has to be withheld from the company. Companies in these cases are more of obstacles than contributors. To be able to build credibility as a critical scholar, there must be room for criticising the coproduction partners; without such possibilities, coproduction as a way of creating knowledge is a closed road for researchers working according to a critical knowledge interest.

## To conclude

What I have attempted to show is how the growth imperative, translated into the profit-making logic of firms, is connected to the nomological knowledge interest. Companies whose business depends on a low degree of task uncertainty are not likely to appreciate collaboration with researchers working in fields where task uncertainty is high. Therefore, the opinion that social scientists and humanities should work on having a better offer for firms is problematic. If they were, it would most probably mean they would have to do it as something not representative for their discipline. Hence, working to promote the economic value of human and social sciences working in the hermeneutic and critical knowledge interests is meaningless. What is required in order to facilitate coproduction between such

researchers and commercial companies is a change of attitude on the part of the companies. Or, alternately, researchers (and funding agencies) should consider the trust issue in a more comprehensive fashion and seek longer-lasting connections and personal contacts.

In terms of knowledge interest, it can be said that critical researchers need to find partners that are open to critical perspectives and whose businesses tolerate being criticised. If the critique is aimed at the general workings of the economic system, it may be hard to exert this in collaboration with a company working according to traditional company logic. In order for the historical-hermeneutical knowledge interest to thrive, the partner organisation would preferably have an interest in funding knowledge making in a broader sense, not just knowledge making that would lead to applications that have been defined beforehand.

# 11. Final discussion
# - on how the rationality of money colonises system and life worlds

A number of the developmental lines of the university system in general, and in Sweden in particular, have been outlined in this thesis. A shift has gradually taken place in terms of funding, organisation and governance of academic knowledge making processes, and they are all relevant for the cases in this study. The changing contract between science and society (Elzinga 1997; Martin 2003; Jasanoff 2005) emerged partly as a result of restrictions in public spending on research, replacing unconditional funding of academic research with goal steering and conditional support. The ensuing dominance of relevance criteria, that research is to contribute to something outside of its value to the internal academic system, has in turn resulted in hybrid research communities (van der Daele & Weingart 1976; Elzinga & Bohlin 1993; Elzinga 1993). The three cases in this study are all pertinent examples of hybrid research communities, as they are not exclusively oriented toward validation within the academic system but seek validation from external actants as well.

One reason the shift in the relations between university and society manifests itself distinctly in the cases of this study is that they were already from the start established with a dual purpose. While they were constructed as academic actants committed to do research, at the same time their significance to the surrounding trade and industry was highlighted and they were chartered to collaborate with non-academic actants. Hence, they represent a new way of ordering research that is utility oriented and of importance to economic actants. They are, already in the constitution of their home colleges, transepistemic actants, and, as such, they embody a tension between traditional academic values and externally defined values. Establishing colleges for economic purposes can be seen as a measure

supporting the knowledge based economy. The colleges were established in the same era that saw structural changes in trade and industry; workshop industries and manufacturing relocated and left regions with high unemployment rates and declining economic activity. The colleges were partly established as a remedy for this undesirable situation, but also as instruments to reinvigorate and reproduce existing industrial specializations.

Hessels et al. (2009) discuss a symbolic compliance strategy to show how researchers make use of certain viable discourses in their communication with policy makers (funding agencies) in order to give the impression that the research fits with steering goals while they also get the opportunity to work on what they want, as a way to secure the financial underpinnings for research activities. The alternative definition of innovation, expressed by Medea and CTF/Samot researchers, can be interpreted as a symbolic compliance strategy in this sense, although it also has the deeper purpose of exerting critique against the mainstream interpretation of innovation. Compliance strategies can be seen as resulting from the ever increasing segment of research funding that is made up of conditional funds. From the perspective of policy makers, the researchers are to contribute to politically set goals rather than pursuing their own research agenda. Compliance strategies create a space between policy goals and research agendas in which a partly steered, partly free research endeavour can occur.

In terms of boundary work or boundary maintenance (Tunnainen & Knuuttila 2009), it is pertinent to see how the researchers are careful, as researchers, not to engage in work that resembles development too much, though they may well engage in such work if they "put on another hat" as one interviewee expressed it. The boundary being maintained in these cases can be said to be one between research and consultancy work. Boundary work comes to a head in transepistemic communities, but as regulation already exists in the area it is not so much a matter of boundary work as it is boundary maintenance.

If there is a mode 2 of knowledge production – a contested claim (Schilling 2005) – a relevant question is how it is manifested in the cases in this study. According to Gibbons et al. (1994) mode 1 and 2 differ in a number of respects. It is said that knowledge making in mode 2 takes place in a context of application rather than in an academic context. This is partly true for the three cases. At first glance they all appear to be shaped by contexts of application, but a more careful analysis reveals that academic validation is

just as important as the external. For the researchers who consider themselves part of the academic community – rather than exclusively as experts in practical matters – internal validation along disciplinary lines is essential. For the centres as such, however, external validation is indispensable, not the least considering the requirement of funding. While research problems are defined externally to a large extent, project outcomes are modified and negotiated to also fit academic publication. It is not a matter of an unproblematic application context, but rather a contested and questioned one. In terms of transdisicplinarity, Medea is shaped by attempts to merge media and communication studies with interaction design, operating in the externally defined field of collaborative media. Altogether this means that they represent a step away from traditional organisation along disciplinary lines. For the other cases disciplinarity remains significant in terms of internal validation. Disciplines cease to hold their significance only in the applied parts of the research, as well as in the development of applied academic fields, such as computer engineering and transportation. Academic credibility building takes place primarily in disciplines, but also in externally defined fields, such as computer engineering or transportation. Mode 2 is also characterised by novel forms of quality control that replace the academic peer-review system. For the cases in this study relevance is a present criteria which is fulfilled when companies are willing to contribute funding to coproduction projects. Hence quality must pertain to external actants, project ideas must be communicated in such a way that companies find them worthy of supporting and endorsing. Despite this, internal academic quality control by peer-review remains an important tool by which their research endeavours are evaluated; beforehand as grant proposals, and in the shape of publications.

## The rationality of science and its connection to the economic system

The tension between knowledge for utility and knowledge for academic validation, 'internal and external output', varies with knowledge cultures, epistemic approaches and knowledge interests. As has been shown in chapter 9, questions of *what kind of knowledge* are essential both as they relate to companies or other societal organisations and as they relate to

researchers. An analysis based on different knowledge cultures reveals that the relevance criteria and requirements to collaborate with external actors reinforce the financial underpinnings of carriers of some knowledge cultures more than others. So there is a conflict, or a tension, between, on the one hand, the technical knowledge interest and, on the other, the knowledge culture that builds on emancipation and understanding; at least as the former finds it easier to align with the financial requirements of contemporary research policy.

I have previously mentioned that the sciences are dependent on the idea of progress. The aim for the sciences, and for the technical knowledge interest, is prediction and control, by the isolation of variables, tests of hypotheses etc. Progress in this sense means better predictability or the generation of more efficient technologies. When the sciences progress it is towards a state of enhanced predictability, which is equated with progress. With the dominance of the technical knowledge interest, "progress" is equated with a refinement of findings. From such a perspective, the sciences progress but the humanities do not, as they are not occupied with making more exact and more predictable results, but with increasing the understanding of meaning.

Knowledge as an extrinsic value grew with the development of modern science, in contrast to the cultural, hermeneutic and emancipatory knowledge inherent in the subject. The first 'knowledge economy' was thus the industrial economy that grew in the 19th and 20th centuries and for which science-based innovations became crucial. With this movement the university as a source of innovation began to be realised. Modern science and its making of knowledge as independent of its creator began earlier, however, but this view of knowledge, contrasted with the view of seeing knowledge as intrinsic, seems essential for constructing knowledge as a commodity.

The development of science in the 20th century is connected to a development of the university-based knowledge from 'an end in itself' to 'a means to an end.' This is not affecting the sciences alone; other academic fields also incorporate this shift. An interesting facet in this context is that companies also appreciate access to educated personnel; it is, however, not a question of broadly educated citizens incorporating the *bildung* ideal but rather of experts in technical knowledge.

When research activities began to be incorporated into the university during the 19th century these stood in sharp contrast to the former role of the

university as an administrator of knowledge. Also the figuration of the knowing subject shifts. “Anyone” could become a researcher if he was systematic enough, as was shown by the Swedish Royal Academies. Research activities can be interpreted as processes by which to generate new knowledge by arranging observations in a systematic way and find causal relations – laws - governing events. The point is that if before the bearer of academic knowledge was a man incorporating the *bildung* ideal competent in several areas of knowledge, to become a scientific researcher did not require more than being careful, systematic and curious. Hence the significance of the *bildung* ideal began to cease and, with that, society’s perception of what constitutes a knowledgeable person. The scientific enterprise categorises and classifies, and by the scientific experiment causal relations could be tested and predicted. The sentiment and conviction that science creates knowledge is arguably the construction of another knowledge ideal, from being incorporated in humans to becoming detached. With this a common stock of knowledge is created to which academics – trained researchers – can add, test, verify and criticise. The early social sciences followed this logic but the humanities seldom or never did.

A reasonable claim, thus, would be that the development of modern science has had far-reaching consequences for the view of knowledge. Contributions to a common stock of knowledge – a store of contributions that together increase the total understanding of natural objects and phenomena – fit well with the mode of operation of the sciences. In a way, this has also set the standard for academic knowledge production in other fields so that contributions to the academic community are valued extrinsically. Together with the bibliometric system by which impact is determined, there is little room left for knowledge inherent in persons that is not easily packaged in an article and transferred to a community of scholars.

## Church, state and markets as consumers of academic knowledge

In chapter 3 and 4 the development of the university and the role of academic knowledge was outlined, focusing on the way academic knowledge relates to the wider society. The university was first connected with the church, the church being the main agent of power in society. At this

point in time knowledge was metaphysical, the universities were engaged in teaching and in the transmission of knowledge. With the emergence of nation states, the university became part of cultural projects to create national identities. Instead of being universal they became nationally focused, and with this the value of knowledge for political purposes increased. In this sense, knowledge became a means to exert power. At this time the political-administrative system was the main consumer of the knowledge emanating from universities. The value of the university lay in its ability to train broadly educated citizens – servants of the state. This role still exists today, as shown by Mukerji (1989). In her work, researchers function as a state reserve of experts. The role shifted, however, from broadly educated citizens incorporating the *bildung* ideal to experts in specific areas.

From the 1970s onward a somewhat new situation emerges. A shift in the economic system takes place and the value of knowledge is increasingly stressed. I have proposed the explanation that the crisis of the 1970s spurred on the knowledge economy; continued economic growth made possible as the intangible asset of knowledge is constructed as a competitive advantage and a sort of capital from which prosperity is built. The economic 'wonder' of post-war Europe, it has been argued, was a result of the rebuilding of societies destroyed by war (Temin 2002; Alvarez-Cuadrado & Pintea 2009). In the period after the decline of the post-war miracle, societies globally depend on new foundations for economic growth[22]. In the knowledge economy economic value comes in the shape of intangible assets; creativity and content, design and services. With this development the role of the university changes again, since its 'product' – knowledge – can be seen as a value in its own right, and not only in relation to tangible forms of capital.

For the university, the 1970s onward is a time marked by the increasing significance of relevance criteria. Research had also previously been of relevance primarily to the state. When the state was the main consumer of academic knowledge, it was a kind of knowledge produced in accordance

[22] A telling example is the way research foundations get their money from investments on the stock market. The stock market is dependent on continuous growth in order to function. When growth-dependent money funds research aiming to criticise the growth economy a contradiction occurs.

with traditional academic values and knowledge was made primarily for the internal academic system. The concept of strategic research (Irvine and Martin 1984) can be interpreted as a tendency to govern the direction of research toward greater applicability. Market actants also become more frequent users of academic knowledge.

Habermas speaks of control media – the political-administrative system exerts control by means of power: positions of authority and formal hierarchies, and the economic system exerts control by means of money. At the time when universities were incorporated into emerging nation states, the political-administrative system, through the state, controlled the university. In Sweden this system was represented by the Humboldt model, the state-guaranteed research autonomy. The state regulated the organisation, number of persons on department boards, allocation of work hours for different employment categories etc., but not as much the direction of research. With the 1993 reform of higher education, goal steering replaced autonomy to a large extent – and this was reinforced by the gradual decline of floor funding for university research and a concomitant rise in external funding. A salient fact is that these changes were presented as elements in an increased autonomy. In a way it was; the researcher is free to decide everything, as long as he/she can find funding, find someone who is willing to pay. A more decisive market mechanism was therefore introduced in the academic system, by which knowledge is allowed to be made if there is a demand for it. The result is a certain emptiness, when research has to prove its value even before coming into being. There is no space for visionary thinking outside the box, or outside the scientific paradigm, and there is no room for inquiring into something in a way never done before or to search for the unexpected. We can only do research on things we know that we need to increase our knowledge about, from the perspective of the current social situation. The possibilities for finding that which we did not know that we did not know become very low.

However, the market as a potential consumer of university knowledge already enters when modern science began to be incorporated into the university system. Chemistry, for instance, was from the very start a field with application potential; a potential that was recognized by firms such as Monsanto and DuPont, which frequently collaborated with university scientists, hired their students, and built up R&D capacity in-house (Shapin 2008). The market was a consumer of academic knowledge but the market

logic did not govern the universities and their research endeavours to the extent witnessed later.

It is not just the market colonising the university, but the control medium of money, and its rationality, also colonises the political-administrative system. The case is not one of two separate systems governed by different control media, but money becomes increasingly important also to the political-administrative system. The market does not act on its own, it is provided access when the political-administrative system invites it (Gamble 1979; 1994). I find it reasonable to argue that the economic crisis of the 1970s plays an important part in the situation. Economic growth was decreasing, possibly due to "natural" reasons – unlimited growth is not a realistic scenario – but since a large and strong economy also spilled over into social wealth, a falling GDP is highly problematic. Hence securing and sustaining economic growth became a political goal, and the size of the economy turned into a core political question and aim. Growth-enhancing measures were generally put first, which means that the political-administrative system and the economic system were conjoined from then on.

State-induced measures to align academic research with market forces, as articulated by the funding agencies, mark a profound shift in the governance of the university system. The market system is embedded in, and underpinned by, state regulation – so for market forces to prevail, the state must intervene to secure that the right conditions are in place for the market to function (Gamble 1994). The very fact that the wage-earner funds were terminated and transformed into funding agencies with a special focus on utility research for trade and industry is telling. The commercial values of trade and industry are pitted against the traditional academic values. In academia credibility is a decisive value, it is intangible and it builds on recognition by colleagues. The system relies on voluntary contributions, researchers comment on, read, evaluate and distribute each other's work on a free basis. Jacob (2009) describes academia as a gift economy, in contrast to the circulation of money and commodities in the capitalist mode of production.

Habermas also deploys the concept of life world; the world as subjective human beings experience it. The life world is where people interact and communicate, it is where life takes place. While the systems are governed by strategic rationality the life world is governed by communicative rationality, the creation of meaning and mutual understanding. The systems,

however, especially the economic system, gradually colonise the life world in modern society, and when they do subjective action is rendered meaningless. This occurs when money and the rationality it entails begins to make its way into the minds of individuals so that activities that used to be about communication for creation of meaning are instead governed by the rationality of money.

In the university system this takes place on two levels. First, by the invitation of money rationality by the political-administrative system. The dominance of the political-administrative system was gradually replaced by the market logic, as showcased by the introduction of new public management and target oriented steering. Accompanying these arrangements came a tendency to connect knowledge goals to monetary measurements. The money rationality, the way I interpret it, is visible not only in actual money but also in the rationality it entails: that activities can, and ought to be, measured and expressed nomologically. Research endeavours have to be measurable in terms of their outcome, be it in the number of patents, start-up companies, innovations, publications or bibliometric points. With this type of rationality, research that does not show a clear and explicit result becomes meaningless.

Thus, the second level on which the colonisation of the life world by the economic system takes place is this: conditional funding partly replaces fixed grants and thus money becomes an important factor to take into consideration in the daily activities of researchers. When researchers have to apply for grants to sustain their activities, raising money becomes an ever-present aspect of research practices. It entails a shift in consciousness among academics, a consciousness about money and its significance. The researchers who have been interviewed in this study are all very aware of the importance of securing future funding. They develop strategic research areas and keep track of new calls, build networks and cultivate relations to strengthen their position in the "funding market." They also relate to the industrial environment to which they have to prove their relevance in order to receive continued funding from the Knowledge Foundation. They are also pushed to publish an acceptable number of academic articles, and to publish in fora that grant them bibliometric points. A highly ranked journal is more valuable than a lower, or unranked one, even if the lower ranked journal would be more congenial to the approach of the researcher. It is a recurrent theme – at least for CTF and Medea – that this reward system punishes innovative ways of pursuing research. Interaction design, for

instance, does not have a tradition of publishing a large number of journal articles (and with very few relevant journals available) – a pattern characteristic of fields with high levels of task uncertainty (Whitley 1984a) – yet has to obey the quest to gather bibliometric points in order to secure future funding.

The consequences of the marketization of the academic system differ for different knowledge interests. Clearly the humanities are worse off, and the consequences of this are worth taking into consideration. The technical knowledge interest, together with the scientific method of prediction and control, has quite an unproblematic relation to money rationality. The bibliometric system is fitted for the sciences not for the humanities and social sciences, as their publications patterns differ (with the latter's fewer and longer publications). The technical knowledge interest is also well aligned with companies working according to a traditional profit-maximising logic. It fits with the traditional logic of companies as they both can be said to aim at reducing uncertainty and complexity. In science this is manifested as low task uncertainty and in companies it is manifested as avoidance of risk associated with development projects.

Humanities, or the hermeneutic knowledge interest, represent thinking in terms of meaning and content to counter the emptiness of the money rationality. They pertain to the life world and the creation of meaning and mutual understanding between different social groups, times and cultures. When the economic system enters the university and money rationality begins to govern, both through the political-administrative system and through the minds of individuals, emptiness arises. Money is a medium that can be filled with any meaning (Linné 2008), but is in itself empty. Money is an abstraction of value, a means by which value can be detached from time and space. When the goal is interpreted in terms of money, it substitutes a discussion of the qualitative content of knowledge development.

Habermas sees the systems of labour and interaction as fundamental to human existence. Labour is connected to strategic rationality, it is about fulfilling a clear and predefined purpose. Interaction, on the other hand, is connected to communicative rationality aiming for understanding and being able to live together in a society. Without either of the two – labour and interaction – there would be no society. With the market rationality governing the university, and if this tendency continues, the result could be

probably not a society deprived of meaning but a university whose knowledge only pertains to the systems and not to the life world. The risk is that the university is left with the task of making applicative knowledge for external and commercial actants while the visionary thinking about social questions takes place somewhere else.

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