From paper to digital, and back.

A qualitative study of the publishing of Open Educational Resource based textbooks in a knowledge society

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Abstract

This thesis investigates the reasons behind a Norwegian publishing house producing textbooks for upper secondary high schools in all the subjects leading to academic competence in higher education based on Open educational resources (OER) classified Nasjonal Digital Læringsarena (NDLA). The background for this thesis is an internship at a publishing house as part of the Masters in Education Program Communication, design and learning at the University of Oslo. The internship period was 4 days a week in 5 weeks from 10.19.2015 to 11.19.2015. The subject areas relevant to this thesis are Information and Communication Technology (ICT) and learning in school, and in ICT general. Also ICT in a community perspective, differentiated instruction, and learning with ICT are relevant subject areas. The research questions posed, are in my view related to these subject areas because both publishing of Open Educational Resources (OER) based textbook and teacher preferences regarding learning resources in classroom practices, involves technologies related to ICT.

The primary aim of, the real life workplace case studied, is to investigate the publisher's process in translating educational content online, which means multi-modality and interactivity, to paper based textbook, which is dual-modality. The research question raised for answering this primary aim is (1) What are the key features in publishers work translating educational content from digital to paper-based learning resources? A secondary aim, of this thesis is to make use of the survey conducted as part of an internship in the publishing house. The survey conducted, consisted of three parts mapping three different aspects of the empirical knowledge needed in the process of producing a textbook. This thesis makes use of two of these three aspects. For the purpose of investigating the first part of the survey the following research questions are posed ; (2) Which features do teachers view as important in the design of learning resources?, and for the second part (3) How are teachers using NDLA as digital learning resources compared to traditional or paper-based learning resources in the classroom. The first research question, is related to the actual real life situation experienced through the internship. It has intensions to explain how and why it is possible to have a scenario where a publishing house is basing a product in the form of a book on digital content. Second and third question has ambitions to try and make use of the data collected through the survey conducted as part of mapping teacher's preferences regarding learning resources. Because of the many aspects involved, it had to be some delimitations in the sense of some

choices between which of the aspects considered should be part of the thesis. To develop a coherent narrative and to make use of a relative decent amount of empirical data from the internship, the focus will be on trying to explore, understand and explain the posed research questions. For ethical reasons, all data related to personal identification are chosen to be excluded, and there are no names used, just general descriptions. It is important to have in mind that all descriptions and data are from an excerpt from reality. It is from a real world work situation in a publishing house. To answer the posed research questions prior research on similar research area is taken into account from Ministry of Education (Udir) and the Ark&App project among other studies. The sociocultural perspective of learning based on Vygotsky's is the underlying grounding for a holistic understanding of the educational and pedagogic aspects of the research questions. Gibson's theory of affordances is used in accordance with Norman's design perspective. Last but not least, Norretrander's concept of exformation is used for a better understanding of that role editors at publishing houses have in their daily lives. Books or other content produced influences in turn the society in whole.

The main methods used for answering the research questions is fieldwork in terms of unstructured participant observation and semi-structured interviews within the internship at the publishing house and a survey questionnaire containing structured and unstructured questions. The analysis of the survey is done using thematic analysis. Some of these methods used are known for creating challenges in organizing and notetaking of conversations and or activity. Thematic analysis shows emergence of three different themes consisting of; (1) Choices and customization options with regard to tasks, which shows concept of task culture, (2) Digital resources with regard to references and joint use, which shows concept of hybrid practices, and (3) Structure and overview with regard to design, which shows concept of exformation. Main finding in this thesis investigation of the case, which explains the conversion of a digital learning resource to paper based learning resource in the form of a textbook, is that publishing houses being concerned about their economic interests. Some publishing houses view OER as an opportunity to do what according to them they do best; the process of exformation. Others finding are that of different affordances and constrains existing between the object and the observer. Books and living teachers affords and constrains different things than computer screen mediated artefacts and activities.

The overall impression regarding survey data, is that of different design elements, including textbook tasks, joint use of learning resources, the teacher's need for exformation in form of

typographical elements such as summaries in the pedagogical and didactical part of the survey. In the part of NDLA, the main findings include that it is known as the problem of the knowledge society; the overwhelming amount of information makes it difficult to navigate to relevant and needed knowledge, and on the positive side that NDLA is more updated than the textbooks in regard to curriculum goals given with the learning content. The interactive and multimodal part and the collaborative tools are appreciated on NDLA.

Other finding from the analysis of the survey shows that teachers want textbooks to be structured with only the most important content, which gives a quick and clear overview of the respective subjects. This has to do with the design aspect, were typographical means to acquire pedagogical text. Teachers mean the content suitable for the above criteria are accomplished by having minimal with text and many exercises. The content should reflect different levels of difficulty to give the availability for differentiation. Most of the teachers want a joint use of different learning resources with the book as the main educational resource. Because of this many teachers want the learning goals of the national curriculum to be linked to the content of the textbook. They want the content of the textbook to show which curriculum goal is covered where in the textbook. A possible reason behind this is that they want to release time for other planning tasks, and to be sure that they are covering the learning goals specified by the national curriculum goals. Both the textbook and OER design educational resources. Regarding mapping, textbook in virtue of being a book contains constraints which do not allow many interactions with the book other than turning pages, viewing typographical items and reading exformated textual content.

The triangle of teacher – textbook – student is important to understand, and therefore many studies have been conducted to investigate factors related to this triangle. In my opinion, since the triangle of teacher – textbook – student is considered such importance, then the triangle of publisher – teacher – textbook, which this thesis is concerned with, should be considered some importance as well. As this thesis review section will reveal, the teacher´s main preferred learning resource is the textbook, so in that sense the publishing house's role in producing those textbooks should be regarded as a valuable research area for the educational sector. As this thesis review section also reveals is that there are mixed or joint use of learning resources consisting in daily classroom practice's. This is in my opinion of high relevance for research on different learning resources including digital technologies.

Sammendrag

Denne masteroppgaven undersøker årsakene bak et norsk bokforlags produksjon av lærebøker for videregående videregående skoler i alle studiespesialiserende fag, basert på åpne digitale læringsressurser (OER) klassifisert Nasjonal digital læringsarena (NDLA). Bakgrunnen for denne oppgaven er praksis i et forlag som en del av Masterstudie i Pedagogikk studieretning Kommunikasjon, design og læring. ved Universitetet i Oslo. Praksisperioden var 4 dager i uken i 5 uker fra perioden 19.10.2015 til 19.11.2015. Fagområdene som er relevante for denne oppgaven er informasjons- og kommunikasjonsteknologi (IKT) og læring i skolen samt IKT generelt. Også IKT i et samfunn perspektiv, differensiert undervisning og læring med IKT er relevante fagområder. Forskningsspørsmålene som stilles, er etter mitt syn knyttet til disse fagområdene fordi både publisering av NDLA-basert lærebok og lærerens preferanser vedrørende læringsressurser i klasseromspraksis, innebærer teknologier knyttet til IKT.

Hovedmålet med å studere et fenomen fra en arbeidsplass å undersøke forlagets prosess med å oversette pedagogisk innhold fra Internett, noe som i praksis betyr å oversette multimodalt og interaktivt innhold om til papirbasert lærebok. For å finne ut av mulige årsaker til produksjon av digital innhold til papirbasert lærebok, har jeg stilt følgende forskningsspørsmål:

1. Hvilke nøkkelprosesser er nødvendige i forlagets arbeid med oversettelse av eksiterende digital innhold om til papir basert lærebok?
2. Hvilke elementer syns lærere er viktige i forhold til designet av læringsressurser?
3. På hvilken måte brukere lærere NDLA i forhold til papirbaserte lærebøker?

Det første forskningsspørsmålet er relatert til de empiriske funn som er gjort gjennom å være en del av forlaget som arbeidsplass gjennom praksisperioden. Den har intensjoner om å forklare hvordan og hvorfor det er mulig å ha et scenario der et forlag baserer et produkt i form av en bok på digitalt innhold? De to neste er relatert til spørreundersøkelsen som ble utført som en del av forlagets produksjonsprosess for å kartlegge testskoler og lærernes preferanser tilknytter læringsressurser. Å utvikle en sammenhengende narrativ og å gjøre bruk av en relativt anstendig mengde empirisk data fra praksisperioden, vil fokuset først og fremst være å prøve å utforske, forstå og forklare forskningsspørsmål. Av etiske årsaker, er alle data relatert til personlig identifikasjon i forhold til praksisperioden og spørreundersøkelsen valgt å ekskluderes fra denne oppgaven. Derfor er det ingen navn som brukes, bare generelle

beskrivelser. Det er viktig å ha i bakhodet at alle beskrivelser og data er utdrag fra virkeligheten. Det er fra en virkelig arbeidssituasjon i et forlag. For å kunne besvare forskningsspørsmålene er det bruk relevant forskning fra blant annet Utdanningsdirektoratet (Udir) og Ark&App prosjektet. Vygotskys sosiokulturelle perspektiv på læring er brukt til å få en helhetsforståelse av de pedagogiske aspektene ved oppgaven. Gibsons perspektiver på ulike egenskaper ved objekter sammen med Normans forklaring og utdyping i forhold til design er brukt for å forstå de designmessige aspektene. Sist men ikke minst så er Norretranders perspektiver og forklaringer på informasjon brukt for å kunne forstå kunnskapssamfunnet.

Metodene som er brukt for å samle inn empirisk data er feltmetoder slik som ustrukturerte deltakende observasjoner og halv-strukturerte intervjuer. Noen av disse metodene som brukes er kjent for å skape utfordringer i å organisere og skrive notater fra samtaler og eller aktivitet. Dette har resultert i en del notater som har vært nødvendig å organisere og strukturere før tolkning og bruk kunne skjer i analysen. Selve analysen og bearbeidelsen av datamaterialet fra spørreundersøkelsen ble gjort gjennom bruk av tematisk analyse.

Tematisk analyse viser fremveksten av tre forskjellige temaer som består av; (1) Valg og tilpasningsmuligheter med hensyn til oppgaver, som viser en oppgave kultur, (2) Digitale ressurser med hensyn til referanser og felles bruk, som viser hybride praksiser, og (3) Struktur og oversikt med hensyn til utforming som viser behov for eksformation.

Hovedfunnet i oppgaven som forklarer konvertering av en digital læringsressurs til papirbasert læringsressurs i form av en lærebok, er at forlagene er bekymret for sine økonomiske interesser. Noen forlag ser på OER som en mulighet til å gjøre det som, i følge redaktør ved praksisforlaget mente de kan best; nemlig eksformation. Andre funn er at ulike muligheter og begrensninger som finnes mellom et gitt objekt og observatøren av objektet. Bøker og levende lærere gir og begrenser andre ting, enn de gjenstander og aktiviteter som er mediert gjennom dataskjerm gir og begrenser.

Det generelle inntrykket av data fra spørreundersøkelse er at forskjellige designelementer, inkludert oppgaver, felles bruk av læringsressurser, lærerens behov for eksformation i form av typografiske elementer som sammendrag er viktige i den pedagogisk og didaktisk del av undersøkelsen. I delen om NDLA, er de viktigste funnene relatert til problemet med

kunnskapssamfunnet; den overveldende mengden av informasjon gjør det vanskelig å navigere til relevant og nødvendig kunnskap, og på den positive siden at NDLA er mer oppdatert enn lærebøker i forhold til nye læreplanmål. Den interaktive og multimodale delen og sammen med samarbeidsverktøy på NDLA er verdsatt av lærerne.

Lærerne ønsker lærebøker som er strukturert med bare det viktigste innholdet, noe som gir en rask og klar oversikt over de respektive fag. Innholdet bør reflektere ulike vanskelighetsgrader for å gi mulighet for differensiering. De fleste av lærerne ønsker en felles bruk av ulike læringsressurser med boken som hoved læringsressurs. På grunn av dette vil mange lærere at læringsmål skal være knyttet til innholdet i læreboka. De vil at innholdet i læreboken skal vise hvilken læreplan mål som er dekket i læreboka. En mulig årsak bak dette er at de ønsker å frigjøre tid til andre planleggingsoppgaver, og for å være sikker på at de dekker læringsmålene som er angitt av de nasjonale læreplanmål.

Trekanten av lærer - lærebok - student er viktig å forstå, og derfor har mange studier blitt gjennomført for å undersøke forhold knyttet til denne trekanten. Etter min mening, siden trekanten av lærer - lærebok - student anses til å ha slik betydning, da bør følgelig trekanten av forlag - lærer - lærebok, som denne oppgaven er opptatt av, også bør vurderes gitt en viss betydning.

Preface

The Danish philosopher Soren Kierkegaard says so wisely that life has to be lived forwards but is only understood backwards.

In retrospective, some things could be done different while others should or shouldn't been done at all. In my opinion mistakes could be excused if a person can learn something from them. For me, this means a good amount of learning during the process of being a part of the publishing house practices regarding textbook production related activities, and then writing a thesis about the insights. The thesis process has given me insights in how to work strategically and disciplined towards a goal. It has learned me that plans are to be changed, ideas and work being thrown away for the sake of a bigger cause. Most of all, sacrifices had to be done to be able to manage to write a paper of the size of this thesis. It is all worth it, if this thesis can manage to shed light on the research questions posed in form of findings through the analysis. If this thesis can further be used to investigate and further streamline the learning resources available for the students and their teachers, it would be considered as valuable for the research area of mixed and joint use of learning resources.

The process of writing has been iterative, and my knowledge of open educational resources and the triangle of publisher – textbook – teacher is increased.

I want to thank my supervisor Palmyre Pierroux, the editors at the publishing house and editor at NDLA. Of course, I also want to thank my family and friends, students and teachers at the Department of Education.

Nasim Abbas
University of Oslo, 2016

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Table of content

1 Introduction

The purpose of this chapter is to clarify the grounding for this thesis. Such clarification is considered important so that influences the internship period could have on my analysis and discussions later in the thesis, and where and how I have obtained empirical information about the textbook publishing industry is clear and transparent. After a wide historical overview, this chapter will start by make account for delimitations and contextualization of the thesis. Further descriptions of the background for this thesis, which is a case scenario consisting of publishing houses process of producing textbooks for upper secondary high school in Norway are given and the research questions posed. At the end of this chapter, some methodological and ethical considerations briefly discussed.

Humans are by nature a group organism, and humans have always worked and lived together in small or big groups. Different objects in the environment have given humans different affordances and constrains (Gibson, 1986; Norman, 2013). Another distinguishing property of humans is that they are the only species that make use of sign and tools for making an impact on their environment (Vygotsky, 1978). By using sign as in language and different tools, humans have delivered knowledge to the next generations so the knowledge could be accumulated. This was primarily done both by spoken narratives and showing by example, but also by writing and literacy.

Humans have therefore always had the need to try to preserve knowledge for the future. What started as idealized pictures and simple symbolic notations, became writing about over 5000 years ago (Encyclopedia, 2016). Before the invention of the printing press by Gutenberg in 1450, books were produced primarily by monks (Brunelle, 2016). With the invention of the printing press, knowledge could be distributed in a radical effective way, and it sets the stage for an important transformation of societal literacy (University of British Columbia [UBC], 2016). Before the Danish book printer Tyge Nielssøn came to Christiania to establish his printing press facility in 1643, there were no printing presses in Norway (Nasjonalbiblioteket [NB Digital], 2016). Thus were the first book in Norway "Almanac for 1644". Those who wanted something printed until 1643 had to use printing facilities abroad, especially the printing presses used in Copenhagen. With the technology of the printing press, books could

be produced and copied in masses. For not only could the knowledge be produced at a low and effective way compared to earlier writings and it could be spread a lot easier. Most of all, the printing press transformed learning and education (UBC, 2016). Books have in turn led to the need of bookshelf's and private collections of books.

Long before books were available for the general public Cutter (1883) referred by Robinson (2015) presented a vision about The Buffalo Public Library in 1983, a 100 years after his present time. Cutter predicted library automation in a good manner (Wikisource, 2016). According to Robinson (2015), Cutter foresaw modern technological developments in a surprising accuracy (Robinson, 2015). But Cutter were not the only one predicting the future with great accuracy. But Cutter were not the only one making true predictions on the future of books and the overwhelming amount of information and knowledge for the general public.

According to Wells (1937) the idea of an encyclopaedia was predicted to undergo a considerable extension and elaboration in the future (Wells, 1937). The reasoning behind this prediction was that the past encyclopaedias sufficed for the needs of a cultivated minority. Wells meant that access to knowledge and information were still in the "coach and horse" phase of development rather than in the phase of the automobile and the aeroplane (Wells, 1937). Wells thought that larger and more powerful universities co-operating more and more intimately should be ideal in the future. The assembling and the distribution of knowledge in the world at that time was ineffective according to Wells. The phrase "Permanent world encyclopaedia" conveys the gist of Wells ideas and is often referred to as "World Brain" by the media (Wells, 1937). This idea of a world brain has become true in some sense in today's Internet technologies.

With the invention of the Internet and the World Wide Web, education was once again to change. In 1995 The Federal Networking Council (FNC) agrees on the term "Internet" referring to the global information system that is logically linked together by a globally unique address providing high level services publicly or privately. The internet as it is today had been made possible through the collaboration of many people on a global basis (Leiner et al., 2009).

After this brief historical overview over relevant perspectives and technologies, this thesis will move on by placing this thesis in relevant subject areas and pointing out some considerations regarding validity and reliability of this thesis. The importance of investigating the research questions posed later will be argued for in the following sections.

1.1 *Delimitation and contextualization*

This thesis investigates the rationale, challenges and translation work involved when a publishing company converts existing digital educational content into traditional paper based textbooks for use in upper secondary schools. It touches many different topics and subjects, both technological and educational, physical and psychological. At the most basic level, it concerns the written word as a means for sharing knowledge and information for educational purposes.

Because of the many aspects involved, it had to be some delimitations in the sense of some choices between which of the aspects considered should be part of the thesis. To develop a coherent narrative and to make use of a relative decent amount of empirical data from the internship, the focus will be on trying to explore, understand and explain the posed research questions.

For ethical reasons, all data related to personal identification are chosen to be excluded, and there are no names used, just general descriptions. It is important to have in mind that all descriptions and data are from an excerpt from reality. It is from a real world work situation in a publishing house.

The subject areas relevant to this thesis are Information and Communication Technology (ICT) and learning in school, and in ICT general. Also ICT in a community perspective, differentiated instruction, and learning with ICT are relevant subject areas. The research questions posed, are in my view related to these subject areas because both publishing of Open Educational Resources (OER) based textbook and teacher preferences regarding learning resources in classroom practices, involves technologies related to ICT.

The triangle of teacher – textbook – student is important to understand, and therefore many studies have been conducted to investigate factors related to this triangle. In my opinion, since the triangle of teacher – textbook – student is considered such importance, then the triangle of publisher – teacher – textbook, which this thesis is concerned with, should be considered some importance as well. As this thesis review section will reveal, the teacher´s main preferred learning resource is the textbook, so in that sense the publishing house's role in producing those textbooks should be regarded as a valuable research area for the educational sector. As this thesis review section also reveals is that there are mixed or joint use of learning resources consisting in daily classroom practice's. This is in my opinion of high relevance for research on different learning resources including digital technologies.

In this thesis, educational resources are synonymous to learning resources, and used as a term to describe any kind of educational aid, especially digital resources, including computers, smart boards, mobile phones and tablets with access to the Internet, and paper-based textbook or other printouts. All the empirical data are gathered though the publishers process of producing textbooks.

In regards to the influence of pre-understanding on the interpretation of the empirical data and analysis, it is found reasonable to make account for it (Ryan, 2011). I was already thinking of writing a thesis on the topic of open resources. Earlier in upper secondary high school, I used Nasjonal Digital Læringsarena (NDLA) in seek of multimodality and interaction with multiple representation in the subject of natural science. Another reason for this was a search of alternative ways of telling about the same knowledge. And with what kind of success. This was the perfect work assignment for the internship and a handy coincidence regarding my forthcoming thesis. The supervisors at the publishing company where informed about my intensions using the internship period for use as an empirical case study for my master thesis at a very early stage. After getting approval for using data, observations and notes from the internship period for my thesis. My pre-understanding is regarded as important because it could influence on my interpretation of the qualitative nature of the empirical data.

In the following the internship period and related work tasks will be described, followed up by posing research questions which are to be investigated through this thesis.

1.2   Presentation of case

In autumn 2015 I had a mandatory internship at a Norwegian publishing house as part of the Master in Education Program Communication, design and learning at the University of Oslo. The internship period was 4 days a week in 5 weeks from 10.19.2015 to 11.19.2015.

The publishing house was already in the process of developing printed textbooks for upper secondary high schools, based on electronically available content from NDLA. The publishing house, planned to release textbooks in the subjects Norwegian, English, history, science and social studies. All, part of general admission requirements for higher education in Norwegian Universities and Colleges (Samordna opptak, 2016). A survey was planned as part of the production process of the upcoming OER-based textbooks. Responsibility for conducting the survey was the work task given to me as part of the internship.

The exact work task given at the publishing house was part of the overall production process of these upcoming textbooks. Survey work task consisted of two different parts, the first of, was to identify teachers' preferences in terms of learning resources, and the second to map which upper secondary high schools that could be candidates for being a test school for the purpose of testing the soon to be published textbooks in real life classroom practice. Almost all activities during the internship was related to these tasks. Activities included participating in both regular weekly editor meetings, supervision sessions and other meeting as with marketing division and author of the textbook in social science, and this became part of the fieldwork consisting of unstructured participatory observation and semi-structured interviews (Dalland, 1997). The survey was used to reach out to the potential test schools and teachers, and this became part of the empirical data from the teachers analysed using thematic analysis (Braun and Clarke, 2006).

Before the internship period started, I expected that the publishers were digitizing all kinds of information and knowledge. It was never in my mind that the publishing house were actually planning to publish a textbook based on digital content, found on an open educational resource portal online. Microchips and other technological inventions are giving humans access to technologies far beyond most people's imagination some decades ago. Still a

publishing house in Norway is publishing a textbook for secondary school based on open educational content online on NDLA.

Why is it that the publishing company wants to use available content online as the content of a printed textbook? The content is already available to the students and teachers because of its location online. And because all students in Norwegian schools have access to a computer connected to the Internet. And what does this entail in concrete design constraints?

1.3   Research Questions

Based on the pondering above, I developed a study of the conversion process, as the object of my analysis. More precisely, the research questions for this thesis are formulated as:

1. What are the key features in publishers work translating educational content from digital to paper based learning resources?

2. Which features do teachers view as important in the design of learning resources?

3. How are teachers in Norway using OER (NDLA) as digital learning resource compared to traditional or paper-based learning resources in the classroom?

The first research question, is related to the actual real life situation experienced through the internship. It has intensions to explain how and why it is possible to have a scenario where a publishing house is basing a product in the form of a book on digital content. Second and third question has ambitions to try and make use of the data collected through the survey conducted as part of mapping teacher's preferences regarding learning resources.

Digital technology is regarded as vital for the future of education (Senter for IKT i utdanningen, 2016). The case phenomenon which consists of a publishing company publishing textbooks for secondary school based on OER classified NDLA. Since OER is a digital phenomenon itself, the ICT aspect occurs. Another argument propounding the importance of the topic covered are data from the teachers, regarding their preferences and classroom practice relative to learning resources. According to Herbjørnsen (1999) its wise to look at the triangle of teachers, textbook and students, regardless of the subject being taught

(Herbjørnsen, 1999). According to Herbjørnsen it is important to resonate over which possibilities exists for communication, and how to grasp those possibilities. A factor to consider is that there are no on-way connections between the triangle, but rather back and forth everywhere. In this thesis there is a triangle of publisher, teacher and the textbook. The design implications translating from a digital resource to paper-based and the possible reasons behind. Teachers importance is a well-known fact (Udir, 2013a). Most utterly is the aspect of interaction between human and their environment, were technological artefacts like the paper-based textbook or the computer, mediate learning and knowledge through affordances and constraints.

My investigations of these research questions related to the case will contribute to shed light on how and why the publishing company wagering on open educational resource based textbook for secondary school (Yin, 2009). The study will also of course show if there are some common shared properties and similarities between paper and screen.

1.4   *Methodological and ethical considerations*

This thesis will concentrate on answering the research questions posed related to data both from publishing company and teachers, and seek to choose methods which result in a clear and researchable outcome. The main methodological choices include the use of unstructured participant observations and semi-structured interviews (Dalland, 1997), which is the base for the empirical data gathered during the internship, and a survey as questionnaire containing a mixture of structured and unstructured questions (Research methods knowledge base, 2016), which is the base for the empirical data gathered from teachers. The publishing house as a workplace where partly chosen by me through workplace wish application, and partly by considerations did by the study counsellors, and the work task were given by the publishing house as part of their process of producing textbooks. The survey was part of the work tasks. The methods used were in a sense given by external sources in the form of workplace and work tasks. Still the actual fieldwork and the methodological work afterward in the form of systemisation, interpretation and presentation in the form of this thesis is of course done by me. Thematic analysis has been used for interpreting the empirical data related to the case. Some choices were made with special regards to the ethical aspects and standards, such as not using the person related data from the survey. For reasons of privacy, all information linking the person to the answer is not used in coding or any other activity or reference related to this

thesis. The name of persons and the publishing house itself has been anonymised for the same ethical principles. There has been obtained a written consent from the publishing company for use of data from the survey carried out through the internship period.

All the delimitations, considerations and the presentation of the case in this section has been included to give a good understanding of where to place this thesis in the academic field of ICT related pedagogy. The importance of mediating artefacts and tools are important for human development, and the design of things is important related to their use. Both paper-based textbook and Internet are mediating artefacts for development and important part of where we are today in means of knowledge and education. The idea and prediction of both the public library for paper-based books and a public repository of information and knowledge in means of a digital "World Brain" has become true in some sense. With the different aspect around empirical, methodological and academic considerations made account for, this thesis will present a review of research and literature regarded relevant for the enlightenment of the case of converting digital educational content to paper-based textbook.

2   Educational resources

The thesis will in this section make account for the backdrop of the development of OER-based textbook production at the publishing house. GNU General Public Licence (GNU) will be explained in this section along with Creative Commons licences, which is important for the copyright management on the Internet. This is a very important part for the emergence of OER, which in turn is important for the development of NDLA. This section will also review some previous classroom research, which is taken into account for a broader perspective on textbooks and teacher's preferences.

2.1   GNU

To understand the OER movement this thesis it is considered relevant to know about the GNU project, which Richard Stallman founded in 1983. GNU is a recursive acronym meaning GNU's Not Unix. UNIX is a computer hardware undependable software program which operates as the operating system of a personal computer. GNU is like UNIX in technical sense, but not in the sense of licence. It is considered relevant because of GNU's licence policy. GNU (2016) explains GNU General Public Licence further:

> "Free as in freedom and not price…. the main features of GNU are allowing you to run the program as you wish, the freedom to copy the program and give it away to your friends and co-workers; the freedom to change the program as you wish, by having access to source code; the freedom to distribute an improved version and thus help build the community" (GNU, 2016).

Richard Stallman also founded Free Software Foundation (FSF) in 1985, which is a non-profit organization to advocate free software ideals. FSF has been supporting the GNU in several ways, including FSF acceptance of copyright assignments and disclaimers, so it can act in court on behalf of GNU programs. GNU claims that the ultimate goal is to provide free software to all of the computer needs users have, and in this sense make proprietary software a thing of the past (GNU, 2016).

Even if GNU was intended for software licensing purposes. Later GNU was a main part in the making of Creative Commons licences. Creative Commons licences are regarded important related both to the case of converting digital to paper-based and the free software movement influences on the emergence of open educational resources movement.

2.2 Creative Commons

Creative Commons (CC) is a set of copyright licences free to the public founded in 2001, by Centre of Public Domain and William and Flora Hewlett Foundation. CC is led by a Board of Directors comprised of thought leaders, educations experts, technologists, scholars, investors, entrepreneurs and philanthropists. The CC Affiliate Network consists of 100+ affiliates working in over 79 jurisdictions to support and promote CC activities as sharing and use of creativity and knowledge around the world. The first set of copyright licenses free to the public late 2002. CC is inspired by the Free Software Foundation's GNU General Public Licence to provide a Web application platform for helping users with a licence in their intellectual work, and in some conditions to dedicate the work to the public domain. Accordant to CC's website there are over one billion CC licensed works online per 2015 which are ported to over 50 jurisdictions (Creative Commons, 2016).

CC has a pool of hundreds of millions CC-licenced creativity, including songs, videos and academic material. The reason behind it is according to CC's website that the idea of universal access to research, education, and culture is made possible by the Internet, but our legal and social systems do not always allow this to happen. Copyright was created long before the emergence of the Internet, and can make it harder to legally perform actions that

most users take for granted using the Internet as copy, paste, edit source, and post it on the Internet. According to CC's website the default setting of the copyright law requires all of these actions to have explicit permission, granted in advance, whether you are a scientist, librarian, policymaker or some regular user.

"To achieve the vision of universal access, someone needed to provide a free, public, and standardised infrastructure that creates a balance between the reality of the Internet and the reality of copyright laws. That someone is Creative Commons" (Creative Commons, 2016).

CC's infrastructure provides consists of a set of copyright licenses, and tools that tries to create a balance between traditional all rights reserved setting copyright law creates. All the available options regarding the choice of copyright for a particular user's creative work consist in three layers of licenses, the legal code, the human readable and the machine readable. This is done so the spectrum of right is not just a legal concept.

CC has six different licenses to the general public to choose where all include an attribution (BY) to the creator when the material is used and shared. CC BY is recommended for maximum dissemination and use of licensed material. CC BY allows others to distribute, remix, tweak, and build upon the original work, even commercially. Alongside BY the users are able to choose between NonCommercial (NC), which lets others remix, tweak, and build upon the original work non-commercially, and their new work must acknowledge the original creator and be non-commercial. Still the derivative work does not have to be licensed on the same terms. NoDerivates (ND) allows for redistribution, commercial and non-commercial as long as it is passed along unchanged and in whole, with a credit to the original creator. ShareAlike (SA) let others remix, tweak, and build upon your work even for commercial purposes, as long as they credit the original creator and license the new creations under identical terms. This license is often compared to copyleft free and open source software licenses. All new works based on the original will carry the same license, and any derivate will also allow commercial use. This is the license used by publishing house for the upcoming NDLA based textbooks. The last two license types are a mixture of NC, ND and SA.

A type of CC licence, which are explained later, are the copyright used on NDLA and for the upcoming textbook. To obtain a chronological narrative, it is considered relevant to become

acquainted with how the OER-movement became acknowledged, before NDLA is described, because NDLA is classified as an OER.

2.3 Open educational resources

Introduction of the term Open Educational Resources (OER) was done by UNESCO at a conference forum in 2002 as part of a a work group report. UNESCO convened the forum in association with the William and Flora Hewlett Foundation and the Western Cooperative for Educational Telecommunications. Totally there were seventeen participants from all over the world, attending due to their involvement in the development and practice of higher education in their respective countries (UNESCO, 2002).

The working groups were organized to make recommendations concerning critical areas including an appropriate name and definition for the service which was known as open courseware. Main discussion was on the recurring theme of a clear understanding of issues related to copyright, including prospects of open courseware, freely available on the Web, could be misused. Open courseware was defined as provision of educational resources for college and university faculties to adapt in accordance with their curricular and pedagogical requirements (UNESCO, 2002).

In defining of OER the work group considered the following elements accordingly to UNESCO (2002):
- The vision of the service: open access to the resource, with provision for adaption.
- The method of provision: enabled by information/communication technologies.
- The target group: a diverse community of users.
- The purpose: to provide an educational, non-commercial resource

Which in turn resulted in the following definition of OER:
"The open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaption by a community of users for non-commercial purposes" (UNESCO, 2002, p. 24).

According to a study report, OECD (2007) claims that the development of the information society and the widespread diffusion of information technology give rise to new opportunities

for learning. At the same time, they challenge established views and practices regarding how teaching and learning should be organised and carried out. Higher educational institutions have been using the Internet and other digital technologies to develop and distribute education for several years. Yet, until recently, much of the learning materials were locked up behind passwords within proprietary systems, unreachable for outsiders. The open educational resource (OER) movement aims to break down such barriers and to encourage and enable freely sharing content (OECD, 2007). According to the same report the sector of higher education is facing a number of challenges: globalisation, an aging society, growing competition between higher educational institutions both nationally and internationally, and rapid technological development. OER is itself one of these challenges, but may also be a sound strategy for individual institutions to meet them. "The trend towards sharing software programmes (open source software) and research outcomes (open access publishing) is already so strong that it is generally thought of as a movement. It is now complemented by the trend towards sharing learning resources – the open educational resources movement" (OECD, 2007).

The situation of today is that we live in a knowledge society, rather than an information society. According to UNESCO the concept of knowledge societies describes todays societies better than information societies since enhanced access and flow of information alone is not sufficient to grasp the opportunities for development that is offered by knowledge (UNESCO, 2003). Because of this unprecedented abundance of information output and accelerated information dynamics that characterises todays societies disregarding conceptual descriptions whether it is called knowledge society, information society or as Terranova calls it "network culture", it is important to be able to take in the bewildering variations without being overwhelmed by it (Terranova, 2004).

For the sake of a holistic approach to understanding the case of converting digital educational content to paper-based educational content in the form of a textbook, it is considered important to make account for the governmental funding and approval of textbooks as a learning resource and the governmental focus on digital learning resources. The Ministry of Education grant to support their focus on digital learning resources are the spark that led to the founding of NDLA.

2.4   National educational policies and NDLA

Learning resources is defined as following in Norway's Regulations to the Education Act §
17-1:

> "[…] all printed, non-print and digital elements that are developed for use in education. These fractures
> can be standalone or a part of a holistic whole, and will cover alone or together as a whole with
> competence in curriculum for the Kunnskapsløftet" (Udir, 2013b, p. 10).

The term learning resources are within Norwegian research primarily related to school and
secondary education. It is defined by institutional affiliations, and out of an intention to
instruct, enlighten and convey. In some part of scientific communities, the concept of learning
resources replaced with educational or pedagogical texts. According to Knudsen (2011)
referred by Udir (2013b) "the concept allows for a broader textual concept and a broad
concept of learning" (Udir, 2013b, p. 10). The texts must have common characteristics that
qualify them for the term educational. That they must have a content that is aimed at an
audience, and a learning situation that leads to an interaction.

The Norwegian state has since the late 70's allocated funds for the development and
production of learning resources for the student groups where there is a market base for
commercial releases. According to Udir (2013b) there has been a big focus on digital learning
resources or a combination of print and digital components since 2000.

The approval scheme for textbooks which were in use since 1889 were earlier defining many
explicit demands and criteria for the content and design of textbooks. The approval scheme
was discontinued spring 2000 (Bratholm, 2001). According to Bratholm, Norway was one of
the last countries in Europe that held on to the approval scheme for textbooks for such a long
time. Counties, like Sweden and Finland, that are relevant to compare with has removed such
approval scheme since 1990s. Denmark has never had such scheme.

In proposals for the Revised National Budget (RNB) for 2006 the Government suggested
above Parliament a grant of NOK 50 million for development and use of digital learning
resources in secondary education (Regjeringen, 2006). All counties in Norway were invited to
apply for the funding. The applications from the counties could include one, several, or all
secondary schools in the county, and it may include one or more subjects. The objective of the

grant was to encourage the development and use of digital learning materials, as well as helping to reduce students' expenses for learning resources.

The following were defined as targets for investment:
• To increase access to and use of digital learning resources in secondary education.
• Develop secondary schools and school owner's expertise as a developer and / or ordering of digital learning resources.
• Increase the volume and diversity of digital learning resources aimed at secondary education. Over time reducing students' expenditure on learning resources.

Later the Ministry called in a letter dated 30.06.2006 the 50 million under the proposed RNB. In a meeting September 20th, 2006, all counties except Oslo agreed to establish a joint venture to develop an open learning resource portal online for all subjects in secondary education (Nord-Trøndelag fylkeskommune, 2007).

The project was named the National Digital Learning Arena (NDLA). County executives assumed the project as a common national solution for procurement, customization and production of digital learning tools as a prerequisite for success in efforts to provide free teaching materials. The application was sent to the Ministry of Education and county authorities received a letter dated 04/20/07 pledged 15 million for the development of digital learning resources in the subjects Norwegian and science VG1 level, with a requirement that they should be ready by school start in 2007.

Increased volume and diversity of digital learning materials was seen as a prerequisite for introducing the scheme of free learning resources in secondary education. The reason for this was a rule change in 2007 which introduced the free principle in the Education Act § 3-1, ninth paragraph (Udir, 2014). The free Principle was introduced to ensure that education should be inclusive, so that all students can participate on an equal footing, regardless of economic background.

Wednesday, 26 September 2007 was NDLA launched by Prime Minister Jens Stoltenberg as a project that delivered on behalf of the Ministry of Education and in collaboration with the

Directorate of Education. Thus, an inter county cooperation was a fact (Hordaland fylkeskommune, 2007).

NDLA is called a distributed organisation. NDLA has no employees, but controls employees with county employment resources from both public and private sectors, staying employees in all parts of the country. The core activity is the development and updating of digital learning resources and work is organised in three processes: management processes, management processes and core processes that include manufacturing. Through efforts to develop digital learning resources and disseminate good pedagogical use of them, NDLA developed a strong professional network for collaboration and distribution between counties. Therefore, NDLA constantly invited as a cooperative partner for small and large national initiatives in education and training. An example of this is the sharing arena for FYR project, which develops learning resources with vocational rectification and relevance to common subjects (NDLA, 2016).

According to NDLA, being online is an important forum for sharing intellectual property. While some intellectual property is related to normal copyright, other intellectual property are licensed as Creative Commons (CC). When school started in autumn 2014, NDLA provided educational materials for nearly 40 curricula in secondary education. Also the use of NDLA has increased steadily with approximately 50,000 daily hits per November 2014 (NDLA, 2016).

As NDLA was launched the publishing industry started to get concerned and started investigating the possible consequences of NDLA for the industry's economy.

2.5 *Publishing industry*

In 2007, shortly after the creation of NDLA, the Norwegian Publishers Association issued a study to report the possible consequences of NDLA. According to the report, there are three distinct effects on development of learning resources in Norway if NDLA is a success. First and foremost, the report concludes that NDLA may greatly reduce publishing industry's commitment to developing educational materials, due to that NDLA is seen as a publicly funded competitor to existing publishers. The next possible consequence is a direct consequence of the first. For if NDLA is a success, the development will be concentrated

around material on NDLA. The content on NDLA, according to the report (Den Norske Forleggerforeningen, 2007), will be determined by NDLA´s editorial staff, and thus the diversity of Norwegian learning tool development decreases as a result. A third consequence mentioned in the report, is reduced quality. The report warns that a reduced focus on development of teaching materials from publishers, will cause the competition to disappear (Den Norske Forleggerforeningen, 2007).

According to the impact assessment of the Norwegian Publishers Association, learning resources in the upper secondary high school is roughly all utilities used to achieve goals education authorities have set for students. The basic need a learning resource must meet is knowledge (Den Norske Forleggerforeningen, 2007). Although learning resources constitute in a wide range of products, still printed textbooks are the largest group of learning resources used in the Norwegian school. When to understand the value chain for learning materials, it can be appropriate to distinguish between three different dimensions:

- Prioritization of learning resources
- Financing of learning resources
- Development and distribution of educational materials

Given the priority of learning resources, is it that students are presented several learning resources in learning. Which learning resources made available is mainly settled by schools through the teachers. Which learning materials that are prioritized depends, among other financial constraints, quality and availability.

The government`s goal of ensuring free learning resources for all students in upper secondary high school from 2009, started already in 2007. The transition from students paying for learning resources to the public sector providing them, according to the The Norwegian Publishers Association study, will have implications for how learning materials are purchased and thus financing of learning resources. Previously, no schools had any direct economic limitations in the choice of learning tool. Since it will now be financial constraints related, there possibly could be schools that seek to buy learning materials with the highest quality per krone.

With regard to the development and distribution of educational materials, it is common that a content provider, typically a textbook author related to a publisher, is responsible for the publication. The textbook is jointly developed by the textbook author and publisher. The publisher then distributes textbooks to schools directly or through a bookstore. The impact assessment by NDLA shows the development of learning resources is associated with significant risk (Den Norske Forleggerforeningen, 2007). Several subjects in secondary schools have developed 5-6 sets of textbooks from publishers. The risk, according to the report is that publishers do not know about their version of learning resources, will be chosen in competition with other publishers. A learning resource`s success is determined by the schools, in the sense that one learning resource is better on price and quality than another. The development of a textbook can cost a publisher many millions, therefore publishers want to make sure the revenue is higher than the cost of developing costs.

The impact assessment report points that the content of NDLA is free for users. Since it is based on a licensing model that allows user contribution in complementation of the content, raised the question whether the additional information has the quality required by a learning resource? It also pointed out that the organization of NDLA is similar to the organization of a publishing house with own editorial staff. It highlights that the difference lies in NDLA being publicly funded. This is much of the same criticism for as NRK has gained with its online newspaper solution (Dagens Næringsliv, 2015).

After the study results were presented, the Norwegian Publishers Association filed a lawsuit against NDLA on the grounds that the Ministry of Education funding NDLA was contrary to the European Economic Area (EEA) Agreement. The lawsuit was reported for European Free Trade Association (EFTA) Surveillance Authority (ESA). The appeal was rejected, and ESA concluded that the development of digital learning materials falls under the definition of public education, which is the government's responsibility. NDLA has since also received an award for best innovation in the public sector. NDLA was the only outside EU cooperation that reached the finals and competed against 116 applicants in its category Smart Public Service Delivery in a Cold Climate Economic (NDLA, 2016).

According to Neal Goff, who is president of Egremont Associates, which works with publishers and educational technology companies in New York, education publishers face

opportunities, challenges and a huge amount of uncertainty in the textbook market these days (Education Week, 2013). There are several factors contributing to the state of flux, like the emergence of OER that challenge commercial publishers, and the question about whether education content, or the technological platforms that deliver that content, will matter more in the time to come. Publishers are also trying to gauge how the rise of OER will affect their revenue. According to Goof, many of the publishers of textbooks today are assuming that school districts and other buyers of curriculum and other products will recognise the value of products, that publishers have invested money into developing, and that teachers and other decision makers, will be willing to pay more for products the industry believes is of higher quality. Goff explained that publishers are likely to take an "if you cannot beat them, join them" approach to open educational resources. That would mean they would either create their own free materials, or partner with others designing those materials, and attempt to make money by offering to curate or organize them in ways that would make them more useful to educators. According to Bergstrom, most teachers would welcome an innovation that would make pieces of their work easier. Since the students change every year, so does their challenges as teachers. According to Bergstrom publishing houses should focus on helping teachers make the lives of students better (Education Week, 2013).

2.6   *Textbook as an educational resource*

In accordance to UNESCO´s 19th General Assembly referred to by Johnsen (1989) it was approved that there should be a report on the design, production and use of textbooks. This Guide pour la conception. l´elaboration, la fabrication et l´evaluation des manuels scolaires describes textbooks as; "a printed material intended to use in a learning trajectory within a determined educational framing" (Johnsen, 1989, p. 10-11). This means an atlas, dictionary or an anthology, artefacts that are commonly considered as textbooks. UNESCO´s definition of a textbook includes newspapers and so forth as soon as they are used in a systematic matter in an educational setting. Learning resources are regarded as anything that the teacher and student agree on using for realising the goals within any given subject.

According to Andreassen (2000) the publishing industry's main challenge is to serve both "marked and cathedral", by making sure to make profit while at the same time publish content that has cultural value and significance (Andreassen, 2000). A Major publishing house that aims to cover the entire spectre of book genre, not only must adjust to meet the challenges of

new technology in production, distribution, marketing and sales, but imagine the text from the start of the process as being suitable for presentation in multiple media.

According to Johnsen (1989) everything now happen very fast. In the 1960s the world view of textbooks was consistent. Since then the world has grown bigger and the problems arise closer than what was expected. All the different happenings arise in turn the need for rewriting or revisions of textbooks so the latest changes are reflected. Johnsen (1989) claims that textbooks are a commodity and that the need for revised and updated textbooks are known problem. According to Johnsen (1999) textbooks are part of a mixed economy. Textbooks are on one hand a commodity which can be demanded and supplied with a price. The publishing companies compete and the regular marked economic principles apply. Government can on the other hand influence on and regulate this market by financial subsidies (Johnsen, 1999). For example, the government still supports the development of learning resources for narrow groups of students with special needs regarding learning resources.

According to industry statistics 2014, which is a statistic compiled by the Norwegian Publishers Association annual estimate book sales in Norway. Figures for textbooks for the upper secondary high school in 2014 is estimated at about 240 million in net sales (Den Norske Forleggerforeningen, 2014). In Norway, as elsewhere in the world, there are schoolbooks which first called the publisher. Andreassen (2000) points out that the book was synonymous with textbook throughout history. Andreassen claims that various reforms in 1990 and 2000's helped to increase the need for revised and new releases of textbooks, so that they would match the learning objectives of the new reforms such as Reform97 and LK06. In the upper secondary high school students had previously had to buy their textbooks themselves.

Schools and textbooks for the entire educational system constituted according Andreassen (2000) in 1998 45.5 per cent (1,280 millions) of publishing houses, who were member of The Norwegian Publishers Association´s, sales broken down as follows:

-Textbooks for elementary school 544 million
-Textbooks for upper secondary high school 372 million

-Textbooks for higher education 265 million

-Textbooks for professional education 96 million

According to Andreassen (2000) summed public spending on book sector in 2000 to about 2.4 billion kroner, which is 0.4 per cent of total budget for all governmental spending's. With a tax exemption for the 1.2 billion amounted government contributions summed 3.6 billion (Andreassen, 2000). The aim of the aid schemes and all book production was to get people to buy and read books. Literature has played an important role in the education system according to Andreassen. There are public libraries run by local authorities and schools are libraries for students. It is not primarily economic intent behind literature's position in Norwegian society, concludes Andreassen. The traditional cost for producing textbooks is considered as relatively high. Especially layout elements as pictures are considered costly. Just the text composition is not necessarily costly but Johnsen (1989) claims that the textbooks also have to be adjusted for different age, level and subject. The typical author of a textbook has traditionally been, as described by Johnsen (1989), as teacher in upper secondary school in his 50s who works part time as a textbook author besides full time job as a teacher. This traditionally typical textbook author works for a publishing company, who often operates with tight budgets for salary to the authors of textbooks.

According to Johnsen (1989) there seems to be almost impossible to read a book without learning something (Johnsen, 1989). This was once an accepted pedagogic where every book was considered as a textbook. Textbooks today are in accordance with Johnsen regarded as "all printed learning resources that covers a substantial amount of a given subject's curriculum goals for the given level of education expected to be used on a regular basis" (Johnsen, 1989, p. 10).

Makers of the national curriculum goals have had both tradition and renewal in mind, claims Johnsen (1989). The making of a textbook includes the centuries long heritage of knowledge and perceptions and new discoveries which results in many different decisions in the process of design. Ultimately layout and content depend on the author or publisher of the textbook. According to Johnsen the pedagogical adoption results in a simplification and therefore also a change in the content. This can be seen in textbooks in the social sciences were new social phenomenon can be presented with different perspectives, resulting in different impressions.

Johnsen (1989) predicted that in the future there will no longer be enough with, what he calls low-level thinking as reading, writing and calculating. According to Johnson we must develop skills in, what he calls high-level thinking; which consisting of not only acquiring information, but to sort it out. Not to understand it, but to consider it. Not to know many details, but to be able to summarise them. Not only determine what's considered trustworthy, but to prioritise what to use in regard to relevance. This is the future Johnson thinks of by a joint use of learning resources like paper-based textbook and the computer. Johnsen (1999) claims that the classroom practice is highly textbook based, because teachers only occasionally have the time and energy necessary to understand curriculum goals and organise knowledge content according to these goals (Johnsen, 1999).

Because students learn differently, some like structure and others have a need for alternative learning strategies, so the differentiation is made through many pedagogical and typographical interventions to be able to reach so many as possible, including the use of foreword, direct addressing and meta-text. Foreword is considered an important part of a paper-based textbook according to Johnsen (1999).

According to Johnsen (1999) the many pedagogical and disciplinary demands for a textbook are inhibiting the textbook genre. Johnsen alleges that it is not expedient to let the traditional concept of what a textbook is, prohibit student's knowledge seeking and assessment of other sources. It is not suitable to have textbooks with enough explanations, argumentation and discussion to cover a subject throughout without necessarily making a relative thick book. Johnsen points out that the textbook only needs to have enough content which gives the fundamental understanding of a particular subject. The rest could be acquired through other channels. The ideal scope for such textbook could be approximately 50-100 pages, and this solution should not scare of authors and publishers according to Johnsen. The reason behind this type of textbook is according to Johnsen (1999) critique on textbooks having too much content which is fragmented in recent textbook debates. If the text binding is done in a successful manner the textbook on the other side, a textbook containing 200 pages would be more effective than a book containing 80 pages.

As mentioned above, the national curriculum gives principles and guidelines for what is expected knowledge and skills in particular subjects and educational trajectories, but there is no rule for using a textbook in a classroom practices according to Michalsen (1999). The teachers could go through the curriculum goal by using other learning resources. Still this is the main learning resource in findings from many studies, like those included in this thesis. A possible reason behind this could be that a written text gives many advantages in contrast to a longer verbal message. One of these advantages is a clear overview over its content according to Falck-Ytter (1999). The eye can catch bigger parts at a time and one could glance up and down in a quick and effective manner. By virtue of being a text the textbook could present large amounts of educational content compared to verbal telling.

According to Falck-Ytter (1999) the traditional textbook is transferring knowledge through the body text, and activating through questions and tasks. A good textbook should work well in cooperation with the teacher, not only in transferring knowledge through the body text, but to let the teacher lean on to it by providing enough examples and tasks which can be given in classroom or as homework. Falck-Ytter (1999) claims that everybody, who teaches, know the importance of enough tasks which can be given for activation of students (Falck-Ytter, 1999).

Design of a textbook has to do with function, aesthetics, colour, materials, production, marketing and economy (Paasche-Aasen, 1999). The graphical design that a textbook gets, like its visual form and feeling, is often neglected, according to Johnsen (1999), which Johnsen thinks of as a shame because of its pedagogical quality of the textbook. Designing a textbook means to create a form that goes into a unity with the content, where visual element is used in an effective way to make the textbook's content as easily available to the reader as possible. There are several processes involved in a successful textbook design. As much a part creativity plays does also conciseness about certain rules and norms, as throughout knowledge in typographical and graphical means and knowledge of the production process. If not, the idea could not be transformed into a functional product warns Paasche-Aasen (1999).

Paasche-Aasen point out three main aspects central in planning design of textbooks. First of all, finding the target group for the textbook is important, which means to determine subject and educational level. This is upper secondary school for the case scenario in the core subjects leading to general admission requirements for higher education like college and university.

Second, the publisher has to decide what kind of textbook it will be. Possible types include basic textbook, task collection and workbooks. As a reminder, so has the publisher in this case, chosen anthology as the best suited type in the subject of social science. Last but not least, the level of quality has to be decided, were the typography and other layout related premises considered. This is the format (standard or specialized), paper quality (processed or unprocessed), weight (thickness of paper), binding (paperback or hardcover), illustrations (black and white or colour), and print quality (regular or high-definition).

When these premises are decided the actual work with the textbook design starts by making a basic form for the textbook. According to Paasche-Aasen (1999) this is done first of all, because there are many typographic elements a textbook possibly could exist of. Some of these elements that's listed include: body text, tasks, frames, pictures, diagrams, footnotes, summaries, in-depth explanations, and so forth (Paasche-Aasen, 1999). Because of the extensive amount of typographical elements, it's wise to have chosen which one to include early as possible. This is often done by the author as a first draft, which is later discussed with the editors at the publishing company according to Paasche-Aasen (1999).

According to Berg (1999), classroom practice exists of interactions between teacher, student and the learning resource. The pedagogical cooperation needs differ. Some teachers have the need for a little information, while others want a lot of explanations, examples and tasks to be given (Berg, 1999).

According to Johnsen (1999) there are few methods standing stronger than problem solving in means of finding solutions to given tasks in Norwegian schools (Johnsen, 1999). Still, there is little research or quality control with textbook tasks according to Johnsen (1999), and shows to how The Language Council of Norway, who are responsible for language is in accordance with national policies, has apologized for not having the capacity to go through the task part of the textbook's.

A dissertation done by Asle Gihre Dahl referred by Johnsen (1999) studied the task culture in textbooks. One of the main obstacles were a classification of tasks because of the many variations and uses, which were true for all subjects. Classification was used as a basis for a development of a questionnaire. One of Dahl´s conclusions was, according to Johnsen (1999)

that tasks are one of the most resistant part of a textbook, and no other type of text has changed so little as tasks over the course of time. What Dahl refers to as task culture, is described as "a conservative and preserving element in the world of textbooks and the educational system" (Johnsen, 1999, p.122).

According to Johnsen (1999) the teacher and textbooks have been the skeleton of education for centuries, and the learning resources has been consisting of speech, text and images (Johnsen, 1999). Johnsen points out that just like the society has been developed through interactions between educational texts and expertise, the students have done the same through their relation with the teacher and the textbook. Johnsen wonders if this skeleton can be re-build, then this would be the first big revolution since Gutenberg invented the technique behind the printing press. According to Johnsen, education could be organized after age, level and subject first after the invention of the printing press. This was the start of the school days being regulated by watches and textbooks. If so, then it has to be taken radical interventions in both the national curriculum, teachers education and evaluation concludes Johnsen.

According to Johnsen, Lorentzen, Selander and Skyum-Nielsen (1997) the role of written text had a minor role before Gutenberg introduced the brilliant technique of the printing press (Johnsen, Lorentzen, Selander & Skyum-Nielsen, 1997). After the invention of the printing press all pedagogical texts have improved their position in all education. At the same time as everybody, according to Johnsen et al. (1997), see the teacher as an important part of education, so does few deny that the textbooks are the most important companion to the teacher, who has has leaned on textbook since catechism to our days. Teachers choices are not easy in the view of Johnsen et al (1997), because the amount of knowledge is enormous, and the teacher has to deal with the choices of others before he or she decide for their own.

As mentioned earlier, the textbook as a product is both working between teacher and student and has both influences on society, but is also itself a reflection of society, at least in intensions. Johnsen et al. (1997) claims that textbooks in virtue of being a pedagogical text are always created in a context, which can be political, moral, economic and so forth. This has resulted in textbooks sometimes been indoctrinating, but most often an upbringing to a civic life. As an evidence of this claim, Johnsen et al. (1997) point out that textbooks had obedience and godliness earlier, which is replaced by democracy and critical reflection nowadays.

One aspect with information technology is the possibilities it gives the teachers and students to produce their own textbooks. Johnsen et al. (1997) points out that this simplification of the production process of textbooks simply by composing their own textbook and just print out the end result. Production of textbooks is no longer depending on established machineries and acknowledged authors because the technology is laying ground for cooperation on a global scale (Johnsen et al., 1997).

Textbooks have a long tradition being a learning resource both for the teachers and their students. Having knowledge about textbook design and its place in the society as a pedagogical text is valuable insight before continuing to the role of learning resources in classroom practices.

2.7 *Prior research on educational resources*

In accordance with Johnsen (1989) the textbook is both considered as a master and a servant in classroom practices (Johnsen, 1989). The textbooks are therefore considered as a complex construction (Johnsen, 1999). There have traditionally been many different actors are involved in the design and content of textbooks. This includes curriculum goals, subject specific demands, author, editors give the finished product, which in turn is considered as the respective subjects design and content. But the main actors involved are teachers and students, everyone using the learning resources in their own way. Johnson claims that because of the many actors involved in the making of the textbook, it becomes an unsigned contract between subject, society and the home. Also the editors at textbook publishers have many considerations in incorporating curriculum ideals, and at the same time being an employee of a profit oriented employer (Johnsen, 1999). They have to serve both teachers and students as users and their publishing company. These considerations influence in turn the author and the textbook developed. As an example, Johnson points out that the occurrence of single individual authors the more you go back in time. Johnsen claims that in the first part of this century, it was not uncommon that only one person could be the author of all the textbooks for all levels in every subject, or that the textbooks were used by more than one generation (Johnsen, 1999). A textbook nowadays is more a result of a collaborative effort by many different actors. In any case the publishers have a key role in the development of textbooks. In

this way the publisher becomes the messenger between the governmental policies such as the national curriculum and the schools

Research on learning resources and classroom practice before the introduction of LK06 which is the current curricula, shows that learning resources are an important part of the school's instrument in education and that the textbook is the most important instrument used in classroom teaching practices. The results are a based on findings in a project with the task of identifying which learning resources are being used, the role and impact of the different learning resources and their role in classroom practice according to the curricula funded by Udir (Juuhl, Hontvedt & Skjelbred, 2003).

According to Udir (2013b) many teachers want to have access to and use a combination of print and digital educational materials for training. It may be appropriate to select the resources from one or more competence, allowing for alternative ways of using learning resources on, e.g. across disciplines and stages. Instead of holistic packages of learning resources it could be developed learning resources that are differentiated and flexible. Printed and digital components can complement each other, and must be designed to meet the need for flexibility and variety (Udir, 2013b).

According to Udir (2013b) the textbook is used mostly in the preparation and conduct of the training, it legitimizes according to teachers and students training, and ensures that it complies with the curriculum (Udir, 2013b). Other learning resources are being used, but as a supplement to textbooks to diversify and secure elaboration or differentiation. Recent research shows that the situation is by far the same after the introduction of LK06 claims Udir (2013b), and concludes that it is better to facilitate the use of digital learning resources, given that the infrastructure is largely in place in the Norwegian schools.

A recent research project called Ark&App has contributed to knowledge about the impact of learning resources or learning resources have for teaching and learning for competence goals in the Norwegian curricula. The Norwegian Directorate of Education and Training (Udir) has initiated the research on behalf of the Norwegian Ministry of Education and Research which is responsible for the development of kindergarten and primary and secondary education in Norway. Research has been conducted by the Institute of Education (IPED) at the Faculty of

Education at the University of Oslo, and is a three-year project that examines the different practices in the classroom in four subjects; math, science, English and social studies. Within the frame of the research project ARK&APP (2013–2015) two quantitative surveys and 12 qualitative case studies has been conducted.

Finding from one of three case studies in social sciences from Ark&App project, shows that individual students activities involves a blended use of learning resources (Rasmussen, Gilje, Ferguson, Ingulfsen & Bakkene, 2014). The printed textbook is often laying on the student's desks, but how different students used the textbook varied. Some of the students borrowed books from the school's library, and some did not have the need for visiting the library. All used computers with access to the Internet, and this was found to be the most important learning resource (Rasmussen, Gilje, Ferguson, Ingulfsen & Bakkene, 2014). The students often used search engines and Wikipedia as a gateway to specific texts or source for their assignments. According to Rasmussen, Gilje, Ferguson, Ingulfsen and Bakkene (2014) the source material is beyond boundaries regarding the Internet as a resource, and therefore creates difficulties in finding the right material from trustworthy sources of information. It creates a tension between what is in the printed textbook, which is a bounded and familiar to the students, against the open and unsure which the Internet represents according to the teachers participating in the study. Students on the other side, did not have so many positive things to say about the textbook, primary because they meant the textbook contained too many details and kind of too much text and at the same time difficult to sort out what to use and not in a need for something specific. To use the textbook demands that the students are active and strategic readers, something they need help to master. In using the Internet as a learning resource on the other hand, students' academic competence is under development, and therefore it is not necessarily strong. Their prerequisites for web search makes it difficult to find relevant information. It is in this field of tension and in this blended learning environment that they have to be able to achieve the skills necessary in the curriculum (Rasmussen, Gilje, Ferguson, Ingulfsen & Bakkene, 2014). Analyses from this study shows that to search, understand and interpret sources for information is very demanding, even for students at secondary level, and how both the teacher and fellow students are vital supporters in the work of managing these skills. The enormous amount of information and knowledge on the Internet, results in difficulties because of lacking skills in the above mentioned factors necessary for using the available content and information.

Rasmussen and Lund (2015) examined the relation between learning resources and the teacher role using data from interviews with teachers and students participated in the ARK&APP (2012-2015) and the TWEAK (2008-2012) studies (Rasmussen and Lund, 2015). Their analysis shows central themes in the experiences of teachers and students their use of Internet and textbook as a learning resource. Central themes include, what they call hybrid practice, that the textbook has lost it sovereign position as the only source of knowledge in classroom teaching practice. This implies, according to Rasmussen and Lund, that the teachers are facing new demands in assisting the students in considering the trustworthiness of the Internet based learning resources, and to organise the teaching in relation to the threat from non-academic activities. Results from their analysis also shows that this leads the teachers to develop and adjust tasks for their students on their own. In this sense the teachers become designers of teaching practices.

Saljo (2010) referred by Rasmussen and Lund (2015) points out that education is in a change in the way it traditionally has been organised and practiced. Saljo claims that this change is mainly because of new technologies like the Internet which in turn demands for knowledge and skill in source criticism, selection and use of different learning resources depending on a given task (Rasmussen and Lund, 2015). According to Rasmussen and Lund these new technologies abolish constraints in time and space, as we see a tendency to going from a strictly regulated and closed learning universe to a more open learning universe, where the historical stabile relation between the textbook, tasks, exams and assessment are challenged by digital technologies, communication means and a new technological economy.

The finding from their study reveals that teachers feel that the Internet is causing an uncertainty among students: "There is a tension between the textbook, which is regarded as bounded and familiar, and the open and uncertain which the Internet represents" (Rasmussen and Lund, 2015, p. 9). Teachers feel the students do not have enough skills in searching for knowledge on the world wide web to accomplish a certain task. Because the Internet feels demanding, teachers often try to keep the more authoritative, closed and safe learning resource, which in a school setting is represented by the textbook. "Hybrid practices are thus characterised by a connection between different learning resources and modalities - both analogue and digital" (Rasmussen and Lund, 2015, p. 16). According to Rasmussen and Lund

(2015) the publishers also have a joint use of paper based and digital learning resources. This is done in the way that the textbooks have their own pages on the Internet with additional content related to the textbook. The findings in this article show that there are not one kind of learning resource, but an ever alternating use of textbook and the Internet. Another key finding in this article is that the textbook is no longer regarded as the curriculum. The textbook is a structuring element in relation to what's considered valid and trustworthy information. According to Rasmussen and Lund (2015) the textbook seems to be part of a didactical practice where the teacher copies, uses other books, and resources from the Internet.

Today's hybrid practices and blended learning with the bring your own device (BYOD) trend (WhatIs, 2016) is a result of development and access to different technologies like internet connected computer, tablets and mobile phones. The textbook role is still major in classroom practices, and textbooks are part of a mixed economy. This chapter has also taken in account different aspect in designing a textbook, which of course is considered important to understand the publishers process of producing them. The findings, from previous research described above, are relevant for my study to understand current classroom practices and the terrain for publishers and authors of paper-based textbooks.

3 Theory

The purpose of this chapter is to present some theoretical perspectives which can be used for explaining and answering the research questions posed in this thesis standing on the shoulders of giants (Wikiquote, 2016). The chosen giant to stand on the shoulders of in this thesis is Vygotsky, Gibson, Norman and Norretranders. Vygotskys sociocultural perspective on learning is used to understand the role of learning resources for learning and education. Gibson and Norman is used to understand and explain what distinguishes different learning resources. Last but not least, Norretranders is used to understand todays information and knowledge societies implications on education.

3.1 *Sociocultural theory of learning*

The Russian lawyer and philologist Lev. S. Vygotsky's sociocultural theory of learning is the fundamental theory behind, not only this thesis, but also the theoretical foundation behind

Udir policies referred to in this thesis and in that sense much of the research shown in this thesis. Central concept of sociocultural is mediated action, which is seen by Vygotsky as dialectically interacting moments between mental functions and sociocultural contexts (Vygotsky, 1978). This mediated action can be from a mediating artefact or a more knowledgeable mediating person. Mediating activity of a person or mediating artefact are internalised by the object of learning. Main principle of sociocultural theory of learning is that the learning process is dialectical in knowledge between internal and external processes. According to this theory, internal thought processes are developed in a historical and cultural context. It is believed that culture is developed through the use of mental and physical tools which mediate our learning through interaction with other people who already process the knowledge desired transferred.

Based on work by Marx and Engels on how the mechanisms of individual developmental change is rooted in society and culture, Vygotsky successfully extended this concept of mediation in human-environment interaction to use the use of signs as well as tools. Like tool systems, sign systems (language, writing, number systems) are created by societies over the course of human history and change with the form of society and the level of the cultural development.

Observations related to experiments led Vygotsky to the conclusion that children solve practical tasks with the help of their speech, as well as their eyes and hands. This unity of perception, speech, and action, which ultimately produces internalisation of the visual field, constitutes the central subject matter for any analysis of the origin of uniquely human forms of behaviour. The linkage between tool use and speech affects several psychological functions, in particular perception, sensory-motor operations, and attention, each of which is part of a dynamic system of behaviour" (Vygotsky, 1978, p. 19-20).

Such simple operations like marking a line every time you count an event, which is a simple example given by me, makes changes in the psychological structure of the memory process according to Vygotsky. They extend the operation of memory beyond the biological dimensions of human nervous system and permit it to incorporate artificial, or self-generated, stimuli, which Vygotsky calls signs. A vital characteristic of elementary function of the sign, like marking a line each time an event occurs, is totally and directly determinate by

stimulation from the environment. This leads to what Vygotsky calls higher functioning, which are result of mediation in a stimulus and response relation. This sign also possesses the important characteristics of reverse action because it operates on the individual and not on the environment. The use of sign leads humans to a specific structure and behaviour that breaks away from biological development and creates new forms of culturally-based psychological process, which is meditation. It could be mediation in the sense of activity, sign, tool, person.

The very essence of human memory consists in the fact that human beings actively remember with help of signs. Where Vygotsky exemplifies with the monuments human's builds as manifestations of who needs to be remembered, it could be exemplified with all versions of written text as a means for remembering information considered to be a value in the future. The processes underlying the creation and use of sign and tools are not only related to the sign or tool itself but also have a person who establish connection between the sign and tool in a mediated activity with the mediating artefacts in the forms for signs and or tool. This feature distinguishes, according to Vygotsky, the higher forms of behaviour from the lower. A most essential difference between sign and tool is the different ways that they orient human behaviour. The tool's function is to serve as the conductor of human influence on the object of activity; it is externally oriented; it must lead to changes in objects. It is a means by which human external activity is aimed at mastering, and triumphing over, nature. The sign, on the other hand, changes nothing in the object of a psychological operation. It is a means of internal activity aimed at mastering oneself; the sign is internally oriented. These activities are so different from each other that the nature of the means they use cannot be the same in both cases.

So to summarize, internal thought processes are developed in a historical and cultural context. The culture developed through the use of mental and physical tools that "mediate" our learning through interaction with other people. There are two mediating tools that are mentioned in literature on the subject; tools and languages. Tools may concern all vessels that people use to achieve a particular goal. Vygotsky notes that it has established an empirical truth that learning should be level adapted to the development level student or pupil to that time. Therefore, it is important to identify two different levels, one is the actual or real development level student or child has achieved and the level that the student or child can achieve using assistance from an adult or more competent person. Then we come to the last

term of the sociocultural perspective of Vygotsky, namely the zone of proximal development. As example, Vygotsky one situation where a teacher shows and solve an arithmetic problem in mathematics that child cannot resolve on their own. It's something your child understands immediately. But when the same teacher shows and solves a problem within higher levels of mathematics, the child will not be able to solve the task despite for how many times a child tries to imitate solution. Vygotsky believes that this illustrates a general law in the development of higher psychological functions that can be used in learning. Vygotsky proposes that the learning process creates the zone of proximal development by adopting a number of internal developmental processes which only occur through interaction with people in the environment that you are in (Vygotsky, 1978).

A sociocultural perspective on mediating tools is relevant for my study of the role and design of textbooks and digital learning resources in formal education. The semiotic features of such resources is not trivial for learning in these contexts.

3.2   *Affordances and design*

The theory of affordances was first introduced by J. J. Gibson in "The ecological approach to visual perception" in 1986. The book describes how different environments as surfaces affords different affordances to both animals and humans.

According to Gibson (1986) the verb to afford is found, but not the noun affordance. As Gibson (1986) puts it "I have made it up" (Gibson, 1986, p. 127). By the noun affordance Gibson thinks of it as something that refers to both the environment and the animal. According to Gibson a flat surface for instance, gives the affords of support if it is sufficiently extended and its surface is rigid relative to the animal. Another example that Gibson gives is that of water. "Water is more substantial than air and always has a surface with air. It does not afford respiration for us. It affords drinking." (Gibson, 1986, p. 130).

An important fact about affordances of the environment is that they are in a sense objective, real and physical unlike meanings and values. Affordance is neither a property of the object or the subject, it's both. It is a part of both environment and the behaviour. While being both psychical and physical, it points both ways, to the environment and to the observer.

Gibson's theory of affordances is not only suited for explaining interactions between surfaces and animals in the nature. It is a general and powerful concept, which could be used in many aspects. According to Gibson the most valuable and elaborate affordances of the environment for humans are provided by other people. Behaviour affords behaviour because humans interact with the observer and with one another, and the whole matter of psychology and social sciences can be thought as an elaboration of this fact proclaims Gibson (1986). In this study the notion of affordance is used to understand the design perspective in the work of translating existing digital educational content to paper-based textbook. Both paper-based textbooks and digital learning resources like NDLA are designed products.

Norman (2013) claims that bad design is a lot easier to notice than good design, relating it to everyday things as doors (Norman, 2013). Reason behind this is that the good design fits so well to our needs that the design becomes invisible.

According to Norman (2013) affordances make sense when dealing with interaction with physical objects, but are confusing dealing with virtual objects. This has according to Norman created much confusion in the world of design. While affordances define what actions are possible with a given object, as we remember from Gibson (1986), does signifiers show how people could discover those affordances. Signifiers are according to Norman (2013) signs and signals of what can be done with an object. The design is, according to Norman (2013) concerned with how things work, how they are controlled and the nature of the interaction between technology and humans. Even though people has designed things since the beginning of time, the fields of design is relatively new, and the number of areas are according to Norman enormous. Norman claims that the designer often fail to understand people when designing technology, and that an understanding of the interplay between human psychology and technology is the key to good design. Interacting with a product means discovering that it does or how it works. Discovering is a result from the appropriate application of some fundamental psychological concepts including; affordances, signifiers, constraints, mapping, all major clues trough their perceived structure.

As we know from Gibson's theory of affordances; objects give different opportunities and constraints for the observer. Norman explains this further by pointing out that the basic principle behind the term affordance is that it refers to the relationship between a psychical

object and a interacting agent or observer like a person or animal. The relationship relies on the capabilities of the agent to determine how the object possibly could be used. As an example given by Norman is that a chair, for instance, affords support, and therefore affords sitting. Despite that, most chairs are possible to be carried, in that they also afford lifting if you are strong enough. For those that are not strong enough to lift the chair, then it only affords sitting for those people. "The presence of an affordance is jointly determined by the qualities of the object and the abilities of the agent that is interacting" (Norman, 2013, p. 11).

According to Norman, many people find affordances difficult to understand because they are relationships, not properties. Being an engineer, Norman reveals that designers deal with fixed properties. Designers need to know how to design things to make them understandable. "Affordances determine what actions are possible. Signifiers communicate where the action should take place" (Norman, 2013, p. 14). Since people need to understand the product they are trying to use, some sign of what's it is for or the different choices you have in possible interactions with the product. Sign is in this way the meaningful information about the product. You could think of a bookmark, which is deliberately placed as a signifiers of exact place you left reading in a book, but which accidentally signifies how much is left. Norman point out that the psychical nature of the book, the bookmark actually is not even needed for showing how much of the book that's left. Norman also points out that digital text does not have the physical structure of the book, and hence there is digital texts do not provide these kind of clues, if it is not designed in some signifiers. Norman explains further that the signifiers are the signals as signs, labels, and drawings placed in the world, such as the signs labelled "push," "pull," or "exit" on doors. In design, Norman (2013) claims that signifiers are more important than affordances, for they communicate how to use the design.

According to Norman (2013), the world has many natural, physical constraints which restrict possible behaviour. This could be by means of an object not being movable or lift able. Besides these natural constraints, there are cultural constraints and conventions which are artificial restrictions on behaviour that reduce the possible actions. In design constraints are considered as useful in the sense that they restrict possible action or interactions with an object.

Mapping is a technical term, borrowed from mathematics, meaning the relationship between the elements of two sets of things, according to Norman (2013). Mapping could be considered as being able to know that that each key on a keyboard result in an understandable result. Natural mapping provides an immediate understanding of this mechanism of the means of action for the outcome. Norman warns that many mappings that feel natural are in fact specific to a particular culture which changes in different cultures.

The design aspect of the textbook is important in the understanding of the first research question regarding what the key features in publisher's work translating digital content to paper-based textbook. Apart from the design aspect, there is another aspect of the actual existing digital content that are being included or excluded from being a part of the paper-based textbook. In the next sections Norretranders perspectives are included to understand this aspect of including or excluding existing or available information.

3.3 *Information and exformation*

The interesting part with information, according to Norretranders and Johansen (1992), is to be able to get rid of it again, because the information itself is boring (Norretranders and Johansen, 1992). Also how we actually get rid of information by throwing it away is similarly interesting. An example of this away throwing of information occurs in the supermarket when we are about to buy groceries; we know that each thing has its own price, which is scanned one by one, and ends up with a total amount. This amount is the result of a calculation, were many prices are put together. Norretranders and Johansen (1992) asks a rhetorical question of were in these it lays most information, the result or the calculation? In fact, there is much less information in the total result, than in the calculation. Many different shopping carts could have made the exact same result or total price, but in reverse we have no way of guessing exactly what was in the shopping cart just by knowing the total price result. Norretranders and Johansen (1992) answers the rhetorical question by concluding that it is the end result that is most interesting, because we want to know what to amount to pay for the groceries, even it does contain much less information. The reason behind this is the context in which the information exists. In order to leave with the groceries, one have to pay for them, and that could only be done by knowing the total amount of the groceries. Because of the sender and receiver only need the result of the calculation. Calculation is a method for getting rid of information. What is not relevant is thrown away. According to Norretranders and Johansen

(1992) this kind of thinking is not in accordance with our everyday thinking about information, which is positive. This perception of information being a plus word is a bias that humans have at the entrance to the information society, claims Norretranders and Johansen (1992).

Borrowing concepts from thermodynamics, Norretranders and Johansen claims that humans have a pleasant view of heat. We like temperatures, but does not care about the movements and motions of molecules. Microstate as the motions of molecules, and the macrostate is as the temperature. Macrostate is an expression of what's of relevance or interest, and the kind one has interest in knowing.

Entropy is a measure of information which we have no immediate interest. The microstates that we have no interest thinking of. Entropy is a term which is meaningful once it is declared what we are not interested in keeping. The entropy term requires that the macrostate has been declared as interesting. Entropy and disorder have an order that is so rich in the details that it could be the same, claims Norretranders and Johansen (1992). Entropy is clearly defined when we know the level of description, and that a term like entry does not make sense if we don't define which macrostate we have in mind. Entropy is only defined when we know who defines it and it is not a subjective term because everyone has their own entropy. Everyone with interest in the same macro- and microstates, will find the same measure for entropy. But it is subjective in the sense that it only makes sense when we ask what he or she find interesting.

According to Norretranders and Johansen (1992) asked an engineer named Claude Shannon a good question in 1948; "What is the cost of transmitting a message from one place to another?" While others before him like Szilard had asked what it cost to measure, Shannon asked what it cost to communicate. Both with base in the term "bit" from Szilard's earlier analysis, which distinguishes between two different states, a yes or no answer to a question. With the help of Szilard's analysis, Shannon's analysis was ground breaking and the foundation of the modern theory of information.

According to Norretranders and Johansen (1992) the everyday use of the term information has to do with meaning, but it was not meaning that concerned Shannon. It was the length of a

telephone call, because he worked for Bell Laboratories, which was AT&Ts famous research division. According to Shannon it was the the surprise value that expresses the difficulty with communication. If we are about to measure the surprise value of a live with letters, we know that the next character will be a letter. We also know that our alphabet contains 29 characters. So the surprise value is expressed by 1 of 29 letters. When we actually see the letter, we get surprised that it was that letter or not one of the 28 other letters.

Shannon's theory can, according to Norretranders and Johansen (1992), be expressed by seeing every letter as a macrostate which can be one of 29 other microstates, represented by every letter. More precisely, a letter's microstate's surprise value is determined by how many microstates that is corresponding to the given macrostate. According to Norretranders and Johansen (1992), Shannon was in doubt on what to call this size of indeterminacy or information, and wanted to call it "informationentropy", but since nobody knew the word entropy, this size was called just "information".

There has been a lot of confusion regarding the concept of information. The reason behind this is, according to Norretranders and Johansen (1992), that the word information has been used as a synonym to order and meaning. This use of the word does not come from information theory, but from cybernetics – the study of control and communication, because the inventor of cybernetics, Norbert Wiener, mixed information with positive charged words like order and organization.

The information society is in reality an entropy society claims Norretranders and Johansen (1992), a society of ignorance and disorder. This has nothing to do with information in the sense of everyday use of the word "information" which is understood as meaning. Norretranders and Johansen points out that it actually is possible to write a lot of words without them being meaningful or giving meaning at all. Entropy is a measure for all the information which we have no interest in knowing. There is lot of information in a state of big entropy. We do not possess this information, just be it being available, just that it is a possibility to possess this information if we care about doing so. Information is something that resides in disorder. It is claimed by Norretranders and Johansen that there is more information in disorder than in order. The more disorder, the more information it contains. The more microstates, the more information. The more microstates a macrostate contains, the more information is thrown away when considering only that macrostate. The macrostate of

heat is given as an example of the vast amount of macrostate´s which we do not know when referring to only the temperature.

Disorder is hard to describe, especially in details. Therefore, a total disorder is of no interest. Just as total disorder is of no interest, total order is also of no interest, according to Norretranders and Johansen (1992) referring to a lattice of atoms in a crystal, where it is a total order of repeating patterns. Or just think about a text which just contains an orderly repeating of a series of letters like AAAAAAAA. There are a lot of order, but it does not contain any meaningful information. What to say about this kind of order is that it soon becomes trivial. Therefore, it must be a third kind, which is not total order or total disorder. Something that is not trivial, but complicated without being messy; complexity, concludes Norretranders and Johansen. This area between order and chaos is kind of what matters and is worth talking about, it is what is meaningful.

According to Norretranders and Johansen, it has been more information in a text written by an ape than a text written be a famous author. This is true because it is no system in what the ape writes, as far as we can see, therefore it could not be said shorter. The text of the author contains a lot of redundancy; a meaningful text can always be said a little shorter, because the language contains some repetition of characters. Information is an exciting term, but it is not useful to describe complexity, according to Norretranders and Johansen. And complexity can be measured by logical depth.

The idea of logical depth is decisive by point out that it is not the information presented, but the process of discarding or disposal of information behind, which is central to the understanding of complexity. It is about the information that is not there now, but was there before, claims Norretranders and Johansen.

> "Depth is an expression describing something that has been interacting with the world. It is changing, but still itself, out of equilibrium, but not out of it. It has experienced surprises in its time, but it is still here. It is marked by the world, and it leaves a mark on the world. It has acquired depth" (Norretranders and Johansen, 1992, p. 106).

According to the Guinness book of world records referred by Norretranders and Johansen (1992), the worlds shortest correspondence occurred in 1862. It was between the author Victor Hugo and his publisher. After going on vacation right before the publication of his

novel Les Misérables, Hugo could not let go of thinking of how the novel was doing. Therefor he wrote "?" in a note to his publisher. The response was in accordance with the question: "!". In the context in which this correspondence happened, both had already been talking about what was important or not. In that context, both could perfectly understand each other by only using one character. As we know now, Les Misérables was a huge success. It is not about the number of bits transferred that was important, but the context in which the communication takes place. Before the words are used, there is an awful lot of mental work, which is not said in words, but are still there. Hugos "?" is explicitly referring to some information that the publisher could only know through the reference given. Before Hugo put the question mark on the paper, he threw away lots of information, which he had in his mind. This information, which is thrown away, but still referred to explicitly be what Norretranders and Johansen calls exformation. In this sense, a statement that includes a large amount of exformation has logical depth. A skilled communicator, does not only think of himself, he or she will also think of what the recipient has in mind. Still, it is not enough that the given information explicitly refers to information in the mind of the sender, if this information in any way leads to the right association in the recipient. The meaning behind passing information is to create a state of mind at the recipient's head, which is related to the state of mind in the head of the sender, and is described by exformation it refers to in the sent message.

Exformation is perpendicular to information, explains Norretranders and Johansen (1992). Exformation is what is thrown away before the actual expression. Exformation is all that we have in the head, but never is saying. While, information is the measurable, what we actually say. It is no correlation between the amount of information and exformation. It is not like if there is much information, then it has been much exformation. There is neither any contrary between information and exformation, nor any correlation. A very short statement could have great depth, while a long statement could have great depth. Both short and long statements could be superficial. But they are related as concepts. Exformation is the statement history, while information is the product of the statement history. Both are meaningless without each other. Information without exformation is empty talk, and exformation without information is no information but wasted information claims Norretranders and Johansen (1992).

Meaning is information which is thrown away, information that is no longer there. And it does not need to either according to Norretranders and Johansen (1992). It is with information

as it is with money and wealth. The real value, real wealth, is not about money, but about money spent, money we had. Things of use that is bought by paying for them. It is only Scrooge McDuck who can use money by itself by swimming in it. The rest of want money because we want to get rid of it claims Norretranders and Johansen (1992). It is with information like it is with money; it is when we are full of it, we realise that it has no value in itself.

Communication has in general nothing to do with creation or removal of information. According to Norretranders and Johansen (1992), communication is pure transportation. The important thing means. As an example, there is pretty much meaning in not saying anything. The worlds shortest conversations are done in silence, and the shortest calls are those that never take place. The relation between communication and away throwing of information can be illustrated by the following conceptual drawings; the first one showing two parallel lines without something really happening, while the other shows an arithmetic calculation. 2+2 = 4. In the latter, the two lines are connected to one point. The point is, that to different states are connected to a mixed state, which is 4. It happens something, in the sense that we are able to go in one direction but not in the other. It is possible to come to 4 from the starting point 2 and 2. But when we have 4, it is no longer possible to come back, even if we knew we came from two different states of the one we now know. The reason behind this is that 4 could have come from many different states or starting points claims Norretranders and Johansen (1992). This process is illustrated by Norretranders and Johansen in figure 1.

Kommunikasjon og beregning ifølge Rolf Landauer.
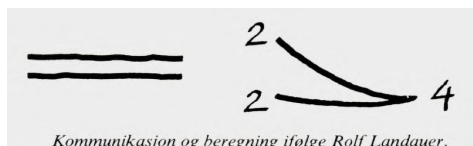
Figure 1: Process of calculation

The calculus represents a process, were information is thrown away. It is happening something, something irreversible, and it is because calculation is throwing away information. It is less information in 4 than 2+2. And that's the problem that arises when the problem represented by 2+2 is replaced by the result which is represented by 4, that the irreversibility arises. If we are not throwing away the starting point and the calculations, and just keep the result, then the calculation is not irreversible. This kind of reversible calculus is in theory of great interest, but not in practical life. Norman mentions an old joke about the difference between theory and practice; "In theory, there is no difference between theory and practice. In

practice, there is" (Norman, 2013, p. 236). The whole idea of calculus is to reduce the amount of information. If nothing is thrown away, the it could be the same with the calculation claims Norretranders and Johansen (1992)

Summarization of information is in sense away throwing of information. A summarization in the form of calculating the total amount of groceries in the supermarket could be so it is easy to pay for our goods. If could of course have paid separately of every item, but that would have been time consuming. Another reason for summarization could be time restrictions or other constrains like when placing a call or have a meeting.

It is truly most information in disorder, but thing humans could tell each other in sense what we think of as information. Typically, the result of a calculation or a summary, claims Norretranders and Johansen. What we call and think of as information in the daily is a result of exformation; it is a summary, a result for guiding a transaction like paying for the groceries in the supermarket.

Calculations and recognition consist of away throwing of information, to pick at what matter from what doesn't. Information is only interesting when we have got rid of it again, after taken a lot of information to us, extracted that what matters and thrown away the rest. What interests us is not what takes the longest time to describe, because it is identical with disorder, mess and chaos. It is neither the perfectly ordered and predictable that interests us most, because there are no surprises involved.

Human capability is beyond what is being used interacting with computers and technology, claims Norretranders and Johansen (1992). While humans are equipped for managing millions of bits per second in a meaning full way, computers have made humans manage only a few bits per second. Computers have capacity to handle a vast amount of information, which has made it possible to study complexity. But it has also the ability to present very little information to the user through the graphical user interface. According to Norretranders and Johansen, the reason behind the information society being difficult is not that it contains too much information, but too little. Because of this, humans in information societies are supposed to excite large amounts of exformation to be able to do their job.

To summarise this chapter: the difference between Vygotsky and Gibson, is that where Gibson explains how objects (in nature) have different affordances for the interacting observer (human or animal) in the sense of physical properties, Vygotsky relates the same concept of affordance to the psychological processes of higher order and brings forth cultural influences in accordance. For Gibson, a textbook in interaction with a dog result in the book being torn apart. In the interaction of the book with a human could potentially result in the book being further examined. The affordances of the book will in turn in interaction with the human observer probably result in the book being read, that is if the human can read. For Vygotsky, the book would be mediating knowledge and in that way be a mediating artefact. The use of sign and language in the form of the written word, and the book being a mediating tool for education and knowledge promotional purposes. Norman would view the book as a designed artefact which signifies the affordances and constraints by the design of it. Last but not least, Norretranders would see the book as a product of exformation, which is because of it being a calculated and complex source of knowledge which has great depth.

In my study these perspectives provide the framework for my analysis of the publisher-textbook-teacher triangle, which requires an understanding of why and how semiotic affordances are 're-designed for teachers' use in a classroom context.

4   Method

The purpose of this chapter is to make account for the different methods used to gather empirical data, which is along with previous chapters, being used to answer the posed research questions. Also the data from the survey which were conducted as part of the publisher's process of producing digital content based textbooks. The research questions are following;

1.   What are the key features in publishers work translating educational content from digital to paper based learning resources?
2.   Which features do teachers view as important in the design of learning resources?
3.   How are teachers in Norway using OER (NDLA) as digital learning resource compared to traditional or paper-based learning resources in the classroom?

The first research question is connected to fieldwork done during internship. The second and third research question is connected to the survey conducted at the publishing house. Because of the nature of data, being very naturalistic and a real life work situation, they consist of observational and dialogical data during the process of publishing textbooks. This has both positive and negative effects on the research design of this thesis. Or lack of a research design. The lack of structured methods like voice- and video recording could also affect the answers and the whole interaction itself, and in that way result in false results. By not designing research, all the interactions and observations could be regarded as they could be by not having a researcher around. The researcher does in this case not become "elephant in the room". Many day to day life event could be done research on, but is not because research communities have their own areas of focus. As Arne Naess states it, "It is said that amateur opportunities in research today is greater than ever before" (Naess, 1980, pp. 110-112; Dalland, 1997, pp. 13-14). So if you make an account of what level one's at, and choose the method that is adapted to your own skills, then you have fulfilled one of method doctrine's important norms and can safely introduce your research. Naess (1980) warns about not letting all the questions that you cannot answer or scientific ideals that we fail to live up to, prevent us from trying.

4.1 Case study

The phenomenon of the conversion or translation of digital content to paper based textbook made some impact in the form of questions raised about how this was possible and why? After all, the latest trends have been digitalisation in the direction of a digitalised "World Brain" in the sense of a digital library represented by the Internet and its related technologies.

It was a phenomenon in an internship practice which resulted in little control over events or processes of the publisher related to the OER based textbooks. According to Yin (2009) the definition of case is it being a concrete entity, event, occurrence, action, but not a concept, argument, hypothesis, or theory (Yin, 2009). Much of this qualifies in my view for a case study framework. Publishing of paper-based textbook based on digital content is not part of a research design from my side. It is part of an event experienced during a real life job situation during the internship, and in that sense an excerpt from the real word. Yin (2009) claims that,

"In general, case studies are the preferred method when (a) "how" or "why" questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context. This situation distinguishes case study research from other types of social science research. Nevertheless, the methods all overlap in many ways, not marked by sharp boundaries" (Yin, 2009, p. 2).

There are two units of analysis is this thesis (Yin, 2009). First, you have the unit of the turning a web based learning resource to paper based textbook. Second, you have the data corpus from the survey made for the publisher as part of their process of producing digital educational content based textbooks.

According to Yin (2009) "the case study relies on many of the same techniques as a history, but it adds two sources of evidence not usually included in the historian's repertoire: direct observation of the events being studied and interviews of the persons involved in the events" (Yin, 2009, p. 11). In a case or field study, which the unit of analysis in this thesis also carries characteristics of is based on what Dalland (1997) calls for unstructured participant observation which has much of the characteristics of unstructured interview in common (Dalland, 1997).

4.2   Fieldwork

Just the thought of the curiosity that arises in the case of conversion of digital content to paper by a publishing company, and the possibility that questions regarding the case, never will be investigated, is enough to try to understand the phenomenon by researching the case. Since the case is a part of an internship period at a publishing company, it is considered as field work (Hammersley and Atkinson, 2004). Field methodology is about developing realistic understanding and collect data to reside in the field being studied. According to Hammersley and Atkinson in fieldwork, one make use of a variety of methods for directly being able to hear and observe what they studied actors say and do. Experiences becomes the data corpus and it must be coded to be part of a data set. In the social sciences the first and basic coding of experience are formulated in languages. Examples include field notes where one tells what you have heard and seen, interview transcripts, notes and excerpts of the documents from the field (Hammersley and Atkinson, 2004).

As a result, this has, as mentioned by Yin (2009), ended in a huge amount of notes, documents and other empirical data, that had to be dealt with through the process of writing this thesis. Documents consisting of field notes and survey data, which mostly can be characterised as qualitative kind. For someone to be able to assess the value of the new knowledge we have gained, it must be made clear how it is obtained. In this thesis the mere being a part of the publishing company process in developing an OER-based printed textbook is seen as unstructured participatory observation and unstructured interviews, and the empirical data is through a survey done as a part of and in relation to the case and the internship period.

According to Dalland (1997) the interview and the observation hang as methods close together. It's hard to imagine a conversation without that one also observes its interlocutor. Similarly, one rapidly may need to ask questions when one observes. Used in a good way can, these methods complement each other and provide better data than by using only one of the methods. It is therefore natural that advice on the application of these methods will overlap. It is said about the interview, often applies also for observation (Dalland, 1997). We usually have little influence on how the conversation will take place. Taking care of the conversation so that it becomes usable data that can elucidate the problem, is an equally big challenge as conducting the interview (Dalland, 1997). Not being able to control conversations and the general activities could also be seen as a positive thing because what you are observing or the topics that you have conversations about will have less influence by my pre understanding or my agenda. Therefor the recorded data is presumably not influenced be me as the observer. The negative thing about not being able to control the activities or steer the conversation in the directions you want, is obviously that you have to interpret the actual empirical data and maybe not being able to control the result.

According to Dalland (1997) gathering data through one's own internship period offers many possibilities since we are part of what is to be examined (Dalland, 1997). An obvious possibility is that access to a field is gained, which allows for a kind of close contact that can be used for own experiences. At the same time the problems are also obvious. There are many ways of losing track in a new and unfamiliar environment and it is hard to both be a researcher and an internship with specific tasks to accomplish within a given timeframe. Writing in the form of both digital and paper based both from observations and dialogs, in and

with, the publishing company, has become my data, the same way numbers from a tax-sheet becomes data (Dalland, 1997). Specially has data in this case being both dialogical and observational the whole time, both methods being qualitative.

Simply by being in an internship situation in a company, I became part of the field to be studied. Dalland (1997) states "as a student in practice and at the same time observer of the same practice site, you will be part of the field you are studying - you are a participant observer" (Dalland, 1997, p. 56). Dalland explains further by claiming that unsystematic observation implies a heightened awareness where one takes care of impression and write them down without initially paying attention to something specific. Through such unsystematic observation, and being part of a peculiarity or phenomenon the case represents in my view, my interest for a better understanding emerged. It has sometimes been difficult to both being forced to take extensive notes and at the same time trying to be part of the actual context itself. The implications for such challenges has resulted in making notes after a meeting or a dialog because there were impossible to take notes at the same time as talking and carrying out tasks. In either case the notes produced and the empirical data gathered along the way are my data in the context of this thesis. According to Dalland (1997) "there is actually pretty much systematic work involved related to unsystematic observation" (Dalland, 1997, pp. 57-58). The notes from unsystematic observation must be processed and arranged. Because you never know what could be relevant or not, as much material as possible, has been gathered, sorted, coded, synthesised and analysed in the process of writing this thesis.

4.3 Data material fieldwork

Table 1 shows an overview of data collection during internship period.

Table 1:
Overview of data collection through fieldwork

Method	Activity	Date	Data type
Unstructured participant observation	Being part of workplace through internship	10.19.2015- 11.19.2015	Notes
	Editors meetings; briefing on ongoing and future projects. My	10.19.2015	Notes, project

	part was on briefing on mapping of teacher's preferences	10.26.2015 11.02.2015 11.09.2015 11.16.2015	plans, other strategic documents
	NDLA hall meetings; All editor and other relevant people discussing upcoming textbooks	11.05.2015 11.11.2015	Notes
Semi-structured interviews	Guidance meetings; used for discussing work task and investigation of factors of importance for this thesis	10.22.2015 10.29.2015 11.05.2015 11.12.2015	Notes
	Meeting with marketing division; discussing different strategies in relation with marketing of textbook	10.26.2016	Notes
	Meeting with the textbook author; discussion of different aspect to the content, design and other considerations regarding textbook in social science	11.10.2015	Notes
	Conversations with editor at NDLA; discussing different aspects regarding NDLA existence and ambitions	11.04.2015	Notes

During the internship period I participated in meetings of various kinds. This is empirical evidence in the form of unstructured participant observations where I in some cases have been a fly on the wall while other times as a guidance interview with active dialogue on the theme of NDLA-based textbook. This has resulted in a number of notes in both electronic and paper formats. I will explain the different settings I have been observing throughout the internship.

The observations are made by following and assimilation information as carefully and objectively as possible.

Regular weekly meetings where all the various editors were collected. In these meetings, all editors got the word to tell the status of their respective responsibilities and projects that they were responsible for. Here it was also discussed and allocated future projects to the editors. Everyone got overridden schedules of all ongoing projects with estimated time of completion according to a deadline.

Regular weekly calls where I got to discuss various aspects in relation to the survey task mapping teachers. I think the project seemed interesting, and thus I also had the opportunity to discuss the issues surrounding my master's thesis based on the release of NDLA-based textbooks. These meetings proved to be valuable in terms of what factors influenced their decision that the publisher wanted to focus on pressing digital content available.

During this meeting, I got an impression of how the author thinks in terms of how the textbook should be. Both educational and other considerations were discussed. The author who is a former teacher in many different subjects including social sciences had thoughts on the content and layout of the finished book.

At these meetings the involved editors informed about the process of NDLA-based textbooks. Most of the details of the description of the process under the case section is derived from empirical data through participatory observation of these meetings. In these meetings the editors discussed all aspects of the work on the book.

The empirical data collected from the field as unstructured participant observation and semi-structured interviews consisting of different activities such as meetings are made account of. The fundamental nature of the basis of the thesis is an excerpt from a real life work scenario. Since there is a lack of control over the events occurring and the decisions taken, and therefore no research design implemented, nor any experimental settings arranged, is difficult to make the thesis reliability and hence validity be as strong as for experimental design. Still, by making most of the relevant information available to the reader, the reliability and validity could rise higher. As for the survey part. It is different, because it is designed.

4.4 *Survey*

According to Yin (2009) all research methods might be relevant in some situations. Using multiple methods in the study and exemplifies by "a survey within a case study or a case study within a survey" (Yin, 2009, p. 13). A word of caution from Yin (2009) is that surveys try to deal with a phenomenon and context, but their ability to investigate the context is limited. According to Yin the survey designer, for instance, constantly struggles to limit the number of variables to be analysed to fall safely within a manageable amount of data material (Yin, 2009, p. 18). In this case this factor has resulted in some modifications to the amount of questions in the survey. All questions have also been translated to English relating to the decision to writing the thesis in English.

As previously mentioned earlier, the basis for this task a practice period of 5 weeks at a Norwegian publishing company in autumn 2015.

Task for the internship period consisted of identifying teachers' preferences in teaching aid questions. One central subtask consisted of obtaining consent from prospective schools if they would like to test out the upcoming OER-based textbooks and or participate as a collaborating test school.

The survey was executed by sending out e-mail message explaining the intent of the survey with a link to the survey to principals at 415 secondary schools in Norway (all secondary schools in Norway, which was registered in the publisher's registry) 11.11.2015, of which came 61 back with automatic error. Per 11.17.2015 recorded 86 responses. It gives a response rate of approximately 24%. Of these 61 came back with automatic and or auto generated error messages. So a total of 354 principals is supposed to have received the survey. A factors to consider in this matter is if all principals distributed the survey to their teachers and if the teachers felt it like mandatory to answer. From this there were 86 responses that are the basis data corpus for analysis. Table 2 shows and overview of survey questions.

Table 2:
Overview of survey questions

Theme	Question	Type	Options

Pedagogics and didactics	1. What factors of the textbook is important for you to differentiate instruction?	Qualitative Un-structured	Open
	2. How do you think a textbook should be to be interoperable with other learning resources?	Qualitative Un-structured	Open
	3. How do you think a textbook can support reflection, group and fellow-student instruction?	Qualitative Un-structured	Open
NDLA	4. Do you use NDLA resources in your teaching practice?	Quantitative Structured, Dichotomous, Contingency	Yes/No/Sometimes
	5. If Yes or sometimes on questions 4; In what way have you used NDLA in your teaching practice?	Quantitative and Quantitative Structured, Dichotomous, Contingency	Used NDLA as supplement to ordinary textbooks/Use only NDLA/Other (please specify)
	5_2. Other specified from question 5	Qualitative Un-structured	Open
	6. If you use NDLA in addition to textbooks on question 5: Which textbooks are used in your teaching practice?	Qualitative Un-structured	Open
	7. Has there been times when you've used NDLA as a substitute for a textbook? If yes: In what way?	Quantitative Structured, dichotomous, Contingency	Yes, with comments/No
	7_1. Yes with comments on question 7 specified.	Qualitative Un-structured	Open

	7_2. If no to Question 7: What does it take for you to use NDLA in your teaching practice?	Qualitative Un-structured	Open

In addition to these questions the last part was for consent to receive test copies of textbooks and or join a cooperative school for testing textbooks. In this thesis, I have chosen to place emphasis on the first two themes, questions related to education and to open learning resources in the sense of digital learning resources represented by NDLA. Also question six, that tries to explore which textbooks are used with digital learning resources, is excluded from being part of the analysis in this thesis because it is also considered as being too specific for the publishing house and irrelevant for the answering of research questions posed.

4.5 Data material survey

The data corpus existed in a portable document format that had to be converted to a rich text format for import in a coding application for Mac and Windows called HyperResearch. The following is the findings after the coding and organising work done in HyperResearch. See own section about the work done in HyperResearch

The coding strategy in HyperResearch have been to use a qualitative research analysis technique called thematic analysis, which involves taking key words from the answers, and use those as the names of the code related to that answer. So single or multiple codes are applied on each individual answer. Table 3 shows overview of the coding process in HyperReseach.

Table 3:
Overview of coding in HyperResearch

Question	Answers	Skipped	Individual codes applied	Total codes applied
1	85	1	20	261
2	83	3	20	181
3	83	3	20	164
4	85	1	0	0

5	69	17	0	0
5_2	16	0	20	33
7	75	11	0	0
7_1	31	0	24	56
7_2	39	47	22	59

As we can see the questions asked in the survey was quite open, and therefore it is reason to believe that the responding teachers should be mentioning thing that they are interested in without and constrains. First thing to occur is that there are a noticeably more respondents who have skipped the last question 7_2. A reason behind this could be that the teachers are unsure what exactly is that they are missing or what is it that prevents them from using NDLA in their classroom teaching practices. Another reason could be that they are exhausted after answering all the previous questions. This is because there is a trend in skipping pattern at the end of the survey, where more and more of the respondents choose to skip the questions asked. From 1-3 skipped in the first questions to 17-47 choose to skip the last questions. Table 4 shows a summary of the coding process in HyperResearch:

Table 4:
Summary of codes applied

Individual codes	Total of individual codes applied to the data corpus
134	754

The answers have been imported in to HyperResearch to undergo a coding process. The qualitative method used is thematic analysis. This is done by using keywords in the answers as the code tag for each answer in the survey for all questions that are chosen to be a part of the thesis.

The significance of first hand empirical data is valuable insight into a field, in this case a publishing company, and is vital for understanding the process of converting digital OER based learning resources in a traditional learning resource as the printed textbook represents. The insight into the different parts of field data has partly been difficult to obtain, and at the same time, paradoxically there's has been a lot of data that I actually ended up with and had

to synthesise and analyse further to accomplish an answer for the research questions asked in relation to the curiosity aroused when introduced to the case as an internship.

The data gathered from the internship period consist as partly unstructured participant observations, and partly semi-structured interviews from meeting with the marketing section discussing different marketing strategies, and meeting with the author of textbook in social science, which were the first book being released.

4.6   Analytical approach to survey data

There is both an analytical perspective on possible explanations and mechanisms related to the publisher's work, and an empirical based data corpus that was interpreted through an empirical method of thematic coding scheme of qualitative research methodology.

The case study as a research method is, according to Yin (2009), used in many situations to contribute to our knowledge of organizational, social and political phenomena (Yin, 2009). The data material in this thesis is in-depth explanatory data from a small sample from an internship and the analysis draws out patterns from concepts and insights. Important concepts that have been taken into consideration include natural settings where participants are free from any control and data are collected in their natural environment. Shimahara referred by Sherman and Webb (1988) says that human behaviour is shaped in context and that events cannot be understood adequately if isolated from their contexts. Because the whole is more than the sum, the magnitude of contextual factors are taken in to account to understand experience as unified. Both as a practitioner as an internship and researcher the main goal has been to being responsive, flexible, adaptive and good listener in every step possible. Qualitative research generates rich information, thus deciding where to focus and the level of sharing is very challenging. It has been important for me to focus on in the analysis has been on studying the case closely and carefully so decide what the primary content is about. Several factors have been taken into consideration like the reality of people being different in their experience and often contract their own understanding of the reality, and that understanding human behaviour emerges slowly and non-linearly.

"Thematic analysis is a widely used, and a fundamental method for analysis in qualitative research" (Braun and Clarke, 2006, p. 78). According to Braun and Clarke (2006) thematic

analysis should be the first qualitative method of analysis that researchers should learn because it provides core skills that could be useful in conducting many other forms of qualitative analysis. Also because of its theoretical freedom, thematic analysis provides a flexible and useful research tool, which can rich and detailed data that also is relatively complex (Braun and Clarke, 2006).

It emphasises pinpointing, examining, and recording patterns (or themes) within the data. Themes are patterns across data sets that are important to the description of a phenomenon and are associated with a specific research question. The themes become the categories for analysis.

The purpose of this chapter was to make account for different methods used and the empirical data collected, which is the basis for the analysis in the following chapter. Being a study of a case consisting of the publisher's process of producing paper-based textbooks using existing educational content online, it has been difficult to obtain a research design regarding methods used to gather empirical data. The use of fieldwork methodologies was in that sense given by the context of a short period of internship consisting of 20 workdays over five weeks. The true methodology used are in the sense of managing to make, structure and later use those notes in a constructive manner as part of this thesis. Being a researcher without actually doing research activities, but rather work tasks related to real life workplace, is a tricky and tacky process to manage. Therefor it has been important to make account for the data as much as possible, to make the process as transparent as possible, before the actual analysis of the case. Because much of the actual work resides after the fieldwork in the form of preparing, structuring and interpreting the empirical data gathered.

5   Analysis

The purpose of this chapter is to analyse the findings in observations, conversations, tasks and data corpus from the survey related to review and theories from the previous sections to answer the posed research questions. The whole methodology is based on qualitative research because the purpose of the thesis is to gain insights to a particular practice discovered through the internship period in the case of a publisher converting digital learning resource into a paper based textbook which is regarded as a case study. Structuring and preparing data

analysis methods are described in the previous chapter. The main structuring part of this chapter is the three research questions posed.

5.1 *What are the key features in publishers work translating educational content from digital to paper based learning resources?*

The key features of the publisher's work translating educational content from digital to paper based learning resources consisted of several aspects covered in the previous chapters. To understand this research question, there has to be clarified that both the Internet related technologies and the paper-based textbook are both mediating artefacts in the form of the written word, which mediate educational content and therefore knowledge and learning to its readers (Vygotsky, 1978). It is also important to have in mind that these two mediating artefacts are affording different affordances, constrains and signifiers to the interacting observer (Gibson, 1986; Norman, 2013). Also the backdrop of the OER-movement and governmental and economic aspects are important for a more holistic understanding of the context. On the publishers work in translating educational content from digital to paper, there are practices uncovered that are in reliance with the literature and review. The knowledge society and the enormous amount of information that exist on the Internet related technologies emerges the need for exformation (Norretranders and Johansen, 1992). According to the publisher, exformation is a main part of their daily activities as editors at a publishing house. Since this thesis relies on data related to a real life work situation, therefore it is difficult to distinguish parts of publishers work on translating the content, which involves collaborative and individual work on exformation, design and marketing strategies like mapping teacher's preferences and willingness to collaborate as test school through the survey.

5.1.1 Marketing strategies and finding a target group

When I first started the internship period, there were already set in motion processes for the development of the coming textbooks. The first textbook scheduled for release is in the subject social studies. Much of the reason for this according to the publisher is that the social sciences have the most information available online. The publishing company had in addition to my part identifying key factors from the view of the teacher, also ongoing discussions about issues in relation with marketing and sales strategies. According to the publishing house, they are not part of the major textbook publishing house, and saw NDLA and OER as

an opportunity for entering the market. After the removal of the approval scheme, it is, according to the editor at NDLA, possible for anyone to write and or publish their own textbook. The difficult part is not producing, but to have a revenue in the form of sales. There are several aspects to consider regarding textbook production. By using the governmental approved OER (NDLA), the publishing company can be sure of the curriculum goals being met. Excerpt 1 shows how this is considered as an important feature that NDLA has online.

Teacher 32 question 7_1:

"The learning objectives that are new compared to the old curriculum has a nice review in NDLA"

Excerpt 1: Need for signifiers to curriculum goals

By using the available and reliable content on NDLA as base for paper-based textbooks, the publisher reduced their cost of production, assuming that the content on NDLA were already exformated to match, what Norretranders and Johansen (1992) would have called the desired macrostate, linking subject to curriculum goals. By using content from NDLA, the publishing house was able to determine the subject and educational level, which is considered by Paasche-Aasen (1999) as one of the main aspects in design of textbooks.

5.1.2 Deciding on design and level of quality

Textbook need to satisfy a broad spectre of pedagogical and disciplinary demand. According to Johnsen (1999) a textbook should not exceed more than 50-100 pages for being enough for a particular subject. The publishers process included a exformation process in designing the features. For the process for the textbook on the subject of social studies has for the publishing house, been started by a group of editors reviewing the various nodes on NDLA' s online portal. The group of editors having collected and sorted text, links, and exercise tasks that could be used as a basis for a printed textbook in social studies for upper secondary high school. The various pages were out according to licensing. The licensing model that the publisher wanted was CC-BY-SA which is a license category of Creative Commons, which gives the right to make commercial use of content, and requires all derivative work to have the same licence. After efforts of sorting the text corpus sorted by licensing of CC-BY-SA, which could be used by the publisher in a commercial context. Finally, the remains of the text

could then be cut and pasted into a document. This document where sorted according to appropriate learning objectives in the national curriculum.

According to the publisher, this was a very extensive and time consuming process. After everything was assembled in a document, there were gradual, and patient editing work done by several editors, the content was "styled" and compressed further with the author, learning objectives and other labels. The text corpus was in this phase being reduced from 400 pages to 326. Each side had until three normal pages in terms of content in the form of body text, all according to the unstructured participant observations and semi-structured interviews during the internship period. After this the publishing company hired a retired teacher as a writer who proposed anthology structure with a focus on teaching and learning objectives, and level differentiation in three levels (one easy and two difficult).

The author has pointed out that in many textbooks, images are used that have no relevance to the content, and since there were other editors who agreed, so probably the publisher will choose to minimize the use of images or cut them all out. After discussing various formats in terms of layout, the costs of printing and what could be the most comfortable for the end user i.e. the student and teachers. Now after the author, has been through the text corpus, the content was currently down to 158 pages, accordingly to information gathered fieldwork methods during internship.

5.1.3   Mapping the desired macrostate through survey

The publisher had in this process of exformation thrown away a lot of information. The complexity of the end product will be depending on, if the exformation process has been reduced entropy. Entropy requires that the macrostate has been declared as interesting. Interest of who? In means of a textbook, it is the macrostate defined as interesting for the teachers as well as the students. In case of this thesis, it is the exformation process, of the publishing house and the author, that defines one macrostate to the textbook from many different microstates in the form of all the information decided to be removed. A main part of the publisher's process of producing textbooks was the survey, which mapped teacher's preferences regarding learning resources. After analysing the survey data, there were some interesting findings shown in the section regarding the remaining research questions covered below with excerpts. The thematic analysis of the survey data showed that the most wanted

features in a textbook is tasks, and some also wants pictures and images. Fieldwork done during internship revealed that publishing house eventually had removed most exercise tasks so that only subject's relevant material in the form of text was left. This creates a tension between what the teachers as representatives of the economic market and what the publisher is considering important.

The key features in publisher's work translating educational content from digital to paper based learning resources are collaborative and individual work on marketing strategies, design implications like the layout and the desired macrostate for the finished textbook as a product. Mapping teacher's preferences regarding different aspects of learning resources design and use, and collaboration with teachers as textbook author and testing purposes of textbooks was the main part of the work conducted by the publishing house. Regarding the remaining research questions to be answered, the analysis of the survey data will hopefully contribute to a better understanding.

5.2 *Which features do teachers view as important in the design of learning resources?*

The data corpus from the survey consists of both open ended questions, which can be regarded as being highly quantitative in nature, in means of being an object of interpretation of a person, and questions which have closed response option, typically yes/no questions that should be considered quantitative in the sense that they give quantities' of each given option. These questions are typically followed up by open ended questions which asks the respondent to elaborate on what the possible reasons are behind their choice.

The main themes identified in the open ended first three questions are: (1) Choices and customization options with regard to tasks, which shows the concept of task culture, (2) Digital resources with regard to references and joint use, which shows the concept of hybrid practices, and (3) Structure and overview with regard to design, which shows the concept of exformation.

A common answer regarding task is that there should be different levels of difficulty in the complexity of the tasks or exercises. Also, there seems to be a considerable amount of teachers want to easily know what level of difficulty the different parts of the content are. Teachers want the learning resource to be clear on the level of difficulty in text, concepts and

tasks. A possible reason for this could be, except the differentiation between different students being on a different level of understanding of a particular subject or topic, that the teachers want to know how to distribute other available resources like time and locations, like access to special equipment fund in a science lab.

5.2.1 Task culture

As part of the main theme of choices and customization options through thematic analysis of survey data, shows that the macrostate teachers want is one that includes lots of tasks in differentiated levels. Attachment 1 shows an overview of top most codes applied, which in turn emerged to the main three themes. Excerpt 2 shows an example of a typical statement of this theme.

Teacher 60 question 3:
"Type of tasks which are differentiated, both in difficulty and between individual/group, structured and unstructured – tasks which encourage the students to seek and find additional information on their own"
Excerpt 2: Need for textbook tasks

Excerpt 3 shows a typical example of a response which is communicating the need for different level of difficulty in textbook tasks for differentiation between students using a textbook. Excerpt also shows, how the different themes were camouflaged in responses with different codes applied. In this example the code for "evaluation criteria" and "examples" where used in accordance with the code of "tasks". This shows a clear example of what Dahl referred by Johnsen (1999) calls for "task culture" in relation to textbooks traditionally been full of tasks and exercises of all different kinds.

Teacher 3 on question 1:
"Questions with different levels of difficulty. Evaluations criteria supports unequal usage of content and the ability for reflection. In addition, show brilliant examples"
Excerpt 3: Illustration of task culture

Both in regard to 1st question about differentiation of classroom instruction using the textbook, and 3rd question about how textbook could support reflection and group work, shows that tasks or educational exercises are regarded important by a majority of the teachers.

5.2.2 Digital resources

The textbook has a tradition of being both the master and the servant in classroom practices (Johnsen, 1989). As prior research shows (Rasmussen and Lund, 2015) there is a blended use of learning resources, which is thought of as hybrid practices, in classroom practices.

The publishing house are planning of incorporating signifiers of additional resources online in the textbook text. A consideration made in regards of long and difficult to understand URL addresses to NDLA online. This is a design implementation where the publishing house strategy and design is in accordance with the results from the survey data of teacher's preferences. But there are also contradictions, while many of the teachers want a design which does give the affordance of a pool with tasks to be used for activation students both in the classroom and as homework.

Many teachers also respond that they want pictures in the textbook, which the publishing house, neither are planning on using any of, at least for the textbook in social sciences. Excerpt 4 shows a typical teacher response regarding typographical design elements such as the use of pictures.

Teacher 78 question 2:
"Varied. Pictures, text. Show overview and discuss causes and contexts. Problem: text for extensive and demanding"
Excerpt 4: Example of differences in textbook layout and teachers preferences

When asked about how the publisher going to solve matters related to the multimodality, interactivity and referring links on the Internet in the converted textbook version, the publisher thinks of maybe incorporating references to NDLA in the textbook when the original digital material or the context requires this. Long URL addresses, i.e. links, will be compacted by that only using a unique identifier connected to the current subject or topic as a reference to the current page. Links to different modalities such as video and the like will thus be accessible from NDLA, in that it appears to those in the physical textbook.

As much of the previous research and literature shows, the textbook is still considered a main learning resource and a companion serving as what Johnsen (1989) describes as master and

servant for the teacher. The interpretation of the survey data shows that this also is true for the teachers participating in the publisher's survey. Excerpt 5-7 shows how this is expressed in the survey analysis. Excerpt 5-7 also shows, what Rasmussen and Lund (2015) calls for Hybrid practices as well as how these hybrid practices are considered valuable in educational classroom practice.

Teacher 22 question 2:

"The book should be a good and comprehensive tool itself so that it can stand on its own. It may well be online resources related to the book as well as, for example links to relevant historical records, videos, recommended videos, audio files, articles etc. What then is essential when digital resources are used to ensure that sites, sources, articles, videos, etc. as it is linked to are available for a long time and does not disappear and is being broken links after a few years"

Excerpt 5: Textbook as main learning resource and Hybrid practice

Teacher 9 on question 2:

"Textbook + Web resources: The textbook as thin as possible, it covers a minimum. Rather a major online resource that can expand and deepen as needed. Nice about textbook informs about any material that exists online resource (but not an absolute requirement). Certainly tasks book where web resource must be used + extra teaching materials and tasks unique to Web resources"

Excerpt 6: Hybrid practice

Teacher 44 question 2:

"The textbook will be main learning resource - shall refer to other sources and contain tasks that implies the use of other sources, especially network sources"

Excerpt 7: Textbook as a main learning resource

5.2.3 Structure and overview

Teachers wish for a clear overview and structuring of text and concepts, could be related to the need of a good overview over the learning content. Teachers express a need for summaries, and other layout related elements like boxes with additional in depth explanations and knowledge that the average student doesn't need to read and still accomplish curriculum goals. As shown in excerpt 1 earlier, a direct linking to or clearly showing the educational

texts signifiers to the related curriculum goals is something that many teachers mention and has left the impression on me as something important for the teachers. This has to do with the design element in the production of a textbook or OER. Excerpt 8 and 9 shows an example of this theme.

Teacher 5 on question 1:

"Highlight the key words and phrases (preferably by typing the margin) so that the weakest students get a simple overview of the major constituent they must be. Brief summary at the end of each chapter. Creating graded assignments for each chapter (low, medium and high achievement)"

Excerpt 8: Need for structure and overview

Teacher 70 on question 1:

"Keywords / concepts, layout with the images, examples provided, index, table of contents, tasks"

Excerpt 9: Different typographical design elements

In our case, the publisher had done this first part by using existing content on NDLA, which were already structured by subject and curriculum goals. When the initial "scissoring" as the editors at the publishing house call it were done it all were "stitched" together according to curriculum goals and so forth also by the editors. This could probably result in a better logical depth as Norretranders and Johansen (1992) could have described it, the material was handed over to the author. When the author had done his initial editing, it was discussed with the lead editor at the publishing company. It is in this step, it was decided that anthology was the best kind of textbook design suited for the target group and subject.

5.3 *How are teachers in Norway using OER (NDLA) as digital learning resource compared to traditional or paper-based learning resources in the classroom?*

5.3.1 Hybrid practices and joint use of learning resources

In the NDLA part of the questions which consists of both fixed answer options followed up by open elaborations on previous preferred answer. Different questions in this part are seeking understanding of the use of different learning resources in classroom practices. First questions which asks if NDLA is used in their teaching practice, shows that of the 85 respondents a total

of 28 or 33% answered that they use NDLA in their classroom practice, in contrast to a total of 19 or 22% reporting they don't. 38 teachers with a 45% answering rate reports that they use it occasionally. A qualitative follow up question to this quantitative question, is if the response was "yes" or "sometimes" on the previous question regarding if NDLA has been used in the teacher's classroom practice. This follow up question asks in what way the teachers used NDLA in their teaching practice, from the 78% answering yes or, occasionally, 52 or 75% answered that they use NDLA as a supplement to ordinary textbooks, while 16 or 23% answered other which they were asked to elaborate by specifying. Of those 23%, that chose the option "other", where asked to specify how. Answers here, also reported mostly task related and that NDLA is used in addition to the textbook. If used at all, because of the difficulties in finding the right and relevant stuff. This is interpreted as being caused by fragmentation of the text and bad structure and organising of the content on NDLA. Those who actually use it report specially the interactive parts being useful, together with the texts closeness to curriculum goals.

It is unclear why teachers who choose "other" as an option, and still ended up with answering that they do use NDLA as a supplement to the textbook. One possible reason could be bad survey design resulting in that these teachers has understood the main question about NDLA use maybe as something they do regularly and on a permanent basis. By choosing other and then saying that they use is occasional and not regularly. Another possible explanation could be that they thought of the option "other" as an opportunity to elaborate in what way they use NDLA in addition to the textbook.

On the question which tries to identify if NDLA is used instead of textbooks, where 44 or 59% of the participated teachers answers that this has never been the case, while 31 or 41% answers that the statement is true in their case. Those who have answered that they have been situations where they have been substituting the textbook with NDLA, was once again given the option to elaborate on how or why this was done. Most of these 31 respondents, reported that this was done due to the textbook being outdated, and that NDLA were considered better than the textbook. Many found it also useful to follow the curriculum goals in relation to the educational text. Again the results show both that the paper based textbook is the main learning resource used in classroom practices along with digital resources such as NDLA as a

supplemental learning resource. Excerpts 10 and 11 shows how this is manifested in the teacher's responses to survey questions.

Teacher 21 question 7_1:

"NDLA is more updated and has newer and sometimes better information. I use e-lectures and video clips often. Find it very useful to be able to follow the learning objectives directly to where the information exists. In subjects where the book is outdated, I use only NDLA and other external sources "

Excerpt 10: Textbook main learning resource and digital learning resources as a supplement

Teacher 2 question 4_2

"I've tried both, but in foreign languages I would like to have a traditional textbook and use NDLA as a supplement"

Excerpt 11: Joint use of paper based and digital learning resources

5.3.2 Design implications

The different design aspect discussed by Norman (2013) shows that the paper based textbooks affordances, signifiers and its constrains and mapping is a crucial part of the publishing industry's concerns regarding OER, and at the same time shows why publishing house in this thesis case is producing OER based textbooks. The paper based textbooks strength is assumed to lie in its bounded and exformated form. Excerpt 12 and 13 shows how design implications make the digital educational content more or less useless for the teachers need of reliable knowledge in different topics.

Teacher 9 question 7_2:

"Must be more user friendly. Much as is the NDLA is outdated, or you must click 100 times to arrive. Confusing many references and too much text. Poor graphics. One feels lost. Difficult to give instruction where students should click and what they were reading. Simply useless"

Excerpt 12: Design implications

Teacher 22 question 7_2:

"Better quality. A better interface to find and work with educational content. It is cumbersome to navigate menus NDLA and search has results and preferably more of exactly the same from several "places" on NDLA"

Excerpt 13: Design implication in form of less overview and structure on NDLA

The question of NDLA usage related to textbook were further investigated by following up those respondents who reported to not been using NDLA as a substitute for the textbook, equally many teachers answers that there is not good enough academic standard on NDLA which is shown by excerpt 12, and that NDLA should be more structured and organized which is shown by excerpt 13.

As the Ark&App study result show, there are some attentional issues in the daily use of digital learning resources, which is interpreted as caused by the unboundedness of information and activities related to the Internet technologies. Excerpt 14 shows a typical response showing a plausible reason for the teacher's main use of the paper-based textbook as a learning resource.

Teacher 1 question 7_2:
"Are long since I have been on NDLA now, but if it becomes a more "comprehensive works" it may be possible, however: It is often easier to have control over what students do when the PC is closed and they sit with the book in front of him"

Excerpt 14: Shows teachers attitude towards digital learning resources

5.4   Summary of findings

The main finding of the different research questions is that today's society could be regarded as a knowledge society where there is an abundance of information which could be regarded as fragmented and sometimes false. The gives rise to the need for some kind of exformation to make the educational content relevant for different purposes. This role is the publishers which means that the triangle of publisher – teacher – textbook. The publishers process of translating content from digital OER classified NDLA to paper-based textbook contains the key features of collective and individual work on the target audience, design and quality, and deciding which macro-states are regarded as valuable by the teachers through a survey. A key process during the internship were also to prepare for the testing of the textbooks by real life

teachers and their students, which were done by conducting the survey. An important part and where I think the publisher has the right design is by incorporating references to additional educational content in relation to the specific subject or topic such as tasks and curriculum goals. On the other side, some of the design elements that teachers appreciate is visual representations like pictures and images, which the publishing house and the textbook author planned on excluding from the textbooks, because of them taking up too much space in their opinion.

In regards of which features teachers view as important in the design of learning resources is apart from those mentioned above include the main themes of choices and customisation options in relation to tasks and the body text of the textbook. In a sense, there is a task culture that exists in classroom practices, which are explained by Dahl referred by Johnsen (1999) as a mean for activation of the students both in classroom and at home. Another main theme was digital resources in relation with joint use and references in the textbook to additional learning resources. The textbook is still the mainly used learning resource, but because of hybrid practices in the form of joint use of digital and paper based learning resources, the teachers show a wish towards more use of referrals to digital sources of additional information online. Last but not least the main theme of structure and overview show the need for exformation and a trustworthy source of information. The knowledge society has access to more information than needed at all times. It is like the public library, only boundless of physical limits in the form of brick and walls. In this fragmented landscape of information, there is a need for someone to make a exformation process to create logical depth as a measure of complexity in the form of overviews, summaries, and other collections of relevant knowledge of a given subject or topic.

The final research question has findings identifying much of the same topics mentioned above. It is about navigational constrains on the digital side of the learning resources, and navigational affordances and the natural mappings of the paper-based textbook. On the positive side for digital learning resources there is the affordance of updated information more rapidly than is the case for the paper-based textbook which has to be completely replaced by another updated edition. Joint use and hybrid practices along with the familiar fact of the textbook being main learning resources is an ongoing response through the data material.

The reason for the main themes found in relation with all the different research questions could be explained by both teachers in the survey of the publishing house in the case of this thesis, and for the different research included in the review section of this thesis, because it is in fact what matters in day to day life of teachers and students in classroom practices.

5.5   *Discussion*

Developments since the printing press is phenomenal. With the Internet and especially Web 2.0 world has become more global and open. The amount of information is overwhelming, and difficult to absorb, almost to the extent of information overload.

According to Vygotsky (1978), there are two mediating tools that are mentioned in the literature on the subject; tools and languages. Tools may concern all things that people use to achieve a specific goal. In that sense both the computer and the textbook are mediating tools regardless of technology, or if it can be classified as OER or a traditional economic model for exchanging educational learning resources. The teacher in this sense is the mediating person, which creates the zone of proximal development in a classroom setting along with the mediating artefacts or tools that the other learning resources represent. The computer or the textbook are the tools and their content is the sign represented by the written word.

The written word or text in both digital and paper-based form, are a crucial part of literacy and education (Regjeringen, 2016). Although the case scenario deals with paper-based textbook, it is still about the information society which we all are a part of, and how the information overflow can be managed. This means an attention to both constrains and affordances of the different technologies in means of educational design. Education is not what it has once been, after the introduction of digital technologies like the personal computer and the World Wide Web especially what is known as the Web 2.0 and the Web 3.0 also known as semantic web. First one, Web 2.0 is a web for the people and the latter a web for the machines (Webpedia, 2016). Where the first one gives amount others the affordance of mass collaboration and the latter gives the availability to search and gather metadata (Isaias, Ifenthaler, Samson & Spector, 2012).

The internet as a mediating artefact for knowledge distribution is enormous. Internet as a global infrastructure has great impacts on the transparency of information and knowledge,

because of the reach an impact it has in knowledge domains like the schools and education. Many say that education is the solution to the crisis of poverty (Regjeringen, 2002). Every human in the world should be able to read and write, just because it is necessary for communication, which is according to many the main reason behind development (Unicef, 2016). Human creativity and technology has always lead to new affordances and opportunities. Schools have traditionally always welcomed new technology. In Norway today every student has access to a computer with access to the Internet. The information and knowledge society with the Internet as hub, which connects us all together globally. Internet as a channel for communication, sharing and knowledge building has a great potential, because it reaches out to so many at once and support in theory, everyone to be able to communicate with everyone else who is connected to the network. With the newer web technologies even more and more knowledge and information is being digitized through the sky storage solutions as may be the case for Web 3.0. The semantics web´s capabilities are bringing the use of big data and with educational data mining (EDM) and learning analytic (LA) techniques into education.

So who are we when we sit down in front of a computer connected to the Internet? Are we consumers, designers, producers, teachers or students? According to Tapscott and Williams (2006) we have become prosumers, which is understood as people being both consumers and producers of information and knowledge (Tapscott and Williams, 2006).

As the research review of this thesis show; it has been several studies which investigated the triangle of teacher, textbook and student showing the importance of the textbook as a main learning resource and digital technologies being explored as supplements or even the main source of learning resource.

Finding from the analysis of the survey shows that teachers want textbooks to be structured with only the most important content, which gives a quick and clear overview of the respective subjects. This has to do with the design aspect, were typographical means to acquire pedagogical text. Teachers mean the content suitable for the above criteria are accomplished by having minimal with text and many exercises. The content should reflect different levels of difficulty to give the availability for differentiation.

Most of the teachers want a joint use of different learning resources with the book as the main educational resource. Because of this many teachers want the learning goals of the national curriculum to be linked to the content of the textbook. They want the content of the textbook to show which curriculum goal is covered where in the textbook. A possible reason behind this is that they want to release time for other planning tasks, and to be sure that they are covering the learning goals specified by the national curriculum goals.

Both the textbook and OER design educational resources. Regarding mapping, textbook in virtue of being a book contains constraints which do not allow many interactions with the book other than turning pages, viewing typographical items and reading exformated textual content.

To answer the research question I could have chosen to focus on several aspects. We have the aspect of market forces, education policy makers, technological and socio-cultural aspects, design implications and many more. The reason for me to include what is included is as much a result of a calculation and exformation process, as it is a design in the form of academic standards. The result, as presented as this thesis is a product of all the information and knowledge that are thrown away and only what is regarded as important, for as much as possible reliable and valid answering of the research questions, is included. The nature of the real life work situation that this thesis is based upon, implies the methods used for gathering empirical data in the form of observation and interviews.

Regarding the validity and reliability there are some issues to think of. First, because most of the data corpus consists of qualitative open ended questions where the participants were given the opportunity to say what they wanted. This way there is reason to believe that what the answers show relative accuracy what teachers think regarding the different questions asked. On the other side, there could be a possible risk consisting in the questions being leading in some way. Second, because the questions are partly based on the national curriculum goals like differentiation of classroom practice, reflection, group work and joint use of learning resources, including both print-based and digital, the teachers could have been lead to think of what is both accepted and expected of them in regard to their role as teachers in line with national policies especially regarding NDLA having received governmental funding. Last but not least, there could be a possibility that, since the setting is publishing of OER-based digital

content on NDLA, the teachers are specifically thinking of digital as synonym to NDLA and or OER. In other words; the teachers are answering questions to NDLA and not digital learning resources in general. This is only applicable to those questions where there is ambiguity in what exactly lies in their understanding of digital learning content. Last but not least, the both the internship and survey were intended and for the benefit of the publisher. Questions in the survey were, what the publishing house wanted to map according to their strategies. In that way, this thesis could have more reliability and hence validity if more research design were to be implemented. At the same time, this study being based on an excerpt from a real life work situation, with all that it implies, gives valuable insights on what is going on the publisher's side of the textbook and other educational resources.

In my opinion, approval scheme had a great influence on how textbooks are considered in the design and content by both the teachers and the students. After the removal of the approval scheme, in theory, anyone could publish their own textbook. This freedom comes at the price of possible less quality control. Before the removal the distribution of textbooks was regulated by agreements by The Norwegian Publishers Association and the Booksellers Association with only a few major actors on the market. The influence of philanthropists as the The William and Flora Hewlett Foundation and big organisations like UNESCO and OECD made government's take OER seriously.

The World Brain represented by the Internet have not replaced the traditional brick and wall library. Machines in the industry have only taken over tasks seen as repetitive and boring like packing beer or lifting heavy boxes. Internet has not taken over for the textbooks in classroom settings. A product or artefacts true value is only settled by its users. If people stop using a given tool, the tool soon stops to exist in the real world. Also language is in the same manner, if people stop using a certain language, it actually kind of dies out, along with the people that spoke it. And if it did not have any impact, been written down, or being remembered in someone's memory, it vanishes from history as well. In this way only history will show which of the book or the digitalised text sources are best fitted for maintaining access to previous historical knowledge. Factors to consider is the technologies affordances in the future, according to access to resources and climate changes.

6 Conclusion

The textbook is still popular, there is no doubt. The assumed reason for the publishing house's decision on publishing OER based textbooks were to minimise costs and increase revenues. But what impact it will have in the long term for the teachers and students, or which trajectories it may take in accordance to design of textbooks and publishing on demand, is yet to see. Future research on what the implications of designing custom made textbooks and re-use of own and others material has on the layout and content of future texts.

The assumption in the case is that the main problem with digital resources relate to the knowledge society large and relatively complex amounts of information that are experiencing fragmentary. In addition, an uncertainty of how reliable the information you find is. Just as Norretranders and Johansen (1992) try to show that the brain needs to get rid of information, and thus try to forget, is also the case with what we experience as information overload. There is a need for some kind of exformation process to assure quality in the information so it could be regarded as valuable knowledge. The affordances and constraints of paper based textbook are different from OER based NDLA on Internet. Differences in affordances in OER are obviously the result of the web 2.0 and the semantic web which gives the ability of creating his or her own textbooks for use in the school.

Teachers could be seen as future designers of educational resources by, for example making their own textbooks that could be printed. By collaborating and sharing their work, they could be creating a large repository of a wide array of knowledge all in accordance with the national curriculum. By doing this they have the option of printing out only the parts that are going to be used in different trajectories along the course. This way there will be less use of paper that potentially could be beneficial to the environment. Still the student could have access to all the affordances that the paper represents.

This means more work in designing and planning the educational trajectories in accordance with the curriculum, but where the teacher could potentially be creating his or her own customisations to the local environment.

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8 Attachments

Attachment 1: Overview of top most codes relative to survey question

Question	Code	Occurred
Question 1: What factor of the textbook is important for you to differentiate instruction?	Task related Choice and opportunity to adjust Structure and Overview Text related	66 (most) 56 (2nd most) 21 (3rd most) 20 (4th most)
Question 2: How do you think a textbook should be to interoperate with other learning resources?	Digital resources Sources, redirections and links Interaction between learning resources Task related Structure and overview	32 (most) 18 (2nd most) 18 (2nd most) 17 (3rd most) 17 (3rd most)
Question 3: How do you think a textbook can support reflection, group and fellow-student instruction?	Task related Open and reflective questions Text related	48 (most) 22 (2nd most) 15 (3rd most)
Question 4: Do you use NDLA resources in you teaching practice?	Yes No Sometimes	28 19 38
Question 5: If yes or sometimes on question 4: In what way have you used NDLA in your teaching practice?	Used NDLA as supplement to ordinary textbooks Use only NDLA Other (please specify)	52 1 16
Question 5_1: Other specified	NDLA task related NDLA in addition to the textbook	5 (most) 4 (2nd most)
Question 7: Has there been times when you´ve used NDLA as a	Yes, with comments No	31 44

substitute for a textbook? If yes: In what way?		
Question 7_1: Yes with comments on question 7	Textbook outdated	9 (Most)
	NDLA better then textbook	5 (2nd most)
	NDLA in addition to textbook	5 (2nd most)
	NDLA subject Norwegian	5 (2nd most)
	NDLA only if no choice	4 (3rd most)
Question 7_2: If no on question 7: What does it take for you to use NDLA in your teaching practice?	Better academic level NDLA	7 (most)
	Clear overview and structure NDLA	7 (most)
	Lack of content on NDLA	5 (2nd most)
	Unknown or don't know	4 (3rd most)