



KNOWLEDGE SHARING

**Opportunities and Challenges
in the Danish Computer Animation industry**

**The Animation Workshop
– sponsored by Innovation Network Animation Hub**



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Abstract

This paper highlights social practices and experiences of knowledge sharing across boundaries of companies from the perspective of technical directors (TDs) and managers. We aim to contribute with an understanding of the concept of knowledge sharing in the Danish computer animation industry and outline opportunities and challenges for optimizing knowledge sharing among TDs. We employed an exploratory research design, and produced data about knowledge sharing from different perspectives on the basis of qualitative research methods and user engagement of TDs and managers.

Our findings show that the primary need of the Danish computer animation industry is to optimize sustainable knowledge sharing practices. This is especially evident in research and development (R&D) and establishment of a production pipeline. To this we address three primary opportunities: Face-to-face meetings for knowledge sharing, focus on training, and online platforms for sharing. There are, however, also challenges to these opportunities: Lack of trust between companies and individuals, problematic issues to development, and shortage of time and resources.

Our findings also show that engaging the potential end users of knowledge sharing is a great strength of this study. Internationally some users have already begun to establish an online platform that contains a directory of open source projects for the VFX community (cf <http://opensourcevfx.org/>), and others have proposed to establish a research group of TDs in Denmark.

Contents

1 Prerequisites	4
2 Why We Conducted This Study?	5
2.1 Introduction	5
2.2 Purpose	5
2.3 Constraints	5
3 How We Conducted This Study?	6
3.1 Research Approach	6
3.2 Selection of Participants	6
3.3 Methodological Approach	6
3.4 What follows?	8
4 Context of the Danish Computer Animation Industry	8
4.1 Losing Knowledge in The Danish Computer Animation Industry	8
4.2 R&D and Pipeline	9
5 TDs' Perspective on Knowledge Sharing	10
5.1 Focus on Training	10
5.2 Share Knowledge Face-to-Face	10
5.3 It's About the Pipeline	11
5.4 Challenges to Sharing a Pipeline	11
6 Managers Perspective on Knowledge Sharing	13
6.1 Small Tools can Make a Big Difference	13
6.2 Focus on Training	13
6.3 Share Knowledge Face-to-Face	14
7 Conclusions and Future Work	16
7.1 Acknowledgments	16
8 Annex	17
8.1 Interview Guide	17
8.2 E-mail Questionary in an Online Community	20
8.3 Outline of the Workshop	21

1 Prerequisites

Everything in this document is part of an ongoing study and hence not an exhaustive product. It is the first step of a study about the opportunities and challenges for knowledge sharing in the Danish computer animation industry. Feedback is very welcomed from everybody to whom it may interest.

2 Why We Conducted This Study?

2.1 Introduction

Knowledge is a competitive factor that can attract, maintain, and develop resources in an industry. Therefore it is important for companies in an industry to manage knowledge. This working paper explores the concept of knowledge sharing and its opportunities and challenges among technical directors (TDs) in the Danish computer animation industry. We define knowledge sharing as an activity through which knowledge is exchanged among people, e.g. information, skills, or expertise that is exchanged between e.g. colleagues, communities, organizations etc.. This means that tacit knowledge from an individual or organization has to become explicit to others in order to share it. We use this broad definition, because we do not want to narrow the participants' understanding of knowledge sharing.

2.2 Purpose

This paper highlights social practices and experiences of knowledge sharing across boundaries of companies from the perspective of TDs and managers. We aim to contribute with an understanding of the concept of knowledge sharing in the Danish computer animation industry and outline opportunities and challenges for optimizing knowledge sharing among TDs.

2.3 Constraints

Little research has been done on the Danish computer animation industry. Especially not research aiming at knowledge sharing. Too, most studies on knowledge sharing focus on "within-organization sharing". With that in mind, combining the Danish computer animation industry and knowledge sharing is a new field of research. Hence, little background information was available before we went into the field of research. These aspects draw attention to two challenges: Firstly, to get a clear understanding of the Danish animation industry, and secondly to build a mindset about knowledge sharing between companies in an industry.

3 How We Conducted This Study?

3.1 Research Approach

Our research approach is exploratory. This means that we do not have a theoretical framework drawn up in advance or a hypothesis we test. As part of this approach we adjust to the field of study and take unexpected events into account. This makes the study flexible and dependent on the results we get underway. An exploratory approach is appropriate, because no prior structured studies have been performed on how TDs can share knowledge in the Danish computer animation industry. So we did not know what to expect.

3.2 Selection of Participants

Essential to the study is that the user can relate to the opportunities and challenges identified. That is why user engagement is central in this study. Managers and TDs from both inside and outside the Danish computer animation industry have participated in this study. The selection criteria of the participants varied according to the different methods we employed. For ethical reasons we kept the names of the participants anonymous.

3.3 Methodological Approach

To operationalize fruitful research techniques that underpin our purpose and increase the validity of the study, we have chosen a methodological approach, methodical triangulation, that produces data about knowledge sharing from different perspectives. In this approach we employed qualitative research methods. The strength of these methods is that they allow us to obtain a nuanced description of the social practices and experiences of users regarding knowledge sharing, compared to the use of quantitative methods. The use of the qualitative research methods entail that we cannot answer questions about how many or how much. In this context what follows is not an attempt to give a representative picture of all TDs' social practice and experience of knowledge sharing. However, it highlights indicators that contribute to an understanding of the concept of knowledge sharing in the Danish computer animation industry and outline opportunities and challenges for optimizing knowledge sharing among TDs.

Method and Description	Purpose	Selection Criteria and Participants
<p>Desktop research: Research on existing Danish and international websites for knowledge sharing in the computer animation industry.</p>	To understand the social practice of knowledge sharing online.	<ul style="list-style-type: none"> • Participants that engage in the communities. • Participants in the communities participated.
<p>Semi-structured in-depth interviews (cf Annex 8.1): The interviews have dialogical form. There are questions about various topics and additional questions under way. We asked interviewees to draw on subjective and concrete examples.</p>	To understand individuals' perception of the Danish animation industry and their experience of knowledge sharing.	<ul style="list-style-type: none"> • Geographical diffusion. • At least 5 years of experience in the animation industry. Mainly in Denmark. • Four TDs and managers participated.
<p>Ethnographic Field Studies: Field studies involve observing the way TDs and managers work and how they share knowledge in their natural environment.</p>	To understand technical directors and managers social practice and to ask about their experience of knowledge sharing.	<ul style="list-style-type: none"> • TDs and managers in the companies and participants at Nordic TD Forum. • Two Companies in Denmark participated. • We participated in Nordic TD Forum Conference 2009.
<p>E-mail questionnaire in an online community (cf Annex 8.2) : We asked for experience with knowledge sharing and open source in- house projects.</p>	To understand individuals' experience of knowledge sharing and open source in-house projects.	<ul style="list-style-type: none"> • TDs and managers from different countries. • Twelve TDs and managers from different countries participated.
<p>TD-Workshop (cf Annex 8.3): We talked about opportunities and challenges to knowledge sharing and prototyped solutions on a conceptual level.</p>	To identify areas where we can support opportunities for the development of knowledge sharing among TDs.	<ul style="list-style-type: none"> • TDs and managers on different levels from different companies. • Six Danish TDs and managers participated.

fig 1. Schedule of Methods

3.4 What follows?

The Danish computer animation industry works across many business sectors. You will find the workforce in different companies working with computer animated content on television, in short- and feature films, advertising, interactive media, VFX (visual effects), websites, CAD (Computer-aided design), and computer games. This also means that one company can engage in more than one business sector. In this study we have focused mainly on companies working with computer animated content on television, in short- and feature films, advertising and VFX. In these companies computer animation projects rely on a cross-disciplinary and knowledge intensive community that involve many skills from different disciplines, e.g. technological, artistic, management. In the next sections we will enter three areas which have been subject for research: First, we will briefly outline the context of the Danish computer animation industry and afterwards we turn to the TDs' and managers' perspective on knowledge sharing.

4 Context of the Danish Computer Animation Industry

4.1 Losing Knowledge in The Danish Computer Animation Industry

The Danish computer industry is based upon a project structure and any given project determines the workforce that is needed. This means that most companies scale up and downsize their workforce according to the projects they are working on, and employees go from one project to another. As part of this structure, competing companies sometimes lend employees to each other on most levels of the production process. In this way competitors both compete and collaborate at the same time. A large part of the employees on the projects can therefore be categorised as a nomadic workforce. This is most evident in companies in the computer animated film production, because they are not able to maintain a flow of productions and often the company life cycle ends after the production of a feature film. As a company closes down, all the gathered knowledge, procedures, and software is often lost as everybody moves on to new projects.

A common part of most companies and all stages in the process of a Danish computer animation project is that the documentation of the knowledge generated is poor or very unfriendly for new users and iteration. Similarly, documents made in the beginning are often not evaluated due to budget constraints. Consequently, much knowledge about the process is lost and future productions are forced to reinvent it.

Yes, it is often a problem that people are sitting and doing something, because they do not know that it already exists (TDs quote).

4.2 R&D and Pipeline

In relation to knowledge, pre-production is recognised as the most important part of a computer animation project, because it defines everything that happens afterwards. Without a clear establishment of the production you can e.g. invest a lot of time and resources in parts that become unnecessary for the production. Hence, a well thought pre-production can increase quality, and shorten time and resources. Important aspects of the pre-production are research and development (R&D), and establishment of a production pipeline (pipeline). Nonetheless, in Denmark these aspects receive little emphasis, despite their ability to improve workflows and quality of productions. Thus, it is very valuable to bring about knowledge on R&D and pipeline.

If you don't have a solid foundation to start from, it opens a door for a lot of problems later on in the production (Manager quote).

5 TDs' Perspective on Knowledge Sharing

5.1 Focus on Training

TDs in Denmark form a community of interest with a high degree of proximity, and they are driven by a great passion to their work. This means that retrieving knowledge about work is not just a part of their working life, but it is also integrated in their spare time. The communication among TDs is mostly online, e.g. chat clients or various international professional fora like CGTalk, 3D Pro etc. Their work is therefore influenced by many knowledge networks beyond the Danish industry. There have also been several attempts to make Danish groups to share knowledge online.

For example, there are about 3 Facebook- groups where people can meet, but they die slowly (TD quote).

The TDs in the study recognized that there is a shortage of personnel with long-term education in Denmark. And when the term knowledge is brought up they express a need for training courses to improve skills or experience new ways of doing things. Generally, most training of TDs happens on the projects they engage in, or in their spare time, by tutorials, alongside sparring with colleagues, and online networks. A challenge is the lack of time and resources, because project deadlines are almost always looming behind.

Focus on education and that, some of it must be done in a forum outside of work, so we feel we have the time to engage in it (TD quote).

5.2 Share Knowledge Face-to-Face

In this study TDs expresses a great importance of face-to-face meetings for knowledge sharing, but they are also sceptic about the continuity of it:

There is something about the social part, and that we meet (TD quote).

No matter what is happening, it happens two three times and then it's over, therefore it must be sustainable (TD quote).

An opportunity to share knowledge face-to-face for TDs in the Nordic countries already exists. It is Nordic TD Forum (TD Forum). The TD Forum is a conference that takes place once every year in a Scandinavian city. TD Forum also facilitates an online forum, so the interaction between participants at the conference and others is not reduced to taking place once a year (tdforum.eu). In general, TD forum is a good platform for knowledge sharing because it is a channel to get in contact with other TDs. Though, certain challenges appear as TD Forum loses visibility in the participants' daily life after the conference, which means that good intentions of the conference are not picked up, and the participation on the online forum is limited.

You have to keep a more lasting interaction [between TDs], for example at TD Forum they meet once a year and then one or two years pass before they meet again (TD quote).

Many of them [the participants] dream of working together, but then nothing happens (TD quote).

5.3 It's About the Pipeline

When asking about knowledge sharing, TDs that participated in this study focused mostly on sharing knowledge about a pipeline of a computer animation production with colleagues from other companies. This is despite the differences between pipeline set ups from production to production, and from company to company.

There are feature films where the pipeline doesn't need to be quite as flexible and there is the VFX pipeline that must be extremely flexible (TD quote).

We are doing the same, but there are always some [different] specifications (TD quote).

The TDs express that a lot of their work could be optimized (whether in VFX or film animated projects) if they benefitted from each others' knowledge about aspects of a pipeline.

I think constantly of things such as shots and assets and that are the same for everyone (TD quote).

We are doing the same thing all together and every time we implement the whole thing all over again, but there is never someone doing specific things that we need (TD quote).

One of the main concerns TDs have about aspects of a pipeline of films is that they are tired of inventing the wheel with minor modifications every time a company scales up(cf Context of the Danish Computer Animation Industry). This reflect the way many projects are done with deadlines looming – time and resources are scarce and in the heat of the moment finishing the project is of course more important than researching and developing aspects that can improve a pipeline of the current production. Though future projects could benefit from it.

5.4 Challenges to Sharing a Pipeline

However sharing knowledge about aspects of a pipeline is not without challenges from the perspective of TDs. Firstly, there is a concern about sharing pipeline software tools containing codes you are not proud of. A part of this also concerns the lack of constructive feedback to the coding you put forward.

No, I will not share a clumsy code, because it concerns my professional pride (TD quote).

The general lack of constructive feedback is probably the worst thing (TD quote).

But it's not like you can put something out and then expect people to correct the errors, and perhaps even to a specific deadline (TD quote).

Secondly, another concern is free riders, who just take and do not give. Thirdly, we have a legal and economic issue which concerns the managers, and is the reason why some make legal agreements prohibiting employees to share what they produce as TDs in the company, because it belongs to the company. Though, when talking about pipeline it is not just about software:

It is also important to focus on that knowledge sharing is not just software. But also methods and project management, charts, naming convention etc. (TD quote).

That said, TDs in Denmark often experience to some extent that knowledge about aspects of a pipeline from different companies is shared implicitly, because of the proximity among TDs and the structure of the industry (cf Context of the Danish Computer Animation Industry).

How a pipeline operates will in one or another way be shared, because people change companies and they talk with each other. In this way it just happens rather slowly (TD quote).

6 Managers Perspective on Knowledge Sharing

6.1 Small Tools can Make a Big Difference

Explicit knowledge sharing is not commonly experienced across the boundaries of companies, although companies sometimes work together on the same projects (cf Context of the Danish Computer Animation Industry). When different kinds of knowledge sharing across boundaries of companies are brought up, the main question from managers is:

What's in it for us? (Manager quote).

Sharing is a lot about what we give and what we receive, because they are our competitors (Manager quote).

This experience toward knowledge sharing is mainly associated with the internal competition in Denmark. In this context they express a fear of losing a competitive advantage to other companies and the time and resources they already put into the development, e.g. with regard to a pipeline.

Pipeline tools are not so advantageous to share due to time and resources which have been put into it. It's like a manufacturing method of a factory if you have to make biscuits. And we are competing for the same customers (Manager quote).

In accordance with [technological] knowledge, we all think that we are super cunning, and would rather not tell the others about what we do (Manager quote).

Although, to some extent managers still experience that sharing aspects of a pipeline can be valuable, if the sharing is limited to e.g. small tools that only costed little time and resources to develop.

Small tools can make a big difference – make them user friendly (Manager quote).

It would be awesome with a Hub of tools - you choose to share (Manager quote).

6.2 Focus on Training

Among managers in this study the technological part of the production is not identified as their primary selling point, neither to clients in Denmark or abroad.

Our biggest selling point [abroad] is the costs (Manager quote).

It's not the technical knowledge of our industry which is the unique selling point, it's your creativity (Manager quote).

Having said that, the technological part of the production can help to keep costs low, and free space for creativity, why it should still be considered as an implicit selling point. Software can also be considered as a source of income if a company

develops software worth selling. Still, most TDs recognize that Denmark is not cutting edge on the technological front of computer animation production.

Companies' edge in Denmark is not that hardcore on the technological front, although companies sometimes feel that. We forget sometimes to look at the rest of the world (TD quote).

This may partly be due to the lack of training. And managers of the companies also recognize that it is important to focus on the training of TDs.

Speaking of the technical parts of production, it is not unusual that companies hire employees from other countries because there is lack of technical training for people in the Animation Industry (Manager quote).

It is interesting to focus on education. It is enormously important (Manager quote).

Focus on education for the technical people who are working with animation (Manager quote).

6.3 Share Knowledge Face-to-Face

Managers also find face-to-face meetings as a great opportunity to share knowledge, because the participants are on more equal terms and that makes knowledge sharing much easier - even to share knowledge about a pipeline.

To conferences everyone meets each other on an equal level and therefore we can discuss e.g. such things as the pipeline (Manager quote).

TD Forum is interesting because it is a conference, and everybody gets something out of it (Manager quote).

As with the TDs, managers associate meeting face-to-face with the TD-Forum. Similar to the TDs the managers experience that the connection between TD-Forum and everyday life pose significant challenges to the continuity of knowledge sharing:

TD-forum is best to inspire, but afterwards it is everyday life again, and therefore you don't have time for such a forum (Manager quote).

It could be cool with a janitor for the TD forum that picked up the good intentions [that the participants had stated] (Manager quote).

Results

This study addresses three primary opportunities for optimizing knowledge sharing about R&D and establishment of a pipeline among TDs:

- Face-to-face meetings for knowledge sharing: Both TDs and managers find face-to-face meetings for knowledge sharing an important part of the social practice. As an example of this is the TD Forum. Though, they acknowledge the missing link between knowledge sharing at the TD-Forum and everyday life.
- Focus on training: The need for training to improve skills or experience new ways of doing things is of great interest for TDs and managers. The crucial issue here is to create resources and time for TDs to engage in it.
- Online platforms for sharing: TDs' social practice is already influenced by several online platforms of knowledge sharing, and managers also mention the sharing of tools at platforms as a possibility. Platforms already exist, but are scattered. Therefore a common platform or connection of several platforms could be an opportunity.

There are, however, also challenges to these opportunities. Below we outline the primary ones:

- Trust between companies and individuals: This is a central challenge because it potentially involves a case of free riders and legal constraints of what you can and cannot share. Therefore, lack of trust in each other prevent individuals and companies benefitting from shared knowledge.
- Development: Both TDs and managers find knowledge sharing in development challenging. TDs identify sharing development problematic because of the embarrassment of a clumsy code or lack of constructive feedback from others, whereas managers fear losing competitive advantage to internal competitors.
- Time and resources: This is a constant constrain to every opportunity, and must be taken into account when considering a structure for knowledge sharing across the boundaries of companies, so they can benefit from new insights and optimizing of a pipeline.

7 Conclusions and Future Work

In the light of the context of the Danish computer animation industry most projects in the industry produce valuable knowledge. Especially in big projects, such as a feature- and short films. But there is a lack of ability to maintain that knowledge, because of the structure of the industry and poor documentation practices. Hence, the primary need of the Danish animation industry is to optimize a sustainable knowledge sharing practice in order to hold on to the knowledge they generate and exploit existing knowledge. This is especially evident in the technological part of R&D and the establishment of a pipeline, which is what TDs take care of.

Optimizing sustainable knowledge sharing practice on R&D and the establishment of a pipeline is a complex area, because knowledge sharing about development is a challenge, as the results showed. However, research is not such a delicate matter, because it can foster great knowledge about what to do and what not to do without investing the time and resources that development requires. And how companies benefit from the research is of course up to each company. A part of sharing research should be the possibility of freeing time and resources of TDs, so they have an opportunity to gather in groups of training to improve their skills. In order to hold on and prolong the knowledge generated in a research group an existing online platform could be repurposed. Such a platform would also allow the interaction among the participants and the sharing of tools of individual's and companies' own choice. Together these recommendations will increase the trust of sharing knowledge in the industry, because they would enhance the professional awareness and interaction that already exists.

Engaging potential end users of knowledge sharing is a great strength of this study, which has been proven with the activity it already has generated. Internationally some users and participants of this study have begun to establish an online platform that contains a directory of open source projects for the VFX community (cf <http://opensourcevfx.org/>), and others have proposed to establish a research group of TDs in Denmark. Hence, we recommend Animation Hub, individuals, and companies to take advantage of this momentum and act on the results of the study.

7.1 Acknowledgments

The state-funded innovation network Animation Hub funds this project. We would like to thank individuals and companies that have participated.

8 Annex

8.1 Interview Guide

Intro

Thank you for being of part of this interview. I'm doing a study where the main objective is to understand the importance certain types of knowledge have to agents in the Danish animation industry.

The purpose of the interview is to hear your subjective opinions and experiences on the topics that I present in the interview, which means that you're the expert, and there are no right and wrong answers.

First, I would like to ask you to read a consent form for this interview.

Themes of the interview guide:

From the interview I will cover the following areas in relation to the overall purpose:

1. Your perception of the Danish animation industry, and relationships in it.
2. Your experience and understanding of the needs, relevance, and barriers to knowledge and of knowledge sharing in the Danish animation industry.

Theme 1: Perception and Relationships

- How long have you been working in the Danish animation industry?
- In which companies or persons have you worked, in the Danish animation industry?
- What did you do in the different companies where you have worked?
- Try to describe a typical working day
- What characterizes a good working day?
- What can make a working day bad?
- Try to describe your perception of the Danish animation industry.
- How do you see your personal relationship to the Danish animation industry?
- Name one or more persons with whom it was important to maintain contact after you had worked together.
- What would it have meant if you had kept contact with this/these person(s)?

- How do you maintain contact with this/these person(s) today?
- Which companies or individuals do you think have great influence on the Danish animation industry?
- Can you give an example where you have seen that the mentioned companies or persons had great influence?

Theme 2: Experience and Understanding of knowledge and knowledge sharing

- Please, make a mind map of what types of knowledge and experiences have meant the most to you in the animation business?
- What do the different types of knowledge on the mind map mean to you?
- Who has that kind of knowledge?
- How can you get that kind of knowledge?
- Are there any types of knowledge that are harder to get than others?
- How have you experienced that?
- Is it always like that?
- What kind of knowledge do you think is essential to develop the animation industry?
- Can you elaborate on the benefits of that kind of knowledge?
- Are there any drawbacks for sharing that kind of knowledge between companies?
- Are there any people / professionals in the industry that are better to share their experiences than others? If yes - why do you think it is so?
- Are there any people / professionals in the industry, who are not as good at sharing their experiences with others? If yes - why do you think that is the case?
- Make a wish list of what you would hope people in the Danish animation industry were better at sharing:

Outro

- Is there anything that you have thought of that you'd like to add in relation to what we've talked about?
- Thank you very much. May I contact you again?

8.2 E-mail Questionary in an Online Community

Open source in the VFX / Animation industry I am currently conducting an investigation on knowledge sharing in the animation and VFX industry, for a non profit organisation called Animation HUB. In association with this i have a few questions for everybody on list who feels like sharing their views and experiences.

Today there is quite a number of open source projects, coming from studios in the industry.

Just to name a few

<http://www.openexr.com/>

<http://opensource.imageworks.com/>

<http://opensource.image-engine.com/>

Does anyone here have any experience in sharing / open sourcing in house projects. Not necessarily as classical open source project, but also cross company sharing.

If you do

1. Why did you want to share in house projects in the first place. ?
2. What where the main obstacles in getting the project open sourced. ?
3. How where the results, did you actually get the result you wanted from your efforts. ?

Also if you have any kind of input on this subject .. speak up .

8.3 Outline of the Workshop

What will happen?

