Graz University of Technology

MASTER THESIS

Individualization possibilities for Books with

"Print On Demand"

Technique

Carried out at the

Institute for Information Systems and Computer Media (IICM)

Faculty of Computer Science - Graz University of Technology

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by

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Graz, at April 10, 2012

Statutory Declaration

I declare that I have authored this thesis independently, that I have not used other than the declared sources / resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources.

Graz, April 2012 _____

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to my best friend

Lidija Lovrinović

Abstract

This master thesis analyzes the cooperation possibilities between scientific online published books, journals or papers and the new business model of printing on demand. The work focuses on building interfaces between these fields so that technical barriers become less inhibiting and at the same time technology becomes more appealing, for users, authors and print-on-demand providers equally. The benefits- both economical and immaterial that can arise out of this cooperation are also carefully analyzed. Particularly the economic benefit is crucial to the sustainability of the system and its steady improvement.

In the context of this study, a plugin which connects Open Access Journals with print-on-demand providers was developed. Through this development and the possibility to apply it to our case study book L3T (www.l3t.eu), valuable and detailed insight about its implementation characteristics were gained and shared in this master thesis. The master thesis starts by introducing the fields of application and some representative examples out of them, followed by a preview of the business models. A detailed description about the supporting infrastructure which lies behind this technology and the new developed plugin is also included in the study. The last chapter is set aside for discussions, propositions and other non-technical questions which concern themselves with the present and the future of this topic.

Kurzfassung

Diese Masterarbeit beschäftigt sich mit den Möglichkeiten einer Zusammenarbeit zwischen online veröffentlichten, wissenschaftlichen Büchern, Zeitschriften und Artikeln und dem neuen "printing on demand" Geschäftsmodell. Ziel ist die Entwicklung eines Interfaces zwischen diesen Bereichen um technische Hürden zu vermindern und den Usern, Autoren und "print on demand" Anbietern den Prozess zu erleichtern. Wirtschaftliche und anderweitige Vorteile die sich aus dieser Kooperation ergeben werden ebenfalls genau betrachtet. Dabei sind die wirtschaftlichen Vorteile für den Erhalt und die stetige Weiterentwicklung des Systems von wesentlicher Bedeutung.

Im Rahmen dieser Studie wurde ein Plugin entwickelt, welches Open Access Journals mit den "print on demand" Anbietern verbindet. Durch diese Entwicklung und die Möglichkeit sie auf unser Fallbeispiel - Buch L3T (www.l3t.eu) anzuwenden, wurden wertvolle und detaillierte Erkenntnisse über ihre Implementation gesammelt und in dieser Masterarbeit präsentiert. Sie fängt mit der Vorstellung der verschiedenen Anwendungsfelder und einiger repräsentativen Beispiele an, gefolgt von einem Ausblick auf die Geschäftsmodelle. Eine detaillierte Beschreibung der zu Grunde liegenden Infrastruktur und zu dem neu entwickelten Plugin ist ebenfalls in der Studie enthalten. Das letzte Kapitel ist vorbehalten für Diskussionen, Vorschläge und andere, nicht - technische Fragen, die sich mit der Gegenwart und der Zukunft dieses Themas beschäftigen.

Table of contents

1   Introduction

Publishing new research results in science and technology is the core concept of advance in every scientific discipline. These publications don't just help expand the frontier of knowledge but, are also essential for people pursuing a scientific career. Their recognition as researchers is tied up to their publications and the quality they deliver, as well as contributions to the scientific progress. But publishing is not an easy process. It is subdivided into other processes and involves many people. All this work is translated into costs that need to be funded. Aim of this master thesis is to develop and propose a way to finance the publication of resources delivered under open licenses. It especially focuses on resources which target scientific publishing like Open Access Journals, but can also be applied to different educational materials. These resources are already available on the internet so the goal will be to develop a system which allows readers individually to compose their desired materials and purchase the printed copy.

This first chapter will introduce the concepts of sharing open educational textbooks as well as analyze some of the most common business models of how to fund scientific material in the "Open Educational Resources" (OER) domain and the structure which lies behind them. The reason for choosing to work on this type of publication ideology, besides the wish to contribute to the open movement community as a way to support teaching and learning all over the world, is the practical view through an example of OER publication which was conceived and written at the TU Graz by S. Schön and M. Ebner „Lehrbuch für Lernen und Lehren mit Technologien" (L3T; http:// l3t.eu). The following chapters will introduce many surrounding technologies which were used for the development of the plugin. But before going into details it is necessary to understand the type of resources this solution is concerned with. Especially how did they evolve, who is writing them and why, as well as, what are their characteristics and perspectives.

1.1   What are Open Educational Resources (OER)?

"*Open Educational Resources (OER) are teaching and learning materials that you may freely use and reuse, without charge. Open Educational Resources are different from other resources a teacher may use in that OER have been given limited or unrestricted licensing rights. That means they have been authored or created by an individual or organization that chooses to retain few, if any, ownership rights. For some of these resources, that means you can download the resource and share it with colleagues and students. For others, it may be that you can download a resource, edit it in some way, and then re-post it as a remixed work.*" (OER Commons, 2012)

In the early 1990s the World Wide Web was launched, giving a totally new dimension to information exchange throughout the world. This gave birth to instantaneous sharing of

information not just between cities and countries but also for other regions of the world which were virtually inaccessible by free media[1]. The step from news, ideas or any other information to educational resources was not very big, so that very soon people started endorsing the strategy of sharing knowledge through the internet. But they lack on quality assurance for the content and promoted very little enhanced learning. The relatively new Education Program from the Hewlett Foundation was focused on how to catalyze universal access and use high-quality academic content on global scale (D E. Atkins, 2007). This program led to the contribution of founding OER (GUTTENPLAN, 2010). Figure 1 shows the OER logic model. Its main goals are to equalize access to knowledge and educational opportunities across the world by using information technology.
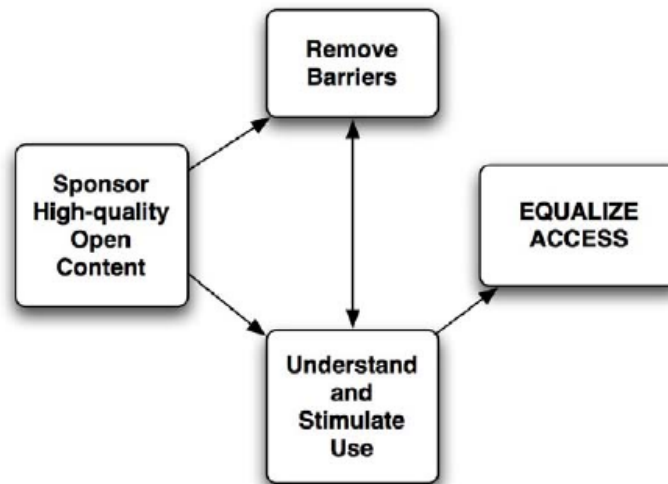

Figure 1: Open Educational Resources Logic Model (D E. Atkins, 2007)

By equalizing the access, the previous figure, denotes the ability to make content accessible to as many people as possible. School textbooks cost American students $900 a year on average (Kinzie, 2006). If these costs are translated to developing countries, it turns out to be the salary of many months and practically unaffordable. The fact is that students in those countries do study even if they cannot afford these costs. So there must be a difference in quality of the content and material in order to make these materials affordable. This indeed is the next goal of OER, delivering quality. Being free doesn't mean it has to be of a lower quality. This is a barrier which also needs to be diminished. In fact many prominent universities have been practicing this strategy for a long time delivering state of the art quality and content. The last point is the usability of its supporting technologies. This idea is not just about transmitting the information but,

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[1] The censorships many totalitarian regimes put on the media.

delivering it in a comfortable way to the reader by offering extra functionalities which would bring profit for both sides.

The term Open Educational Resources was first used at a conference hosted by UNESCO in 2002, where it was defined as *"the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes"* (OECD, 2007, p. 30).

Since then OER has been defined with many terms and descriptions. Following map in figure 2 helps clarifying methodically how OER works.
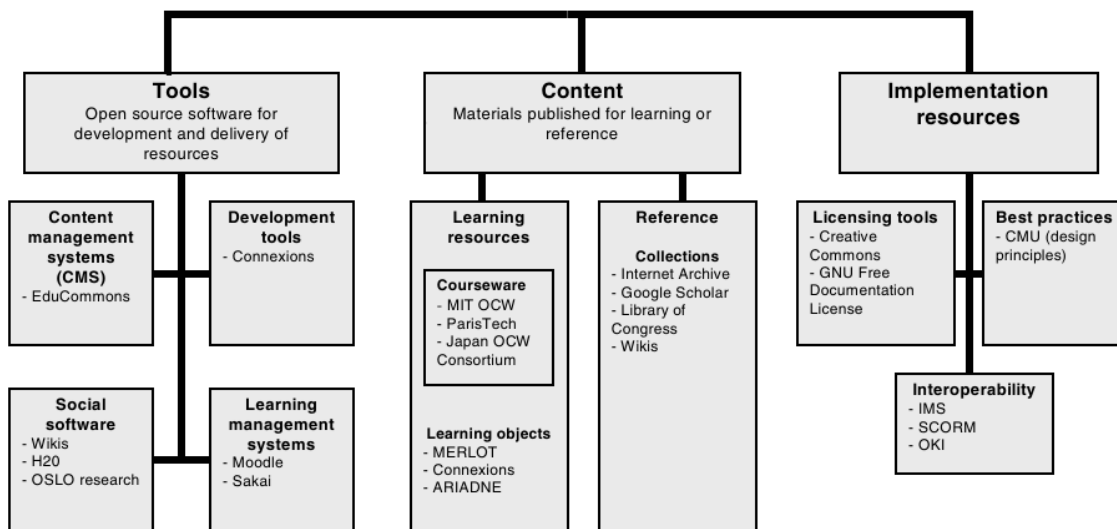

Figure 2: OER A Conceptual Map (OECD P.31)

- *Tools*: The tools are open source software to support the development and delivery of resources. These tools help organizing, sorting, browsing and searching through the necessary resources. They also offer a learning and interaction infrastructure which helps students communicate with each other.

- *Learning Content*: Includes all materials published for learning and/or the references. Full courses, courseware, collections, learning objects and journals are included.

- *Implementation resources*: This encompasses the rights to promote and publish the open materials, design principles of best practice and localized content.

Lately OER doesn't just include learning materials published under a free to use license, but has become a term for a broader meaning. It actually identifies the whole system from conception to support. The list below illustrates some of the terms included in OER:

- online materials
- courses and course components
- museum collections
- open access journals
- reference works
- content management software
- content development tools
- standards and licensing tools for publishing e-Resources

(OECD, 2007)

1.2 Differences between OER and other Open Initiatives

The new philosophy of sharing intellectual property with other people could take place just after the digital revolution which happened the last century. While under different drivers and motivational factors, a product branded with the open logo had mostly the same ambitions and goals (OECD, 2007). *Offering everybody the possibility to access intellectual resources freely for (non-)commercial purposes.* The non-commercial user is what every license, under the open has in common. Because they differ in many other ways such as fees for commercial usage, re-contribution in case of changes and other conditions which can also be applied under double licensing schemas. Some of the most popular open movements are shown in figure two. They might cover similar topics in terms of application fields and sometimes (i.e. Open Content, OpenAccess and OER) are used interchangeably. The most popular one in this category is *Open Source Software* which didn't just rise up as a substitute product for commercial alternatives, but was born alongside it as an ideology. OSS has given a big contribution to the digital revolution and plays a big role in daily applications, as well as in education and science. Unix server systems and its derivatives have a market share of over 60%[2], where a big part is played by GNU/Linux servers. An analysis made by CPAN and Debian developer James Bromberger showed that if Debian's current version was to be written from scratch it would cost about $19.1 billion. They took the average annual salary for a software developer to calculate the results (h-online, 2012). This case shows the practical and market value of open. But the

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[2] http://w3techs.com/technologies/overview/operating_system/all (last visited: 23.02.2012)

open methodology doesn't end here. The Open Beer Project[3] followed by OpenCola[4] are just some other examples on how this philosophy is been endorsed by the non-digital industry. They both share their product's recipe with the public, being this way open and promoting transparency.
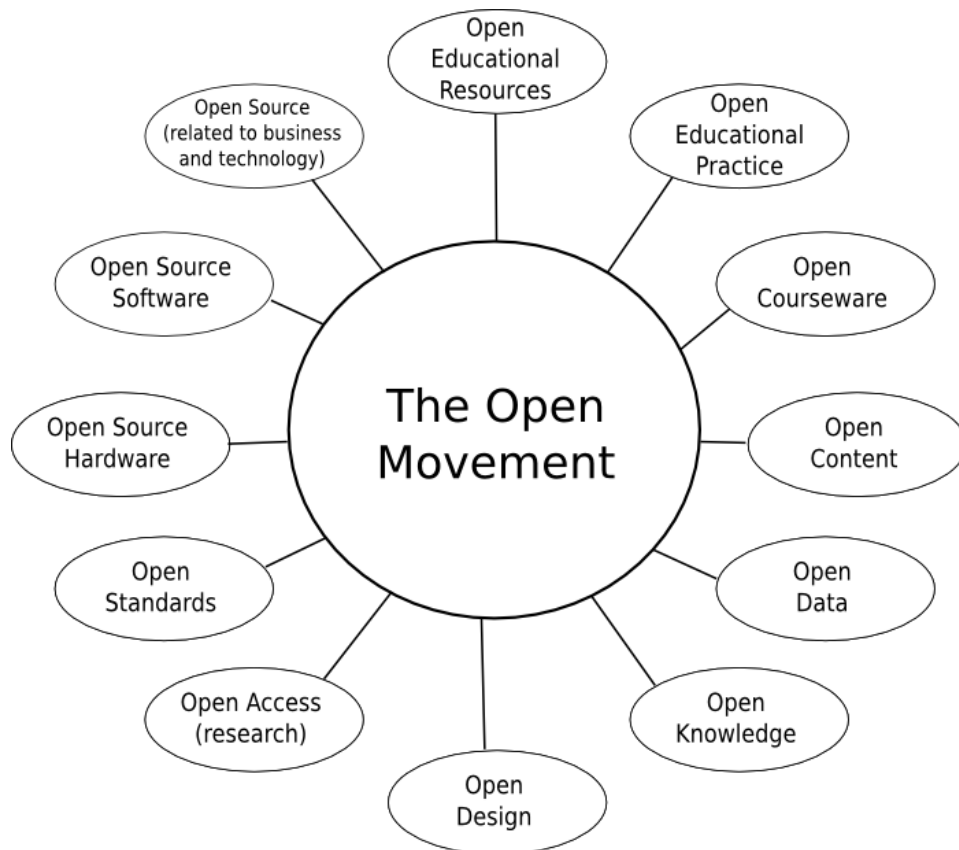
Next follows a description in short terms about the other open movements in order to draw the line between them and OER.

- **Open Source Software (OSS)** includes software published under certain licenses that allows the end user to use it without any charge. Moreover anyone can see the code of this program and can copy it, distribute, study, change and improve it.

- **Open Source Hardware** are the necessary resources needed to understand and rebuild a project that describes a hardware design.

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[3] http://flyingdogales.com/ (last visited: 24.02.2012)
[4] http://www.colawp.com/colas/400/cola467_recipe.html (last visited: 24.02.2012)

- **Open Standards** are a set of rules that help the implementation of open movements.

- **Open Access** is a subset of OER. It concentrates on scientific journals and provides the possibility to read, download, copy, distribute, print, search, browse etc.

- **Open Design** are mainly free design templates and resources for web pages. They publish under an OSS license the programming code, CSS collections and other multimedia resources.

- **Open Knowledge** is any content, information or data that is free to use, re-use and redistribute without any legal, technological or social restriction[5].

- **Open Data** is an initiative to make information public without any restraints. Its philosophy supports the idea that development is better out without copyright, patents and other proprietary rights.

- **Open Content** includes all types of resources that are freely published. It relies on its "4Rs framework": Reuse, Revise, Remix, Redistribute

- **Open Courseware** originated from a MIT's initiative to offer learning materials for free. Now many universities around the world followed the example and published their lecture resources and articles online for free. According to the Open CourseWare (OCW) consortium there are over 200 member institutions in this movement (OCW-Consortium, 2012).

- **Open Educational Practices** (OEP) are not materials but practices which help supporting the creation, usage and reuse of high quality open educational resources (OER). To achieve this goal they deliver institutional policies, which promote innovative pedagogical models and respect and empower learners as co-producers during their learning path (ICDE, 2012).

The difference between OER and other open movements is that OER concentrates itself in the development and publication of resources aimed for any type of education. Not just the education of students and higher education like scientific journals but also for pupils and all educational groups. Considering the variety of materials and the differences between the topics, it is difficult to incorporate all these target groups into one system. So it makes

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[5] Definition from http://okfn.org/about/ (last visited: 01.03.2012)

sense that different providers specialize for the target group they reflect. What are the major players and how do they get characterized within the open movement is visualized in figure 4 below.
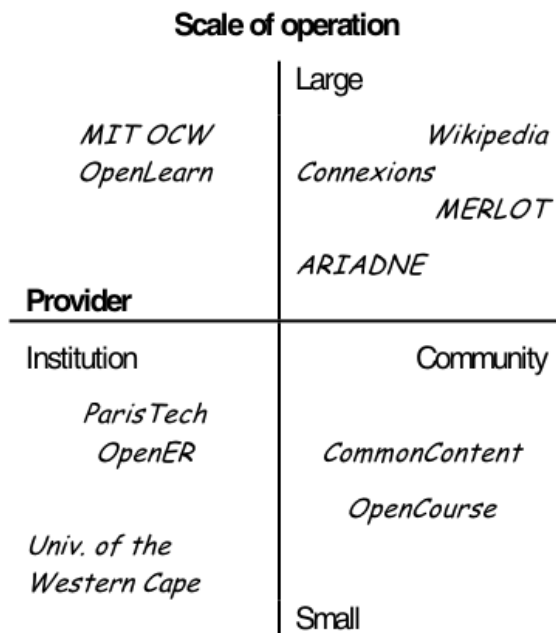
Figure 4 shows some of the most popular OER providers categorized by the scale of operation and type of collaboration. OER has a broad field of application and for every target group there is a suitable product to cover the requirements. The type of categories and their differences will be explained in the following chapter.

1.3 Why are people sharing for free?

Answering this question depends on the subject which is incorporating this ideology. Basically the main reasons can be divided into technological, economic, social and legal drivers (OECD, 2007). The economical part will be discussed in details as one of the main topics of this thesis. The following reasons are mentioned from OECD's study on OER as some of the main drivers and inhibitors for this movement.

- **Technological and economic**: this includes the new infrastructure which enabled improved, less costly and more user friendly interaction between peers. With decreasing hardware prices and broadband connections, spreading not just in the western part of the world, this interaction becomes easier. Furthermore new business models are evolving to support new incomes into this philosophy.

- **Barriers and Obstacles:**
  - A *technical barrier* is the poor penetration of broad band in the developing countries.

  - The lack of resources to be able to invest in hardware and software for developing and sharing OER is an *economical barrier*.

  - *Social barriers* are those inhibiting the usage of OER, even if it is available, for lack of skills for the supporting technologies

  - Refusing to use or share content provided by other teachers or institutions could be seen as a *cultural obstacle*

(OECD, 2007)

But individuals and institutions are not alone in this movement. Governments all around the world, especially in Africa, are promoting OER very seriously. If people are motivated by the above mentioned reasons, what turns the administration on their side? For the government there are three reasons to support OER projects:

- They give the possibility to everyone to educate themselves, particularly parts of the community which cannot afford studying fees.

- This way both, the students and the government have the possibility to learn and gain knowhow out of these programs.

- They can bridge the gap between non-formal, informal and formal learning.

(OECD, 2007)

Another entity interested in sharing information is an institution. Here it can differ between public funded institutions and private institutions. There are fundamental differences on the reasons of their actions, even though they both deliver the same product. From their point of view there are six arguments to support this strategy in order to fulfill their interests.

- The argument that knowledge should be shared and the selfless approach is in line with these academic traditions.

- Publicly funded educational institutions should use their funds in the best interests of all tax payers.

- The re-usage and sharing of contexts can improve the quality and reduce the costs if contribution is made in a costs-free way.

- Public relations can also profit from this strategy in the aim of attracting new and highly qualified students.

- No need for new costs recovery models as a result to the growing competition between institutions.

- The strategy will support the development of new learning resources, stimulate internal improvement, innovation and reuse and help the institution to keep good records of materials.

(OECD, 2007)

Another idealistic reason is the risk of doing nothing in a rapidly changing environment.

The drivers for individuals, teachers, and researchers are packed into four main headings.

- Like institutions they want to share and support the traditional academic values by promoting selfless values.

- Other non-financial gains like publicity or reputation.

- Sometimes it is even good for economic reasons to join the strategy if you are the first one to endorse it and reach quickly a significant market share which will later on translate into commercial value.

- Keeping the resources closed sometimes is of less general value then sharing it with other people for free.

(OECD, 2007)

Nowadays there are thousands of open courses from internationally reputed higher education institutions which offer them for free. This will affect directly or indirectly other teachers to review their materials as result of the openness where students can compare and evaluate the content. OER is also a way to accelerate changes in the traditional teaching and support the evolution of independent learners (OECD, 2007).

1.4 Funding OER

Although some OER projects are completely done by self-initiative and don't involve any kind of refinancing, there are some that due to a certain minimum of quality expectations require financing to be able to deliver it. This implies that some resources may need maintenance, reviewing or other different operations connected to costs and some others don't. According to the creative commons (the most popular license used for OER) license statistics; there were over 400 million (data from June 2010) resources available online under its terms of conditions. A big part of these resources are multimedia objects such as pictures on flickr [6] or videos hosted on different providers (Commons, 2012). Other resources, such as the online book this case study is based on, require permanent improvement to ensure that state of the art information is delivered. This perspective is just the author's point of view. There is also the case of hosting service provider where there are other financing mechanisms like i.e. through advertisement for financing their business.

1.4.1 Value measurement

By definition OER-s are free to use, fully accessible resources. But this doesn't mean that they come at no costs. Whether it is the time spent to create an output or the hosting service in the web or even marketing campaigns, each one of those cumulates to a final value. This value is particularly difficult to measure for OER. There are two principles on how such value could be measured

- Invested Manpower
- Market value

With the manpower strategy the focus for the calculations lies in measuring the input factors which lie behind the final product (input oriented strategy). The market value strategy tries to define the price which the market would find acceptable. This can be done by using the opportunity costs calculation method which can be measured in terms of the value of the next best commercial alternative. The market price method is also a way of measuring the value by estimating, with different techniques, the value of products traded in commercial markets (Schön, Ebner, & Leinhardt, 2011).

1.4.1.1 Manpower (Input Oriented Approach)

OER projects must be calculated like conventional projects as well. Low budget projects are in many ways restricted compared to well-funded projects. They cannot have access to commercial services, so that much of the accomplishment has to be done by personal contribution. This means that part of the infrastructure and professional know-how first

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[6] www.flickr.com (last visited: 01.04.2012)

needs to be gained. In other terms they have access to motivated manpower but not to enough financial resources to fully support their enterprise. By investing the manpower to do the same job some professionals do more efficiently, the costs of the whole project inevitably increases. Another factor is the limited time many actors have on disposal. In some cases they have a job not directly bound to these projects so that the time which can be invested is restricted to few hours a week. This implies that one task has to be divided into many other subtasks and this can be translated in more work-in time, thus costs. A simple overview of how this OER project was brought to life can be delivered from the L3T practical example. It was created between April 2010 and February 2011 with almost 200 participants, where 115 are authors, 80 are reviewers and other contributors to the project. To finalize the first version of the product it took 3803 hours. Table 1 illustrates the distribution of these work hours for a better understanding of how this work was invested.

Task	Description	Time and Resource Costs
Concept	Planning, Book content, Chapter components, Layout	120 h
Chapter production	130 Authors, each ca. 5,5 h Revision:115 Authors, ca. 1h	830 h
Chapter quality assurance	Reviewing (54 Chapters, each 2 Reviewers 1. Round, each 2 h; 25 Chapters in 2. Round, ca. 0,5 h and editorial report for 50 chap. Each ca. 4 h)	441 h
Layout and Illustration	Each chapter on average 5 h (50 Chapters), Picture for each chapter	250 h
Project management	Time schedule, Controlling, Meetings, Transportation expenses	100 h/ 1.000 €
Participants assistance	Process organization for 200 assistants (Authors, Reviewers, others), per person ca. 2 h	400 h/ 1.000 €
Other L3T materials	15 L3T videos (10 h per Video), Links collection at Mr. Wong (ca 500 links a 2 min, ca 17 h), other preparations (CiteUlike etc. ca. 15 h)	182 h
Technology and material Costs	Installation and support for the technical structure, three Smartphone apps, iPad	1000 h/ 500 €

	chapter material costs (hard copies), Assessment	
Marketing	Creating web materials: videos for the project, i.e. public Appeal, Christmas video, Thank you, Assistance of Facebook-Fanpage, Twitter channel, Booklet, Other advertisement materials	300 h/ 500 €
Presentation at Learntec	Preparing for the presentation, costs, Flashmob organization and assistance	180 h
Sum	Labor and material costs	3.803 h/ 2.000 €

Table 1: Practical costs overview from L3T project (Schön, Ebner, & Leinhardt, 2011)

An approach on evaluating these work hours is converting them to full-time equivalent hours and rating them depending on the work experience. Another example is the measurement of free online encyclopedia like i.e. Wikipedia[7]. The approach here is to automatically calculate the time invested by counting the words in new or edited articles. Not without reason it was followed by criticism, because not every new written word means that value was added. But for such big projects the automated approach is the most realistic one (Schön, Ebner, & Leinhardt, 2011).

1.4.1.2 Market Value (Output Oriented Approach)

The monetary value of an OER initiative can also be measured by the market share value it takes once made public. Wikipedia for example as a major OER contributor is currently rated as the sixth most popular website[8] globally, with huge advertisement potential. But binding other links or ads it would notably decrease its ranking on some search engines like Google. Alternatively you could measure its value by the value of non-free competition like Britannica[9] which offers its services under an annual fee of $69.95 (Schön, Ebner, & Leinhardt, 2011).

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[7] http://www.wikipedia.org (last visited: 01.04.2012)
[8] http://www.alexa.com/topsites February 2012
[9] http://www.britannica.com/ or for information about fees https://myaccount.britannica.com/faq (last visited: 01.04.2012)

1.4.2 Sustainability and Financing for Open Content

Now that it is clear that serious OER projects are inevitably connected to costs, which are comparable to other types of commercial projects, it is time to discuss about the funding possibilities. The question "how to fund OER?" can only partly be answered because till now most answers consist in approaches and not market proven business models. Open content itself is not a business model which was brought to the market as a new way of doing business. It is more of an attack to the actual value added chain which arises from new social developments (Hartmann & Jansen, 2008). What's clear is that open content has to establish itself to solid business models in order to survive in the long run. Following some of the most popular business models for OER are going to be examined. But before these specific business models are discussed it is necessary to localize the areas where OER can generate added value in order to attract investments.

1.4.2.1 Value added through Preparation

Lawrence Lessig discusses in his book "Free Culture" about the possibilities that free content don't have to be in discordance with business models for which one has to pay for access. An example for this case is *LexisNexis*, a law information service website which requires fees from its subscribers for the allocation of public domain information. In the same manner is possible that through preparation, navigation and analysis of free content, an added value is generated, for which the user is willing to pay. They could be considered as products which are dealt as merchandise (Hartmann & Jansen, 2008).

1.4.2.2 Value added through premium services

Chris Anderson, the chief editor of *wired*[10] brought the new term *Freeconomics*, which was a merger from Free and Economics (Anderson, 2007). In his article he was backing up the idea that offering for free what was till now commercial doesn't mean it has to be unprofitable. He brings some examples which were possible after the bright band evolution of internet. Companies like Skype, YouTube or Flickr could not have possibly seen a feasible business model before this new state of the interconnection. With new technological possibilities, new ways of thinking rose. So did i.e. Skype change the way everyone perceives telecommunication today and established itself as a worldwide leader by giving for free parts of its services but charging for other premium ones. In this new age Anderson argues about the slogan "*Be the first to give away what other charge for*" to attract new customers. In this concept even if let's say 99% of one million users do not want to pay for extra services, the 1% of this big group still counts for 10.000 accounts which multiplied by 10 Euro monthly brings 1 million in revenue (Hartmann & Jansen,

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[10] http://www.wired.com/ (last visited: 01.04.2012)

2008).

1.4.2.3 Value added through marketing

In this prospective the added value consists in promoting the institution or organization standing behind this project. Open content's first role is to work as an advertisement for other business sectors from the same issuer. An example is giving some articles for free to convince the customers about the delivered quality and then charge for others. One prominent example implementing this business model is MIT's *Open Courseware*[11]. Through this OER project MIT[12] makes very good publicity about its educational degrees, showing the new state of the art technologies and prominent writers working for this institution (Hartmann & Jansen, 2008).

1.4.2.4 Value added through dual licensing

Dual licensing has its roots on *Open Source Software* (OSS) where the same software could be licensed with two different terms of conditions. One reason to do this is for private users to be able to enjoy the full functionality of the software and for those who use it commercially and earn something out of it, to pay some contributions to the owner of the intellectual property. The same principle could be applied to open content and OER. If someone uploads a picture to *Flick* or his music to *YouTube* he accepts that everyone can share it but if used for advertisements or other profitable purposes, he expects to be paid the contributes agreed in the license.

It is interesting to acknowledge that *dual licensing* has not yet found broad acceptance in open content. One reason for this could be because commercial users do find the delivered quality complying with the one asked for (Hartmann & Jansen, 2008).

1.5 Sustainability models

As OER gains on popularity and more and more institutions or private individuals contribute to the community, it has become a key issue how to sustain these projects on the long term. A study from OECD shows that these projects are mostly funded by an initial grant by their own institutions, from governmental funds or from private foundation if there is no long term sustainability plan. All these cases can be subject to cost cuts like government cuts for education, private institutions cutting their support in bad financial periods or even worst when it's a private individual which can be affected in many ways from his personal life. So economical sustainability was needed, not only for business

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[11] http://ocw.mit.edu/index.htm (last visited: 01.04.2012)
[12] Massachusetts Institute of Technology http://web.mit.edu/ (last visited: 01.04.2012)

purposes but to carry on with the enterprise. This strategy includes technical support, organization, scaling possibilities and content models for the long run (OECD, 2007).

There are three dimensions which affect the way on how to approach the sustainability issue:

- Size of the operation (small or large)

- Provider type (community or institution)

- Level of user integration in the production process (co-production or producer-consumer model)

The next figure shows some OER initiatives which are representative examples for the mentioned dimensions.
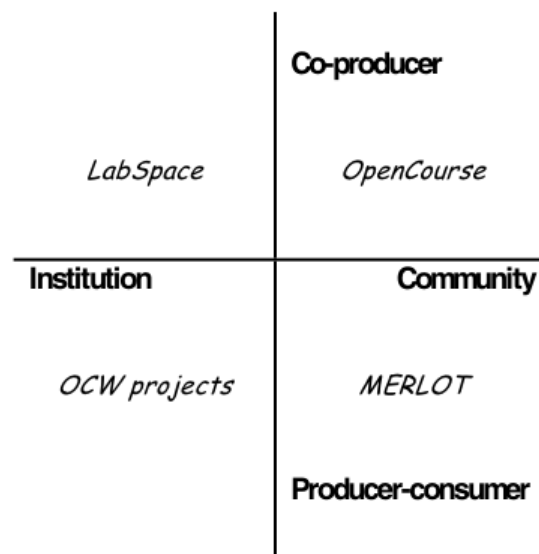
Figure 5: Examples of projects using the co-production and

Producer-Consumer model (OECD, 2007, p. 89)

LabSpace[13] is an example of the cooperation between an institution and a co-producer. It is an initiative of the *OpenLearn* website which provides OER from courses in association with the *Open University*[14]. This model offers courses taught at universities hence it must have some institutional support like i.e. in the generation of course materials.

The **OpenCourse** initiative is a highly collaborative profiled website which states its goal

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[13] http://labspace.open.ac.uk/ (last visited: 01.04.2012)
[14] http://www.open.ac.uk/ (last visited: 01.04.2012)

"Teachers helping Teachers", helping one another using web technologies to teach better. OpenCourse.org hosts virtual communities developing, evaluating and using open, non-proprietary learning objects in their discipline"[15] (opencourse, 2012)

The **MERLOT** initiative stands for less collaboration between producers and puts its strategic goal to "improve the effectiveness of teaching and learning by increasing the quantity and quality of peer reviewed online learning materials"[16] (merlot, 2012).

Sustainability isn't just a matter of being able to keep your servers online. It is more an idea of constitution. It should therefore include the concept of accomplishing goals to that of longevity. This way sustainability becomes for OER projects an ongoing ability to meet their goals. There are two different types of sustainability:

- Sustaining the ongoing production and sharing of the resources

- Making it for customers possible to use and reuse these resources

The first point is divided in production and sharing, which are clearly connected to costs. Whether it is the writing, reviewing, developing workflow policies, buying servers or the ongoing processes like sharing, editing and improving the resources they all have monetary costs. The other point is about being able to produce resources that are compatible with the initiative. An example is the usage of open source software and open standard formats instead of expensive programs which use proprietary formats that the majority of the users cannot afford to buy for the purpose of editing and customizing the file. This improves not only the usability for the end user but also for the publisher (OECD, 2007). Cecilia d'Oliveira stated on her publication about MIT OpenCourseWare formats, that it would take double the time or more to the production process for materials submitted to OCW which are not in XML format (d'Oliveira, 2006).

1.6 Costs and revenue models

Now that the reader knows the kinds of costs that apply to such projects are, where value is generated and the type of support they stand behind, it is easier to talk about a variety of funding models for such projects. The following models are depicted at Stephen Downes article about the models for sustainable OER (Downes, 2007, p. 34).

Endowment Model – this model is supported through a base fund which is administered by a capital manager to generate profit out of it. It is the achieved profit that is used to fund

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[15] http://opencourse.org/ (last visited: 01.04.2012)
[16] http://taste.merlot.org/ (last visited: 01.04.2012)

the model. An example for this case is the Stanford Encyclopedia of Philosophy which reached to the conclusion that a subscription based model would cost (mostly costs which go to volunteers) more than it would earn (Downes, 2007).

Membership Model – the members in this model are institutions or organizations which are invited to contribute to a certain sum which can be used as a seed (one time only) or annual contribution. This amount is used to generate operating revenues for the OER services. An example in this case is the Sakai Educational Partner Program which grants members privileges like early access to roadmap decisions, early code releases and documentation. Membership however costs $10.000 USD (Downes, 2007).

Donations Model – this model is supported by a wide community where many consumers donate a relatively small amount of money. So for this model to work the enterprise should have a certain state of popularity. Donations are, in contrast to the membership and endowment model, managed by non-profit foundations which regularly cover the expenses. One of the most prominent examples of this model is the Wikipedia foundation. There are also variations of this model like for example contributions to the Apache project are owned by the contributor and licensed to the project (Downes, 2007).

Conversion Model – in this model the conversion word stands for the conversion of a user from non-paying one to a customer. The way this works is like in the open source world where many software houses and even Linux distributors like Ubuntu or RedHat give the software for free but charge for other services such as installations, troubleshooting and support. This because they argue "*there is a natural limit to the amount of resources the Donation Model can bring to an open source project, probably about $5 million per year*". In the OER world Elgg[17] and LAMS[18] are popular examples that endorse this model (Downes, 2007).

Contributor-Pay Model – here there are contributors which pay for the costs of maintaining specific resources. Of course the material is then made public for free. Interesting is the fact that this model has earned great support from the publishers like foundations (Welcome Trust). This model is adopted by the Public Library of Science which is the organization that supports Open Access (Downes, 2007).

Sponsorship Model – is probably the most common in everyday life. It works like free television channels or radio. Sponsors support the project and in return they get publicity for their entities. This model has gained popularity in OER world as well. Examples are the MIT iCampus Outreach Initiative (Microsoft) and Stanford for iTunes (Apple).

Institutional Model – this model can be seen as a form of the sponsorship model where

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[17] http://elgg.org/ (last visited: 01.04.2012)
[18] http://www.lamsinternational.com/ (last visited: 01.04.2012)

the institution doesn't just stand behind the financial backup but also takes the responsibility for the OER initiative. MIT's OpenCourseWare is probably the most well-known example of this model. The university has a regular funding program for this project in its budget and justifies it as part of its organizational mission (Downes, 2007).

Governmental Model – this is the case where government agencies directly support the initiatives. They also can be international agencies like the United Nations programs. An example is the SchoolNet project in Canada (Downes, 2007).

Partnerships and Exchanges – is not exactly a funding or financing model but rather a contribution to the support of projects through the help from partners. This works by exchanging highly qualified expertise and resources with partners or even by supporting them with technical issues like online web space. Examples that can be mentioned in this case are the Memorial University of New Foundland and the Federal University of Ceara UFC in Brazil (Downes, 2007).

Classic Advertising – not without reason advertising was left for the end of the list. This is a sensible topic where open source and online advertisement tend not to mix, like Paul Stacy says (Stacy, 2012). He explains this tacit understanding that education should be pure and not unduly influenced by something crass as advertising. But this might not be the case for long as there are already companies like Udemy[19] which have built a platform for online courses using video, PowerPoint, PDFs, audio and ZIP files. Some of the courses are for free and other charge in a range from $5 to $250. Udemy in cooperation with Facebook features advertising and takes a percentage out of each course fee. Even though this is not the general case of OER where anybody must have access to everything and be able to copy redistribute and change it, this is a step which might bring change into the field.

Another model variation which might be interesting to talk about in this master thesis is the *CroudFunding* alternative. Julia Kaltenbeck examined this model in her master project with the title "Crowdfunding and Social Payments in context with Open Educational Resources". She recons that *CrowdFunding* in its classical profile belongs to the Membership Model, but *CrowdDonating* as a *CrowdFunding* derivate is appointed to the Donation Model. To facilitate the concept of this hierarchy figure 6 shows the *CrowdSourcing* structure (Kaltenbeck, 2011).

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[19] http://www.udemy.com/ (last visited: 01.04.2012)
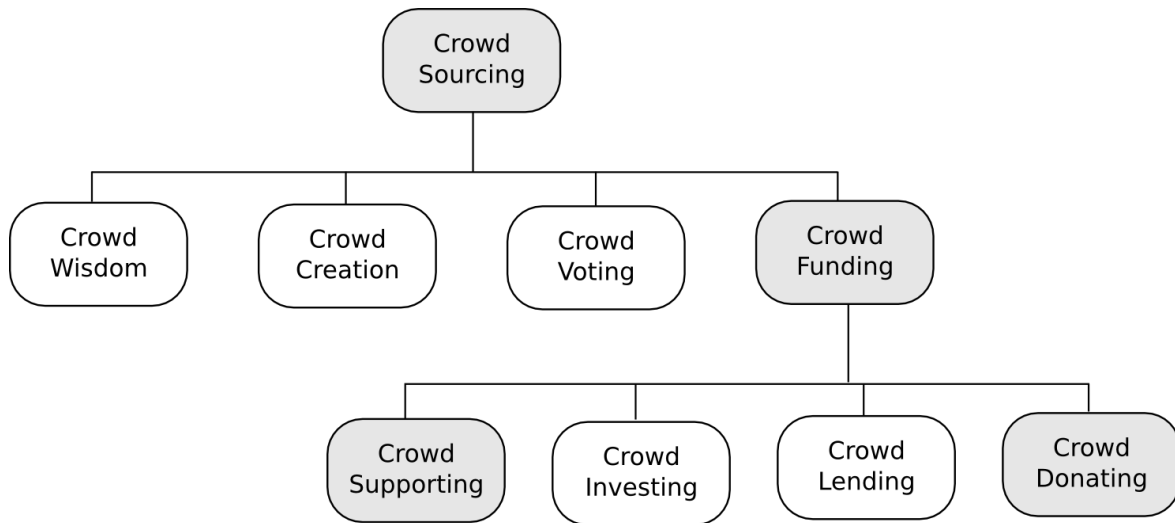
Figure 6: CrowdSourcing and CrowdFunding structure (Kaltenbeck, 2011)

Crowd sourcing is a concept where many individuals engage into a common activity. Funding within this notion is a variation where many people gather a sum of money together to reach a common goal. Interesting is to mention that this is an all-or-nothing principle. The initiator sets the goals at the beginning of the campaign and if the monetary goal is not reached the project is set to stand by and the money is returned back to the funder. Crowd Funding for an OER project would be associated with the *supporting* derivate which fits to the *membership model* in the funding models explained by Downes. The donating variation belongs to the Donation Model. Examples for this case are *SmartHistory*[20] which is a popular example for Crowdfunding in OER (Kaltenbeck, 2011, p. 77ff).

Now it is time to give a quick explanation about where does this project belong to. Even though this is a topic for the following chapters where the model is going to be explained in details, it can be revealed that the model the plugin tries to incorporate to the value of the OER project is an alternative way which provides the user with the choice to independently pay for extra services, if he/she wishes to do so. Therefore this model is associated with the *Conversion Model*.

1.7 Technical Models

Besides the financial obstacle, the technical issue is key to the sustainability of the project. By rising financial support, the technological development has driven the concept of "learning objects" as sharable and reusable e-learning resources which would help reduce

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[20] http://smarthistory.org (last visited: 01.04.2012)

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the costs of production. This implies a set of design requirement for these objects. So Friesen (2001) suggests that OER must be

- Discoverable

- Modular

- Interoperable

(Downes, 2007, p. 36)

There are two technical models which have been subject to considerable discussion over the years.

- *First model (Free use)* - this model implies that the objects are used locally and as they are, without any modifications by other parties. Briefly it consists of a model where the user compiles a collection of many objects.

- *Second model* – allows the users to download, edit, adapt, and send the objects back to the repository for other possible refinement. This includes transitions as part of the adaption which is not part of the first model.

Another concern is the access model certain parties have in order to interact with the resources. OERs are mostly shared and maintained on open source framework called repositories which allow version control and other configurations possibilities like:

- Database based storage

- The ability to let them be downloaded and adapted

- A central index of resources which allows browsing

- Dynamic courseware implying that changed objects will be represented in snapshot like version to be downloaded.

- The index will include full history and the possibility to comment and give feedback.

(Downes, 2007, p. 36)

1.8 Legal aspects and standardizing

The management of OER repositories, eLearning systems or communities is a big challenge and crucial issue for OER initiatives. The biggest concern of all is the time needed to prepare some material in order for it to be ready for acceptance in the database. First the quality has to comply with a set of criteria, like i.e. the document should fit the form of peer review, citation formats and others. To assure this happens, there are several steps that need to be taken like copyright checking, ethical guidelines, article category and formal structure.

After publishing the article, there are a variety of licenses with different characteristics to protect the intellectual knowledge. Licenses regulate the propagation and editing rights of the material, depending on the chosen license. Most OER initiatives implement the Creative-Common[21] License (e-teaching@org, 2011).
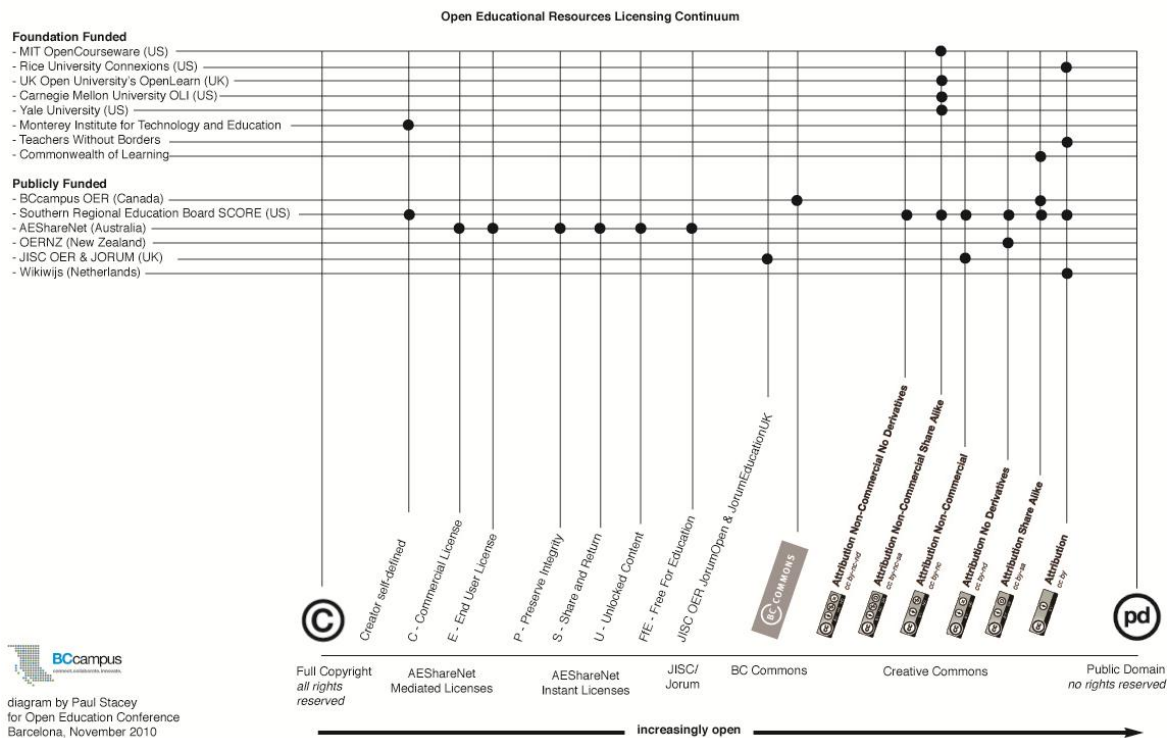
Figure 7: OER licensing examples (Stacey, 2010)

In figure 7 there are some examples of license endorsements from different OER projects.

At the bottom are the license types. The far left is a full copyrighted license and the opposite side is the public domain where no copyrights at all are assigned to the content. Interesting is to note that there are no fully open OER initiatives. None of the listed examples is placed in the public domain area (Stacey, 2010). This behavior is going to be analyzed in the discussion chapter where the possibility to review studies about the opinion of other authors is also included in the topic.

Another concern for the interoperability of the system are the interchangeable formats. To allow other peers editing your materials, some standard documents formats are needed i.e. ODF, HTML, SVG or RTF instead of PDF or Flash. Moreover the equipment of these learning materials with correct metadata is a big problem which has not got yet a satisfying solution. Mostly because the metadata cannot be fully automated in order to reach a certain level of quality (e-teaching@org, 2011).

Standardization is a topic which brings many benefits to the system. The interoperability of data, services and software bring large cost and time benefits. Since 1994 a standardization of "Learning Objects Metadata" is in process. The most popular ones are ARIADNE[22], IEEE[23], LTSCS/LOM, SCORM[24] and IMS (e-teaching@org, 2011).

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[22] http://www.e-teaching.org/glossar/ariadne (last visited: 01.04.2012)
[23] http://www.e-teaching.org/glossar/ieee (last visited: 01.04.2012)
[24] http://www.e-teaching.org/glossar/scorm (last visited: 01.04.2012)

2   Current Technologies

This chapter is focused on discussing about the technologies that support the development and maintenance of open access journals in particular but also open educational resources in general. An important topic is the possibility to *print on demand* the desired material. Following will introduce and evaluate different providers with different models of operation. From those which offer just publishing and managing services, to the providers which offer the whole framework that allows administrators to have free hand over their data. Interesting for this chapter is the way they render the data and the amount of functionality they give users within the framework or in cooperation with other specialized tools. Later on this chapter will introduce and discuss about *print on demand* as a technology and its characteristics.

2.1   Flat World Knowledge

The reviewing case study starts with Flat World Knowledge (FWK) as one of the most popular and fastest growing companies in the business of OER and print-on-demand. Flat World Knowledge (FWK) is a new venture-capital-backed textbook company which is profit oriented. But unlike other traditional textbook publishers they publish textbooks online entirely for free and at the same time offering a black-and-white professionally formatted version on average with a price 80% less than college textbook (Forte, 2010). It also charges for an offline version of the book in different formats like PDF, mobi or epub. FWK's model was adopted by over 500 unique colleges and universities in America within its first business year. The material was endorsed by many educators which also contributed to the improvement of the initial version. This way FWK reached a level of control over textbook content which was reflected to instructors and curriculum developers that also are able to edit and adopt their own version of the material. This was a big change which brought the possibility of printing books instantaneously by students. FWK also builds partnerships with other OER projects offering their learning objects to a broader public and acting this ways as a meta-index. (Forte, 2010). One similar example is the collaboration with MIT's OpenCoureWare project. As FWK is making profit out of this collaboration they agreed with MIT to pay a portion of the sales from the digital or printed versions of their books (Carson, 2012). Figure 8 shows a snapshot of FWK's main page to give an impression of how they organized their look and feel. As a commercial company it puts great value to the usability of the system. Compared with the others systems that were analyzed, it has the most elaborate and user-friendly interface as well as integrated functionalities.

Figure 8: Flat World Knowledge website

FWK doesn't just act as an index for OERs but also offers different collaboration features.

A professor can sign up for a course and moreover he or she can adopt the book online and make it public instantly. Some of the features available for educators are:

- Add / Edit / Delete content

- Reorder the table of contents

- Upload extra materials

- Offer discussion forums

- Create exercises at the end of the chapter

Students can access the book from the customized direct link or if they don't know it, they can browse or search at FWK for the specific course held by their professor and sign up for it. Afterwards they can view it online for free with an enhanced book reader which allows a variety of multimedia formats or if they are willing to pay, FWK offers

- Full color textbook

- Black & White Textbook

- Print it yourself Textbook (PDF format)

- eBook for mobile devices

- Audio book

Readers can access the books online without any requirement for passwords logins or other restrictions.

A problem might rise when too many changes are made by educators and the book writer(s) bring up a new version of the book. Even though FWK uses version control, the merge process would not be effortless.

FWK also offers for students supplementary services such as:

- *Study Aid Package* – which offers the possibility to buy study aids such as flashcards, practice quizzes, and audio study guides

- *Flyx Online Assessments* – an online feedback tool for homework and quizzes.

- *Atlas Black* - is a guide on how to navigate the college career. It basically councils on how to build a successful program.

Figure 9 shows the search results for a random entry like "chemistry". Currently there are 19 matches of books about this topic. Students can also search for educator, institutions or ISBN. On the left area there is information about the professor and institution. The middle section contains information about the book and original author. On the right side there is the price list for the desired format.

Figure 9: Flat World Knowledge search panel

2.2 Open Access Publications

Open Access strategy stands for the free access to knowledge for the user. It has a publication process which undergoes a peer-review like many other commercial journals. It is focused into the publication of scientific journals giving the publisher two ways of going through it. (OpenAccess, 2012)

- **Golden Way**

    o Releasing with Open-Access-Publishers respectively Open-Access-Journals which were financed in advance through the writer (i.e. BioMed[25] Central) or publicly funded (i.e. Digital Peer Publishing Initiative DIPP [26]) (OpenAccess, 2012)

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[25] http://www.biomedcentral.com/ (last visited: 01.04.2012)
[26] http://www.dipp.nrw.de/ (last visited: 01.04.2012)

o Simultaneous publishing printed textbook (commercial) and electronically for free in OA journals and universities. (OpenAccess, 2012)

- **Green Way** – is offering an already published and reviewed article for free in private archives or mostly in institutions like i.e. universities (e.V, 2007).

The main page of open access (www.open-access.net) offers information about the whole philosophy as well as details about repositories and archives. It works like a central for different archives sorted by topic. For an archive to be included to the official OA it has to subscribe to open-access in order to be added to the list. Because everybody can download and install the open access framework software[27], the publishers have to undergo a

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[27] http://sourceforge.net/projects/openaccess/ (last visited: 01.04.2012)

certification (DINI certification[28]) to assure there are no legal issues which could interfere with copyrights (OpenAccess, 2012).

The Journal of Object Technology

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The Journal of Object Technology (JOT) is a peer-reviewed, free and open-access journal dedicated to the timely publication of previously unpublished research articles, surveys, tutorials, and technical notes on all aspects of object technology.

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- Oscar Nierstrasz, JOT needs you!, HTML, DOI.

Special section on Formal Techniques for Java-like Programs

Editorial

- Frank Piessens, Bart Jacobs, Gary T. Leavens, Special Section on Formal Techniques for Java-like Programs, HTML, DOI.

Articles

- Giovanni Lagorio, Marco Servetto, Strong exception-safety for checked and unchecked exceptions, pp. 1:1-20, PDF, DOI.
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- CSOM/PL -- A Virtual Machine Product Line by Michael Haupt, Stefan Marr, Robert Hirschfeld http://t.co/GgDE3x6o 68 days ago
- RT @onierstrasz: The deadline for submitted research papers to #XP2012 is coming soon (Jan 3)! http://t.co/01EcRbJ1 77 days ago

Figure 11: Open Access repository from ETH Zürich (www.jot.fm)

Figure 11 shows the repository about computer science hosted by ETH Zürich. The

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[28] http://open-access.net/de_en/useful_information_for/repository_operators/dini_certification/#c1312 (last visited: 01.04.2012)

website offers the possibility to download articles in different formats like HTML or PDF and also the according metadata in BiBTeX format.

2.2.1 OA Business Models

Open Access gives for free information to the end user. This means that other parties have to pay for the services. Independent libraries are seen as the medium to reach the goals and therefore generally don't pay contributions. So it's up to the publisher, research organizations etc. to take this financial burden. In case of self-archiving or subject-based repositories (Green way) the authors don't usually get charged. This implies that publishing in a journal or with an OA publisher (the golden way) might lead to publications fees. Studies have reckoned that the majority of OA journals do not charge their authors for publishing. Instead they chose out of different models which are going to be discussed below (OpenAccess-business-models, 2012).

- *Author pays* – the author pays at the beginning of the process the full publication fee. This is also known as article-processing charge (APC).

- *Research funder subsidies* – the research funder subsidies the scientist or scholar which was part of a project to publish the results.

- *Institutional membership* – institutions like universities or research organizations can become members to OA so that they can get financed for their members.

- *Publishing support fund* – through a fund conceived for publications and research, institutions give back the paid amount by their members to publish.

- *Hybrid business model* – this model finances the project through a mixture of subscription and publication fees. This model has become popular for commercial publishers as well. Springer Verlag offers since 2004 the possibility to publish your article online for a fee of 3000$. HighWire[29] Press is an example for such model.

- *Community-fee model* – members of a community interested in the journal gather funds to finance the project. In this case the costs are minimal for each member because spread over many members and authors.

- *Institutional subsidies* – Institutions like universities archive the repository under their infrastructure and take responsibility for the costs. This is a common case where the materials are also offered as a Print-on-Demand choice.

- *Combined model* – when applying this model the publisher uses combination of the above models.

- *Consortium business model*: the SCOAP3 initiative - Sponsoring Consortium for Open Access Publishing in Particle Physics is an association of research

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[29] http://highwire.stanford.edu/ (last visited: 01.04.2012)

laboratories, scientific societies and libraries. "Its aim is the successive conversion of the leading journals in the field of high energy physics (HEP) to OA."

- *Hybrid publishing as a publishing model for monographs* – hybrid publishing means alongside the online version also offering a printed version. This model has proved very successful for monographs which get a higher visibility and distribution rate by the online version.

- *Other financing options* – other funding options can be cross-finance publication using donations and other option discussed in the chapter about business models for OER.

(OpenAccess-business-models, 2012)

2.2.2 Pros and Cons

Below there are some arguments about the advantages and disadvantages for publishing with OpenAccess.

Arguments in favor of Open Access
- Higher visibility and citation rates
- Quick and free access to information
- Good findability via search engines and reference services
- All the benefits of digital documents
- Improved information supply and a way out of the serials crisis
- Promotes international and inter-disciplinary cooperation
- Greater research efficiency through early discussion of findings
- Authors retain exploitation rights
- Open access to publicly-funded research results
- Long-term document availability
- Benefits in networked, IT-supported work environments
- Early establishment of priority

Reservations about Open Access
- Reservations about quality control
- Findability issues
- Long-term storage of digital documents
- Reservations about authenticity of documents
- Legal concerns
- Financeability of the author-pays model
- Concerns regarding allocation of publishing funds and conflicts of interest
- Worries that self-archiving is time consuming
- Open Access: a challenge to non-profit publishers
- Impossibility of selecting target groups for information

(OpenAccess-pros-cons, 2012)

2.3 DPubS (Digital Publishing System)

DPubS (Digital Publishing System) is another open-source software system which enables the organization, presentation, and delivery of scholarly journals, monographs, conference proceedings, and other common and evolving means of academic discourse.

The system was developed to support many publishing strategies in order to meet the requirements of as many publishers as possible. It does this by offering a customizable workflow. Even the presentation of a single publication can be individually adapted giving the opportunity for branding. Publishers can also activate access control in order to support subscription, open-access or pay-per-view. Its structure is designed to be scalable and to support various publishing environments. Since version 2.1 DPubS supports manuscript management and peer review that allow editors to collect submission, initiate peer review processes and more (DPubS, 2012).

Some characteristics which distinguish DPubS from other similar systems (after DPubS's official web site)

- It offers an all in one solution that enables publication, resource discovery, and delivery of journal, monographic, and grey literature with the same technology environment

- Has very good scaling capabilities to support an expanding number and variety of publications

- A library-developed tool, designed with an understanding of sustainability and preservation issues, to support change in the scholarly communication environment

- Supports the building of a library-supported publishing program and facilitates cooperation with university presses

- Its modular architecture makes DPubS flexible and extensible

- Accommodates both open access and e-commerce to support different business models

(DPubS, 2012)

Figure 12 shows a snapshot from a DPubS repository to give an overview of its interface.

Figure 12: DPubS issue preview projecteuclid[30]

DPubS has a simple interface for quick accessing information about an issue. On the top right there are functions for accessing specific information about the issue. The top menu enables the user to navigate through the repository. There is also a search and browse functionality where the user can search for full text, subject, abstract, title or authors. The right block menu offers a convenient context sensitive way of accessing important information about the current page.

Figure 13 shows how the framework offers the content for access. It gives the possibility to view the article with a PDF reader. There is not incorporated document viewer. The abstract of the document is also available next to it for a quick preview.

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[30] http://projecteuclid.org/ (last visited: 01.04.2012)

Figure 13: DPubS preview, access to articles[31]

2.4 DPubS summary

DPubS is a very purpose oriented framework. It offers an intelligible user interface with handy function, but lacks on some other services like an enhanced viewer for the user or other user oriented functionalities.

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http://projecteuclid.org/DPubS?service=UI&version=1.0&verb=Display&page=toc&handle=euclid.adjm/1327465811 (last visited: 01.04.2012)

2.5 Open Journal Systems (OJS)

OJS is the framework which was chosen to publish both *L3T* and *bildungsforschung*[32] hence for the development of the print-on-demand Plugin and this thesis. It is going to be explained in details together with the reason why this was the best suitable platform for publishing OER material like the case studies and how does it work.

2.5.1 Description

OJS is developed by Public Knowledge Project (PKP) which "*is a research and development initiative directed toward improving the scholarly and public quality of academic research through the development of innovative online publishing and knowledge-sharing environments.*" (Willinsky, Stranack, Smecher, & MacGregor, 2010).

It started in 1998 with the development of different Open Software Projects for managing, publishing and indexing journals and conferences as well as Open Archives:

- Open Journal Systems

- Open Conference Systems

- Open Monograph Press

PKP describes OJS in its user guide as follows:

> "*Open Journal Systems (OJS) is an open source solution to managing and publishing scholarly journals online. It is a highly flexible editor-operated journal management and publishing system that can be downloaded for free and installed on a local web server. It has been designed to reduce the time and energy devoted to the clerical and managerial tasks associated with editing a journal, while improving the record-keeping and efficiency of editorial processes. It seeks to improve the scholarly and public quality of journal publishing through a number of innovations, from making journal policies more transparent to improving indexing.*" (Willinsky, Stranack, Smecher, & MacGregor, 2010, p. 2)

OJS offers a huge variety of features due to it extendable architecture. By building a Plugin oriented system it gave the possibility to the community to contribute to the framework itself. Now there are many standard plugins which are included in the installation back but were started as individual projects. Some of the most important features that characterize OJS are listed below:

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[32] http://bildungsforschung.org/ (last visited: 01.04.2012)

- Local installation and full control over the data and the code

- Editors can change and configure requirements, sections, review processes, etc.

- It offers online submission, double-blind review and management of all content

- Subscription module with delayed open access and non-open access options

- Well formatted index of content

- Supporting tools for reading and editing

- Email notification and commenting ability for readers

- Context-sensitive online help support

- Payment modules for fees/donations

(Willinsky, Stranack, Smecher, & MacGregor, 2010)

2.5.2 Usability

Now it is time to analyze OJS from the reader's point of view. Like Open Access it offers to the user a straightforward access to the content, in contrast to Flat World Knowledge. It also gives access to a local search engine to search for keywords or other parameters through the articles. Like Flat World Knowledge on the other hand it offers an account based user management system where users can personalize their area and have other functions in disposition, like access to commercial material for instance.

Figure 14 shows an example of a customized repository taken from bildungsforschung.org. On the top menu there are functions such as login, register or announcements. The right panel offers access to other functions which can have a more complex interface such as news feed or other plugins. All actions are placed at the edge of the web site leaving enough space for the primary purpose of reading. This feature has its advantages and disadvantages. For example complex user interfaces are not possible within the small area proposed for the block plugin. Like the print-on-demand plugin, which offers an interactive way of choosing the desired articles, bigger modules have to implement other techniques of visualization. Another example for the sparse space within the block frame is the search function. OJS implemented this feature with a main page which is blended in from the top menu.

Someone perceives it as an advantage where the plugins on the right block are just an

additional feature and the small space intends to preserve the uniformity of the whole web site. But some other designers might think of it as a restriction which forces users to follow other links and open other pages, losing the content they intended to read.

The right block is totally plugin oriented where the order and appearance is a matter of taste.

OJS plugins are going to be presented in a later section in details but important to mention in this section is one of these powerful plug-ins which enables OJS to offer an overall very attracting publication and reading framework, the *reading tools*. This plugin is visible in the figure 15.

Figure 15: OJS Reading tools Source: (Willinsky, Stranack, Smecher, & MacGregor, 2010)

Functions of *Reading Tools*

Reading Tools help users take context specific actions regarding the specific article they are focused on. The tools show on the right side of the web page offering following functionalities:

- *Abstract* – shows the abstract of this article in a separate window

- *Print this article* – give a print version for this article

- *Indexing metadata* – shows 15 descriptive elements based on Dublin Core. Not just for further information for the user, but also for harvesting and porting.

- *How to cite item* – helps exporting basic citation data for bibliographic management software like *EndNoote*, *ProCite* and *Reference Manager*.

- *Review policy* – provides information about journal's policies for reviewing and receiving submission like i.e. if they are peer reviewed or open submission and other information about where it is indexed.

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(Kopak & Chiang, 2009)

In the HTML version of an article the tools facilitate the reader to look up words or sentences, highlight them and email this information to the author or a selected list of other readers. They can also feed it into search engines of *open access* databases and other resources which are grouped into categories such as Research Studies, Press and Media etc. Users are also able to access background information (OJS Help , 2012).

An examination of the system from the administrator's point of view brings these arguments to the topic:
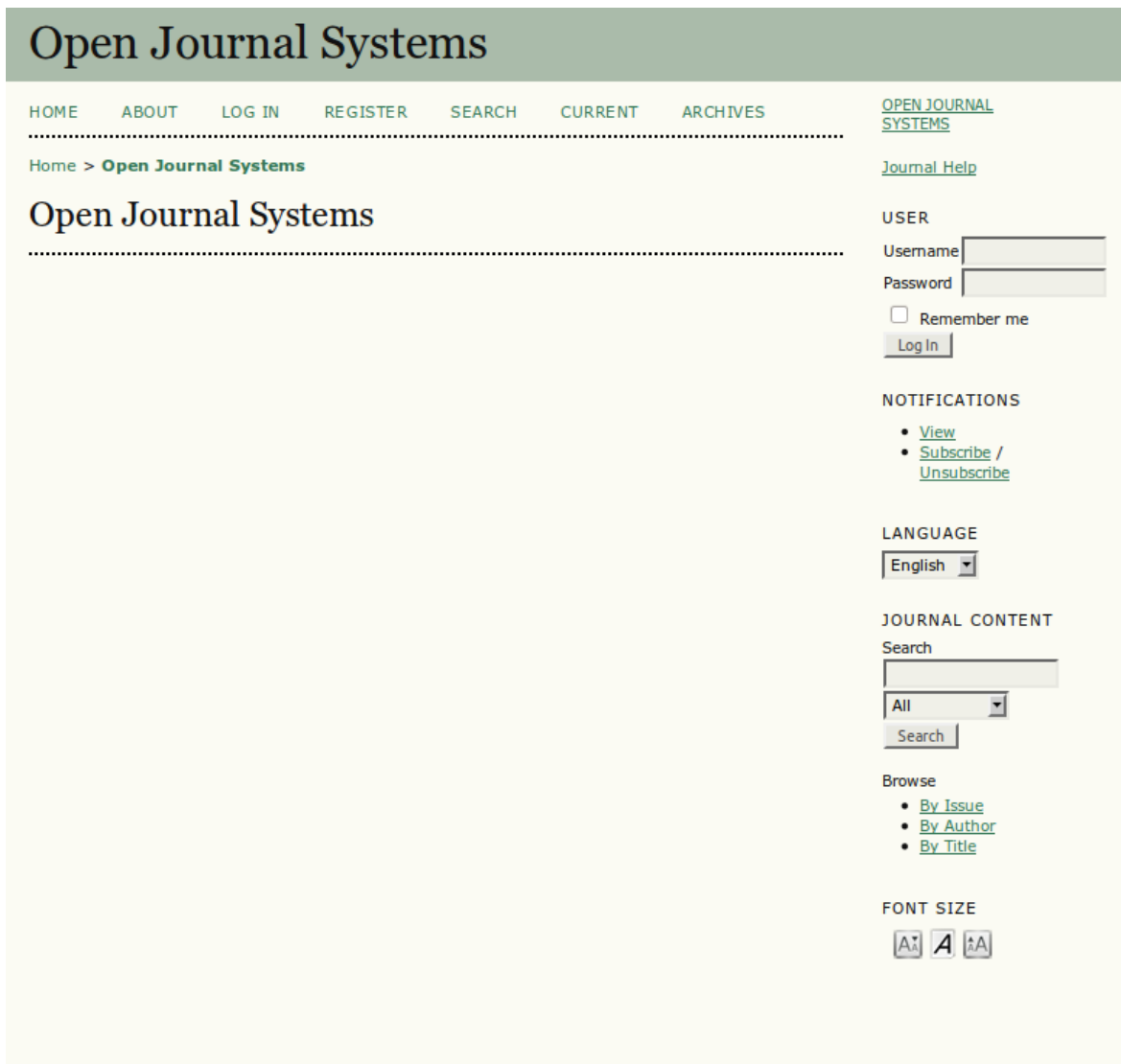
Figure 16: OJS new journal

After installation the framework shows a very simplicistic view. This gives space to a very

broad variety of changes that could be made starting from templates for the cascading style sheets, to the logo, plugins and many others. There are two levels of administration for the repository:

- **Website** – these are settings which apply to the website and can be inhered but customized by journals

- **Journals** – settings which apply to the specific journal like
    - Title
    - Description
    - Topic
    - Submission mechanisms
    - Access for users
    - Rights for editors and others

Figure 17 shows the first level of administration for the website hosting the journals.

Now the framework can be examined from the publisher's point of view. The publisher has the following options for customizing the framework.

- **Site settings** – these settings apply to the web site hosting all journals. Here administrators can find basic settings concerning the whole system like for example introducing the organization standing behind the project or any other general information.

- **Hosted Journals** – as the title reveals, OJS can host multiple journals under the same host. Reducing maintenance and installation costs. Every journal is independent from others and can be managed and configured separately.

- **Languages** – OJS comes with over 35 (20 pre-installed) language packs which can be downloaded and installed in a very simple way. Languages can be installed in the site settings and then configured for every journal independently. Unfortunately it is not possible for the user to change the language on runtime. The chosen language is static and only administrators can set it up.

- **Authentication Sources** – beside the normal username-password login, OJS offers the possibility to entangle login procedures with an LDAP database. This is a very convenient way for automatically authenticating users in the system and not asking for authentication every time they access the page.

Figure 18 shows the administration mask for a single journal. This view is offered joust for the journal manager and the settings are made available for all users. This means that there is no individualization possibility for single users. The administration is split into three areas:

- **Management Pages** which includes technical settings about the framework. Graphical user interface customization is also part of this section.

- **Users** offering functions to take care of user administration

- **Roles** matching the users with their engagement in the system

The level of configuration and the possibilities it offers are very important for the development of the plugin so some of the most important features according to OJS's user guide are going to be explained in details.
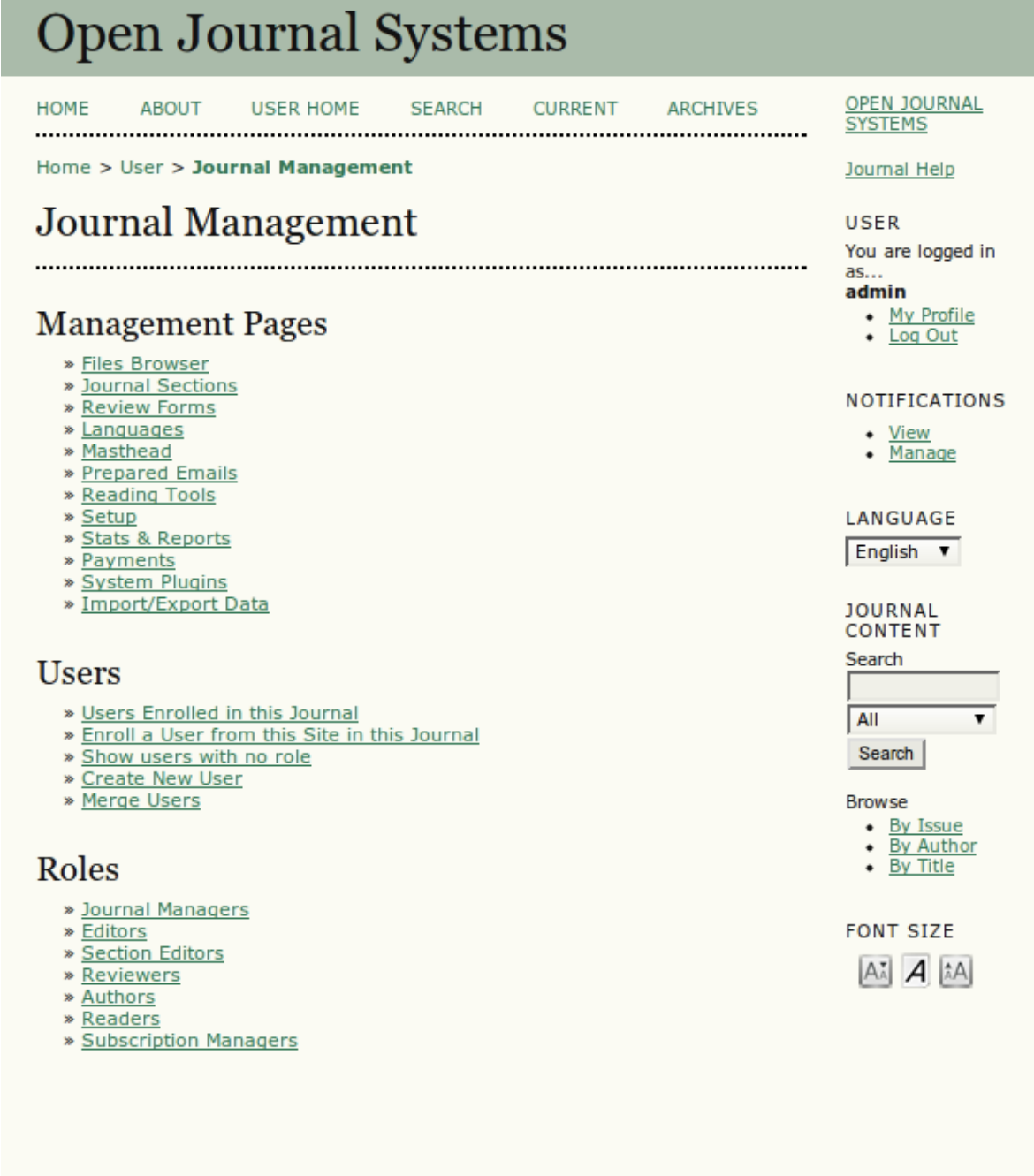
Figure 18: OJS Journal administration

File Browser

OJS offers a very convenient way of managing the resources at operating system level. It offers many operations like upload, copy, delete, move, rename etc. as if interacting with a file system.

This operation is reserved just for administrative facility only. Submissions go through another process which establishes all resources after completion (OJS Help , 2012).

Journal Sections

By creating sections, the administrator divides the resources in categories like

- Articles

- Book Reviews

- Research Notes

- Clinical Application

- Commentary

- Editorial

For each section there are a variety of settings which can be customized:

- A *Section Policy* could be created, which includes a policy statement with a description about the scope of the section and the type of submission sought.

- A specific *Review Form* can be created for each section

- Separate *Indexing the Contents* which doesn't always have to be the case, like for example job notices or conference announcements. The metadata will then be available for the search engine.

- *Enabling or disabling abstracts* for special articles like book reviews.

- *Configuring item identification*, this is useful for metadata exchange with external systems (i.e. OAI harvesting). The items can be configured to meet the requirements of other systems as well.

- *Restricting the contents* of a section in a way to meet the policy where users have other rights and privileges then those in other sections.

- *Hiding the section title* if it is desired.

- *About*. Information about the journal can be changed and even hidden if the section follows other rules.

(OJS Help , 2012)

Review Forms

OJS has a simple built-in review form which is ready to use. It has two fields, one for the editor-only text and the other for both Authors and Editors. A key feature of OJS is that this form can be extended with all necessary information which different publishers might need to supplement their custom review. It cannot just be done for the journal but also to create custom review workflows for each section if it is wished (OJS Help , 2012).

Languages

The system is translated in over 35 languages and its dynamic architecture allows the extension of more languages as well as adaption of the existing one. Each journal can select a default language different from others and main page (OJS Help , 2012).

Masthead

In OJS the *Masthead* can be defined in two ways

- Generating the editorial team using assigned editorial roles
  The information is generated using the editorial roles defined in the journal manager. In this case editors, section editors, layout editors, copyeditors and proofreaders will be listed

- Generating the editorial team using custom editorial team titles
  In case information is too general administrator can enable this option to create custom editorial team titles which will be listed in the masthead.

(OJS Help , 2012)

Payments

Even if OJS's philosophy is to support OER and other open movements there should be the possibility to use the system commercially if the publisher wants to. The administrator can enable the *Fee Payment Module* separately for each journal. It will keep track of users with premium accounts and display fee information in the *about* page. There are several options in customizing this module:

- **General Options**
  The options include turning the module on and off, the currency settings, and others.

- **Author fees**
  In this case individual fees for Article submissions, Fast-Track Reviews and Article Publications can be activated. The fees can also be adopted to follow the desired purpose.

- **Readers fees**
  Reader fees can be enabled for subscription or for single pay-to-read purchases.

- **General fees**
  These are the *association membership fee* payments and *donations* to the journals

These fee models are also discussed in details in chapter 1.6 Costs and revenue models.

Interesting for the plugin and the discussion about the payments are the payment methods. The journal manager has the option of activating the payment in two ways:

- **Manual Fee Payment**
  In this option the journal has to deliver the necessary data to allow the users to complete the transaction.

- **PayPal Fee Payment**
  If this option is selected the system must decide between a testing- or production-level URL to interact with PayPal's Instant Payment Notification (IPN)

(OJS Help , 2012)

Stats & Reports

Statistics & Reports provides useful information about the history of the journal's usage. This information gives detailed overview over the submissions and can be used to generate reports on a specific range of dates. There are four types of reports available:

Journal Report: Reports on all journal submissions in the given period.
Editor Report: Reports on submissions, grouped by Editor.
Review Report: Reports on submissions, grouped by Reviewer.
Section Report: Reports on submissions, grouped by Section.

(OJS Help , 2012)

Setup

Setting up the journal can be achieved by working through five steps, which need to be filled in templates and configuring the management section of the journal. It is not necessary to fill all information as there is the possibility to edit them in a later time.

While setting up following information is necessary to complete all steps:

- Principal contact for the journal

- Technical contact

- Scope and Focus Statement for the journal

- Journal Sections and policies

- Author Guidelines

- Submission requirements for authors

- Indexing elements and appropriate examples

- Peer Review Policy

- Reviewer Guidelines

- Copyright Policy

- Open Access Policy

- Editorial Board/Review Board

- Subscription Policies

- Use of layout editors, copyeditors, and/or proofreaders

(OJS Help , 2012)

Subscriptions

The subscription component allows users to access materials on a subscription base. There are two types of subscriptions:

- *Individual Subscriptions* for individual users. It requires users to login into the journal to validate their subscription and access commercial content.

- *Institutional Subscription* for a group of users belonging to an institution. Their access is validated through the institutions IP address or domain.

Users which are registered as having the following roles are not required to pay and always have free access to the journal as if they were subscribers.

- Journal Manager

- Editor

- Section Editor

- Layout Editor

- Copyeditor

- Proofreader

(OJS Help , 2012)

System Plugins

Due to its very extendable architecture OJS offers the possibility to develop customized plugins which bind into OJS without having to change the original structure. Many core features, as it is to be seen later on, are implemented on a plugin concept. This study occupies itself with plug-ins in depth during the following chapter (OJS Help , 2012).

Import/Export Data

One important role these plugins take is the extraction and injection of data. There are five plug-in implementing these behavior which are shipped with OJS. They fill different functions depending on the data and format they import/export:

- *Users XML* Plugin
  Used to import/export users and their roles

- *Erudite Article* Export Plugin
  This plugin enables full-text indexing for a single-article export.

- *Articles & Issues XML* Plugin
  It enables the primary option for batch import export for importing and exporting (both with extended metadata)

  - Single Articles

  - Multiple Articles

  - Single Issues

  - Multiple Issues

- *PubMed XML Export* Plugin
  It helps generate bibliographic information for articles in the current issue in PubMed[33] standard.

- *Crossref XML Export* Plugin
  This plugin enables an import/export function to generate metadata information for articles and issues for indexing in CrossRef[34].

(OJS Help , 2012)

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[33] http://www.ncbi.nlm.nih.gov/entrez/query/static/spec.html (last visited: 01.04.2012)
[34] http://www.crossref.org/schema (last visited: 01.04.2012)

2.6   Print On Demand

When speaking about *Print-on-Demand* (PoD) the term mostly denotes the technology based on digital printing that enables books to be printed even in small amounts. Printing is first processed after the user has initiated the request and no stocks are built beforehand. Its meaning has evolved recently and now it also includes *Self-Publishing* as well. *Self-Publishing* stands for the possibility to bring your books directly to the market without a traditional publisher. Most print-on-demand services have connections to wholesalers so that they can get access to book shops. This is a favorable situation because the distribution works like the traditional publishing model with the only difference of omitting the publisher from the chain. Also interesting is the collaboration between online book shops like amazon for instance and Print-On-Demand. The amount of orders amazon would give by the end of the day brings the PoD printing costs similar to the traditional bulk printing (Kirschner, 2003, p. 57).

2.6.1   Amazon Print-on-Demand

Indeed amazon has recognized this trend and offers this service under the name *Amazon Print on Demand*. Amazon PoD is a program that offers publishers a convenient way of selling their books through amazon. It has many advantages such as:

- Higher sell rates – amazon is worldwide reachable and ships its products to many countries.

- Availability – The title will be available with the brand "In Stock"

- No Stock costs, no shipping costs – Books will be printed and shipped immediately so there is no need for stock. Also you do not need to ship the books from the printing facility to amazon.

- Marketing optimization - Better availability enables the automatic system to rate the book at a higher grade.

- No further cost – Amazon doesn't charge for the file setup since December 2010 and has no monthly costs.

- Book preview – a book preview option offers the possibility to get a small preview of the book before buying

Amazons conditions are:

- 50% from the suggested retail price (40% for technical textbooks)
- 5% for additional marketing

- Print costs

- Pay-out every 120 days

An example calculation would look like in table 2:

	29,90 €	Gross price (set from the publisher)
-	**1,96 €**	Value added tax (VAT)
=	**27,94 €**	Price after tax
	1,40 €	5% from marketing campaign
	13,97 €	50% amazon's share
	4,20 €	Print costs
	0 €	Stock, Shipping, Digital administration
=	**8,37 €**	Publishers share

Table 2: Amazon PoD costs and revenue example

Amazon accepts this kind of collaboration with a minimum number of 10 titles, which could be a disadvantage for many authors or group of authors writing OER material which is supposed to be a single project. It also doesn't take part in the reviewing process leaving it to the publisher (Amazon, 2012).

2.6.2 epubli Print-on-Demand

Epubli is a platform for Print-on-Demand and Self-Publishing. Users can print their contents or publish their books in digital or printed form. The author keeps the copyright and has a flexible contract termination choice of one month. Books and eBooks are traded at epubli Book-shop, Bookseller, Amazon and Apple. In contrast to Amazon's Print on Demand, authors don't have to offer a minimum amount of titles. Basically everyone who wants to get his/her work published can do so. The website functionalities are for free, also publishing in epubli Book-Shop without an ISBN. If the author wishes to order an ISBN, it costs 19,95 €/issue (epubli-About, 2012).

Epubli is the print-on-demand partner for this master thesis. Due to this fact it is interesting to show some main features epubli offers to the customers. Other aspects designed for the partner interface are discussed in details in the following chapter.

Figure 19 shows the main page of epubli's website. The users have the possibility to print a book immediately, to publish it or to search through epubli's repository for interesting books to buy. The main page serves as Print-on-Demand, Self-Publishing and a book store at the same time covering three key business areas of book publishing.
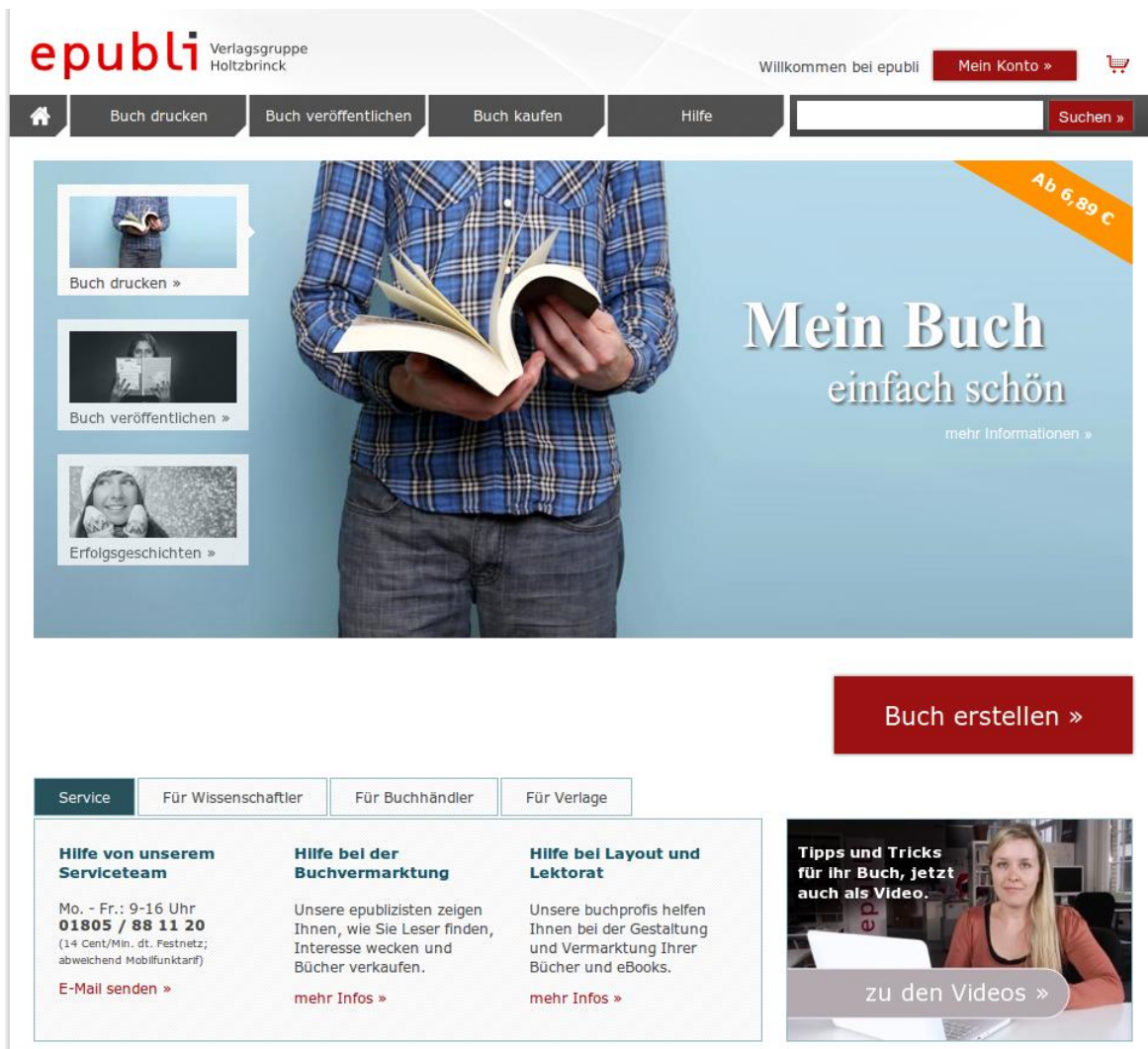
Figure 19: epubli main page preview

The client interface, which will be an important step during the plugin's workflow, is shown in figure 20. This part of the framework is accessible without registration which is a very convenient feature. It is not shared by many other providers which require registration or clicking through many options to reach. Any order of printing, buying and publishing requires registration. At the top of the printing interface there are the parameters which can be adopted:

- **Title** – this is the title of the book which is going to be printed on the front cover
- **Author** – is the name of the author printed on the side (middle of the cover).
- **Cover design** – epubli offers different colored designs for the cover which don't affect the price.
- **Surface** – the surface can be *shiny* or *dim*
- **Format** – offers a broad variety of formats starting from, pocketbook to DIN A6,

DIN A5, DIN A4 and others in portrait or landscape orientation.
- **Binding** – there are four kinds of bindings: softcover, hardcover, ring binding or notebook
- **Paper** – offers five different kinds of paper changing in weight, color and type
- **Print content** – the choice of printing in black and white or color.

The cover can be uploaded separately for both front and back. This feature changes the costs so they need to be recalculated through the function "calculate cover" at the right bottom. If the cover exists within the PDF then the user can chose the first and last page to be the front and back cover. All changes are for the cover reflected instantaneously on left side and for the content on the right side of the screen. Users can also browse every page of the book through the previewer. Through this mechanism the user can check the print job before sending the order request. This is important in case, for example the user didn't know that the second page of the book the front cover's back-page is not printable and miscalculate the page order.

Figure 20: epubli client print interface

Uploads are accepted only in PDF format, but an instruction is available to help inexperienced users convert into this format. A maximum file size of 200 MB is set for upload. After having completed all these steps there is one last step before sending the request which is "save book". This requires the customer to login if she or he is not already and save the book project to his/her account where they can then send it for printing or access it another time. (Epubli, 2012)

2.6.3 Why Self-Publishing and Print-on-Demand?

There are several arguments in favor of why to use this relative new technique instead of going for the traditional printing and publishing. Some of those are:

- *Concentrate on Writing* – it is very difficult for young unknown authors to get a deal with big publishers.

- *Up to date content* – Even if you find a publisher, he/she will be profit-oriented and not interested in publishing small amounts due to minor corrections or changes. This takes the freedom away for which open educational resources where first conceived.

- *Time to shelf* – Even if the publisher agrees for new editions because of small changes to be printed in big scale, it will take up to a year before the book could be in the book shelves.

- *Freedom of information* – Print on Demand brings democracy into the publishing world by allowing anybody who wants to publish his/her documents to do so without worrying about discrimination, politics and other topics interfering with their enterprise.

(Kirschner, 2003, p. 2)

2.7 Recapitulation

This section will try to give a quick overview by comparing for the project interesting functionalities between the systems.

Criteria	Flat World Knowledge	Open Access	Open Journal Systems
Free Access	no	yes	yes
Personal instances of the system	no	yes	yes

Data are saved and provided in portable formats	no[35]	yes	yes
Enhanced reading tools	yes	no	yes
Expandable through self-development	no	no	yes
Centralized product information[36]	yes	yes	no
Print-on-Demand functionality	yes	no	yes[37]

Table 3: Publishing Frameworks Feature Summary

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[35] FWK offers just PDF and ePub formats to the clients.

[36] This denotes the possibility of creating a central hub for more products. OJS is a decentralized system in this case.

[37] With our plugin OJS is in now PoD capable

3 POD Plugin Development

Before starting to explain the plugin details it is first necessary to understand the architecture which supports it. Open Journal Systems in its current version 2.3 is written in object oriented PHP using Smarty Template System[38] for user interface abstraction. In its backend it supports most free SQL database management systems by abstracting database calls via the ADODB[39] database abstraction library (Smecher, 2011).

3.1 OJS Structure and Design

OJS's design pattern is very similar to Model-View-Controller (MVC) or Oracle's Enterprise Java Beans. It is structured for maintainability, flexibility and robustness. Starting from "front-end" to "back-end" the major categories are as follows:

Smarty templates: templates serving as a link between logics in PHP and HTML code. They are responsible for assembling HTML pages.

Page classes: receive requests from the user's web browser and delegates them to the appropriate classes which call the smarty templates.

Forms: are a mix of smarty templates and page classes which allow the creation of user forms.

Action classes: these classes are used by page classes to perform non-trivial processing for user requests.

Model classes: Representation of various system entities in PHP code.

Data Access Objects (DAO): provide utility functionalities for all database interactions such as select, update, insert, delete and many more.

Support classes: provide core functionalities such as language support and other external services.

Following diagram in figure 21 illustrates these components and their interfaces with each other.

---

[38] Smarty – PHP Template Engine - http://smarty.net/ (last visited: 01.04.2012)
[39] ADOdb Database Abstraction Library for PHP - http://adodb.sourceforge.net/ (last visited: 01.04.2012)
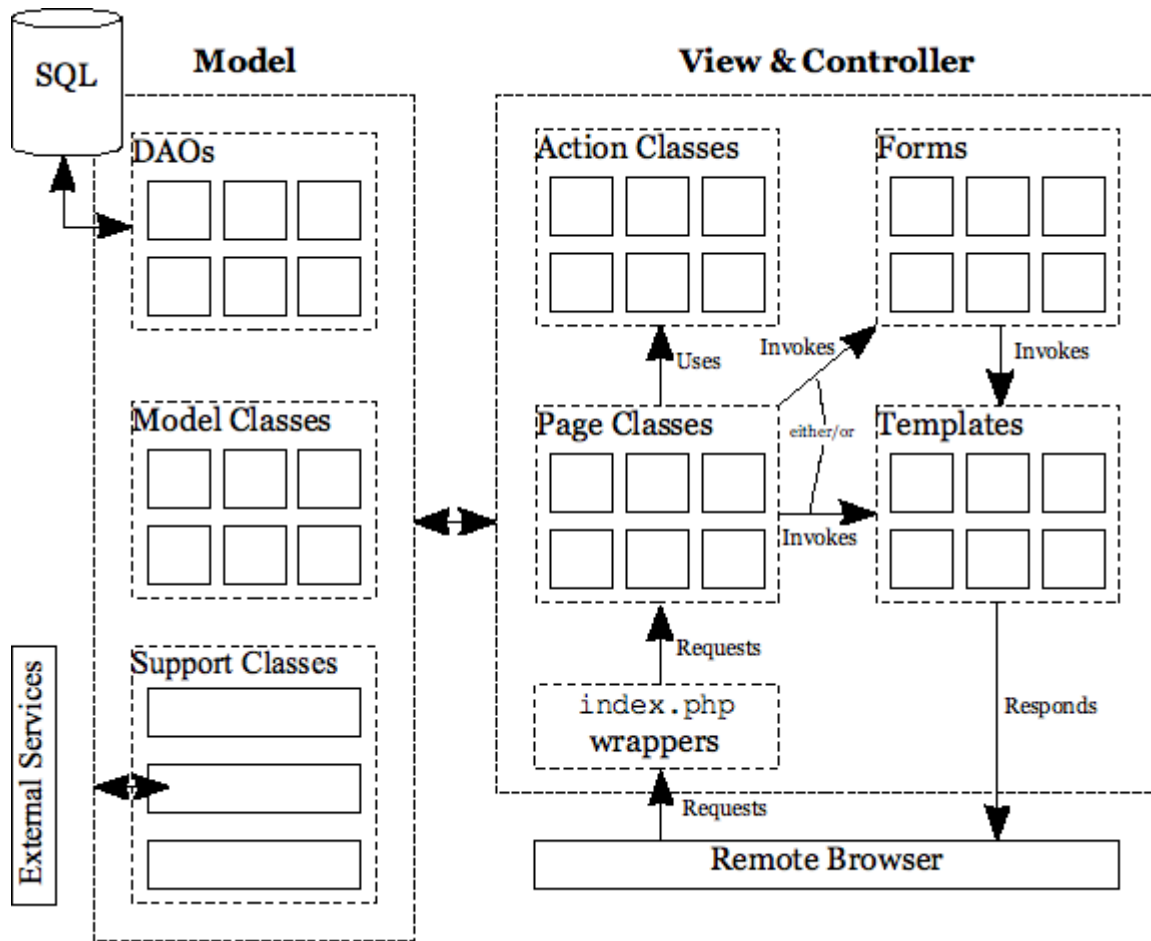
Figure 21: Open Journal Systems MVC Diagram (Smecher, 2011)

OJS has an established architecture which reflects its implementation. Most of the necessary modules concerning system calls prerequisite for the developed plugin were already available to use. Important for the implementation of this plugin are mostly *page classes, action classes, forms* and *templates*. The rest of the categories were adopted from the standard implementation leaving space for a better integration as it uses the very core interfaces and does not violate the MVC principle.

3.1.1 Page Classes

After the index file has recognized the specified parameters from the https request, which action the user intended to execute, it passes control to the appropriate page class, which together with the *Action Classes* represent the controller part of the system. All *Page Classes* are located in the *pages* directory within the OJS installation. Beyond receiving requests and calling the templates to generate a view, the page classes are also responsible for ensuring that user requests are valid and authentication requirements are met (Smecher, 2011).

3.1.2 Templates

Smarty templates are the last step before the response is finalized. It helps to generate HTML code dynamically with respect to the assigned parameters from page and action classes.

PHP Code
```php
<?php
...
$templateMgr->assign('article','This is...');
$templateMgr->display('template.tpl');
...
?>
```

Template Code
(file: template.tpl)
```
<div class="fileNames">
{$article->getLocalizedFileName()}
</div>
```

HTML Code
```
<div class="fileNames">
This is a test article!
</div>
```
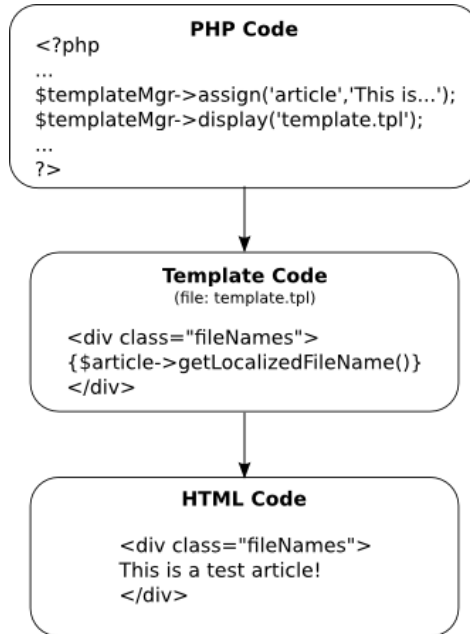
Figure 22: Interconnection between PHP Smarty Templates and HTML

From the figure 22 it is possible to see how the controller assigns template variables and then calls the according template, which results to an automatic response to the user. As the *man-in-the-middle* element, templates contain mixed code from similar PHP annotation and HTML tags. Of course the assignment of one article and its preview could be done from PHP as well, but the power of this concept lies in separating the logic layer from the presentation layer and still having broad control over the generation of dynamic pages. Using it with arrays or lists and many other types together or even with control flow operators such as *if*s and *loop*s, smarty templates give a very clean PHP code and a very understandable template structure. Templates can also call (include) other temples in the same way PHP includes other files. But more important it can also apply the inheritance approach that resembles object-oriented programming techniques, to manage complex tasks.

3.1.3 Forms

OJS Forms offer the possibility to quickly build complex forms with database support. It is compound out of two elements, the *view* and the *controller*.

- The *view* is a template consisting of a HTML form and with the attributes of the

model designed within the controller.

- The *controller* is an *action class* which accepts request and handles them on the predefined way. The controller also defines the model in a parameter declaration form.

The forms concept was used to implement the Plugin settings. By default block Plugins do not have settings so it was needed to implement the functionality which offered the persistence of user data (Smecher, 2011).

3.1.4 Action classes

Action classes are used by *page classes* for the validation of user requests, authentication and template setup. They are also a convenient way of keeping the logics separated between the page classes which filter the request and the action classes which are the following step of action (Smecher, 2011).

3.2 Implementation

Every OJS *page* and *plugin* implementation must have an *index.php* file acting as a router for the incoming requests. The mechanism is very simple and effective. The *pod* page for example declares all possible interfaces within the index file which looks like in figure 23

```
switch ($op) {
    case 'index':
    case 'current':
    case 'view':
    case 'printOnDemand':
    case 'downloadPOD':
    case 'showPodCart':
    case 'help':
    case 'archive':
        define('HANDLER_CLASS', 'PODHandler');
        import('pages.pod.PODHandler');
        break;
}
```

Figure 23: Index interface declaration

If one of the functions is selected then a new instance of the object *PODHandler* is created and the respective function executed. The most important function in this page class is *printOnDemand* which generates the material and forwards the user to the print-on-demand provider. Its content is shown in figure 24.

```
/**
 * This function creates a PDF file out of the articles within the parameters.
 * All parameters are included in the file plus the cover which is definded separately.
 * The hole file has a page counter which is divided by four. After successful execution
 * the user is redirected to the print-on-demand provider to continue with the purchase.
 */
function printOnDemand($args = null) {
    $this->validate(); // validate the paramters
    $this->setupTemplate(); // setup the template. just in case of error messages

    $templateMgr =& TemplateManager::getManager();
    $locale = Locale::getLocale();
    $templateMgr->assign('locale', $locale);

    $pdf = new PDFMerger;
    $cacheManager =& CacheManager::getManager();
    $path = $cacheManager->getFileCachePath();
    $randomFileName = $this->getRandomPDFFileName();
    $fullPath  = $path .'/'. $randomFileName.'.pdf';

    $numberOfArticles = Request::getUserVar('numberOfArticles');
    $articles = Request::getUserVar('Articles');

    //If no articles selected redirect to the entry point
    if(!$articles){
        Request::redirect(Request::getRequestedJournalPath());
    }

    //Retrieve physical path array from galleys
    $galleyArray = $this->getGalleysFromRequest($articles);

    //Generate the final PDF and return the path
    $fullPath = $this->buildPDF($pdf, $galleyArray);

    $pageNum = $this->getNumPagesPdf($fullPath);

    //chose the operator
    $pod_operator = Request::getUserVar('pod_operator');
    $tmp_op = $this->checkPodOperator($pod_operator);

    if($tmp_op != null ){
        // builds the full url out of the randon path and the current journal
        $randomDownloadAddess = $this->getFullURL($randomFileName);

        // this method inits the array with all necessary parameters and HMAC if charging is active
        $settingsArray = $this->getAllParametersWithHMAC($randomDownloadAddess, $pageNum);

        // serialize the parameters in order to get out of an array the URL
        $appendParameters = $this->serializeArrayForGET($settingsArray);

        // redirect the user with the complete parameter set to the provider
        $this->redirect($tmp_op.  $appendParameters);
    }else{
        $templateMgr->assign('errorMsg', 'pod.errorNoProvider');
        $templateMgr->display('pod/viewPrintPage.tpl');
    }
}
```

Figure 24: printOnDemand function implementation

The function retrieves the list of articles from the user request. It converts these articles into an array of objects in order to build the PDF file. Once the file has been generated, a unique random address is associated to the file. This path is along with other parameters packed together in the parameter list. Afterwards they are all hashed and the hash value is also included in the request. Finally the request is forwarded to the print-on-demand

provider in order to continue with customization and purchase.

This workflow doesn't generate a view from the plugin's side unless there has been an error and the template in the else section is executed. The template implementation is shown in figure 25.

```
{strip}
{include file="common/header.tpl"}
{/strip}

{if not $errorMsg}
    {include file="pod/viewPrint.tpl"}
    {include file="common/footer.tpl"}
{else}
    {$errorMsg}
{/if}
```

<div align="center">Figure 25: viewPringPage.tpl code preview</div>

Figure 25 represents a simple example of how PHP objects can be accessed in Smarty Templates allowing the view to build dynamic code.

3.3   OJS System Plugins

Plugin architecture delivers flexibility to expanding the system's core features. It makes it very convenient for participating developers to create powerful extensions without changing the built-in structure. OJS delivers the most popular plugins out of the box. But there is also a gallery[40] where enthusiast developers present their new plugins.
Depending on the fulfilled task, plugins are divided in categories. These categories are not just organizational but also have structural function as well. For example block plugins can be bound to the right block of the interface etc. The categories are:

Authorization Plugins

Authorization Plugins allow users to authenticate through different systems. Currently OJS offers a built in Plugin for authentication through an LDAP server. In this case the plugin is a background task which the users won't see (OJS Help , 2012).

Block Plugins

Block Plugins are those plugins which bundle to the user interface. An example for this category is the Donation Block, which is shown if donations for the journal have been activated. The Print-On-Demand plugin is also a block plugin which reacts depending on

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[40] http://pkp.sfu.ca/support/forum/viewforum.php?f=28 (last visited: 02.03.2012)

the content (OJS Help , 2012).

Citation Format Plugins

These plugins are used by the *Reading Tools* which allow the user to export citation in different formats. Some examples are:

- RefWorks plugin
- Turabian plugin
- CBE plugin
- ProCite plugin

(OJS Help , 2012).

Gateway Plugins

Gateway plugins implement web service functionalities for OJS. Resolver Plugin for example resolves issues and articles based on citation information. METS Gateway Plugin on the other hand offers full access to the contents of the repository delivering data in raw XML format. Data content is than coded in Base64 format within the XML file (OJS Help , 2012).

Generic Plugins

Generics are those plugins which cover different functionalities. Mostly Plugins which do not belong to other groups are generic. To give an impression and an overview of this category some of the most common ones are listed below:

- *Static Pages* – this plugin enables OJS to create static pages for additional content which normally doesn't get published through the existing workflows.

- *Referral Plugin* – makes the tracking of external incoming references possible. For example an external link through a search engine.

- *Web Feed Plugin* – enables the generation of RSS/Atom links in the sidebar.

- *Google Analytics Plugin* – offers an interface to Google's powerful analytics framework.

- *SEHL Plugin* – implements Search Engine HighLighting in order to highlight the requested text or keywords through the search engine.

(OJS Help , 2012).

Implicit Authentication Plugins

Implicit Authentication Plugins offer the possibility to authenticate users through external account management systems (OJS Help , 2012).

Import/Export Plugins

These plugins enable functions for import and exporting repository data into different types of formats. In this category the most popular are Erudit Article Export Plugin which exports articles with English Erudit DTD format or QuickSubmit Plugin which offers a one-step submission feature (OJS Help , 2012).

Payment Plugins

Payment Plugins make journal subscriptions in a very convenient way possible, allowing the author to require payments for specific materials. But it also enables the users to donate to the system and other features. This way of payment is going to be discussed in details on the section about the financial model of the new developed Plugin (OJS Help , 2012).

Report Plugins

Reporting Plugins provide the possibility to export reporting data about the review process or the submission process (OJS Help , 2012).

Theme Plugins

Offer a convenient way of customizing the default CSS themes. Although it doesn't offer the same flexibility of manually accessing the files it still delivers a basic range of functionalities (OJS Help , 2012).

Plugins cover a wide range of functionalities which make OJS a powerful system, not just

for publishing resources but also turn it into an all-around provider for Open Access Journals.

3.4 POD Provider

Epubli is one of the PoD providers which was introduced in the previous chapters. The company standing behind epubli offered direct support for this new cooperation between OER and the publishing industry. This collaboration brought many advantages and offered the possibility to customize both interfaces in order to develop the best suitable solution for the user, author and publisher. This makes it possible to automatically incorporate the desired resources directly into epubli's client print interface. Depending on the type of partnership, epubli offers different ways of accessing their services.

It might be preferable to explain the basic requirements the print-on-demand plugin had before going into details about the available interfaces.

System Requirements

- The communication between the two systems should be fully automatic allowing the user to reach his/her goal with the minimum effort.

- The partner should be able to configure a print-job with default parameters

- There should be cryptographic mechanism to identify the source and validate the request.

- The customer should be able to take further refinements of his/her request before sending the print request. The parameters should be customizable besides the default parameters passed by OJS.

Payment Requirements

- The partner should take care of all payments between the system and the customers. The customer is charged directly for the request.

- The publisher should be able to add an additional amount to the price which the partner is than going to return back.

- The partner should offer an interface where the publisher can check the amount of contributions and other statistics.

3.4.1 Epubli interfaces

Epubli offers three types of interfaces which could be used to interact with the provider and take actions like to upload content, request status and others. These interfaces are listed below.

Client Print Interface – from the website interface the user has the possibility to upload his content. This function was shown in the general description of epubli. (Epubli, 2012)

Web Service – clients can upload the content in XML packages form. This interface allows partners who possess a partner ID and a secret key to automatically access publishing functions. It has the disadvantage, that just the partner can be charged for the services and the user doesn't get involved in the billing process. (Epubli, 2011)

Partner Interface URL – epubli offers the choice to access its functions through a partner interface which allows a direct interaction with the users and the partner at the same time. An example is to pass on a public URL where epubli can download the content and make it available on the web client interface for the user. It also accepts different parameters for complex requests. This is also the interface the PoD plugin uses to interact with epubli. There are two modes of operations for this interface. The first one allows the plugin to use it without charging users for the services. This way also doesn't require a partner ID and a secret key. So there is no need for authentication, which leads to repudiation of the content's source. The other mode is to require a dynamically adaptable amount of money for the service. The PoD plugin supports them both.

The first method (Client Print Interface) violates some of the requirements for this plugin, in which the user would first have to generate the file, download it and upload it again. In which case it takes far more work than passing it one with the same click you had to generate it. But the usability issue isn't the biggest concern on that matter. Combined PDFs could be subject to copyright infringements if one could download it because it is far easier to duplicate it in digital form than hard copied. Even if OERs are free to download the combination of different articles (this is a defined feature of the PoD Plugin) may not always be permitted. Another big disadvantage of this method is the definition of the source. Without having the possibility to prove the author it would be impossible to ask the user for contributions. The second method (Web Services), is a very convenient way to passing information through to epubli but it was reserved for partners only. To interact in this way clients need a secret partner key, to whom all bills are delivered. This means that the journal provider should take care of payments themselves. First they get the bill and then they resend it to the customer. This could be a benefit for some businesses which charge the customer for the printing service. But for a system plugin which should serve

many different OJS-systems this would mean extra job and would lead to losing focus out of the main enterprise. The third possibility was the one it was chosen for this plugin. The plugin delivers together with a GET parameter in the URL the address in which epubli can access the data users would like to deliver.

3.4.2 Partner Interface with URL repository

In this mode of operation the URL address is combined out of the epubli's partner interface URL, the repository type, the action and document URL. This is the predefined URL to upload a document and forward the user to the workbench (Client Interface). The standard URL looks like following:

http://www.epubli.de/interfaces/partnerInterface.php?repository=url&action=workbench&document_url=

The parameter *document_url* takes the address of the file like i.e.

document_url=http://www.mytestjournal.at/file_to_download.pdf

After the download is completed epubli redirects the user to the book creation interface where the user can add and edit information about the print job. This interface mode is easy to use and doesn't require the use of cryptographic mechanisms which is used in the PoD plugin. It also can be seen as a pre-step to the Client Print Interface mode where the user was independent from the author so when she/he needed to upload content. The interface URL is also the one used for the Plugin, but with additional information. Knowing that every author is interested in knowing the propagation of her/his intellectual work, the system added the possibility to track this proliferation with cryptographic mechanisms. More about this mode of interaction is found in the next section.

3.4.3 Partner Interface with TUGraz repository

The other option as shortly described before requires some additional information like, authentication, secret key and overhead charge. There are mandatory parameters to successfully commit a request which are going to be explained in details during this section. To have an overview of the obligatory fields these parameters and there are presented options below.

- **mandant** (engl. mandator) [required] - is the name of the provider i.e. *epubli* or its affiliates

- **partner** [required] – is the partner ID used to identify the source i.e. *tugraz*, *l3t* or *bildungsforschung*

- **repository** [required] – is the repository representing the partner. For example *tugraz* is the partner for this project and it has its own repository where the users are forwarded

- **action** [required] – there are different types of actions

  - *workbench* – this options forwards the user to the client interface where he can make changes to the cover, type of paper, color and others.

  - *price* – requests a basic price for the delivered configuration

  - *voucher* – requests a voucher

  - *order* – an automatic order request without going through the workbench where the user can make additional changes

- **pdfURI** [required] – the URI where epubli can publicly access the PDF file.

- **price** – this is the price which enables the author to charge the desired amount for the printing service.

- **signature** [required] – in order to authenticate the user and assure the data integrity. The signature is generated with the secret key provided by epubli through secure channels.

- **failure_url** [required] – the URL to forward the user in case of errors.

The interface also offers access to other parameters which define the currency, format and other details.

3.5 POD Plugin

After having gained some specific information about the OJS Framework and its underlying and supporting framework Smarty, as well as the plugin infrastructure it is now easier to explain the way the plug-in was incorporated into OJS and its link to *epubli*. The main idea was to develop a system for connecting journals which use OJS to publish their contents to the relatively new industry of printing on demand. The internal architecture of this system is presented in the following section.

3.5.1 Plug-in Internal Architecture

The PoD Plugin is a general name for all the components which make out the whole service of choosing and previewing the content, setting up the configuration, compiling the articles and sending the request for printing out of a journal. OJS is made out of different components as well. A plugin can be represented as a small OJS engine within the system. It gets certain rights and has to follow some rules. The previous section discussed about types of plugins OJS supports. *Block Plugins* are those reserved for the right block of the

screen. This was enough space for simple tasks like, add article to cart or print this article. But it didn't resolve very user friendly when viewing the cart, rearranging the order or even deleting some unwanted material. To offer an all-around solution the plugin had to deliver some extra files besides the plugin.
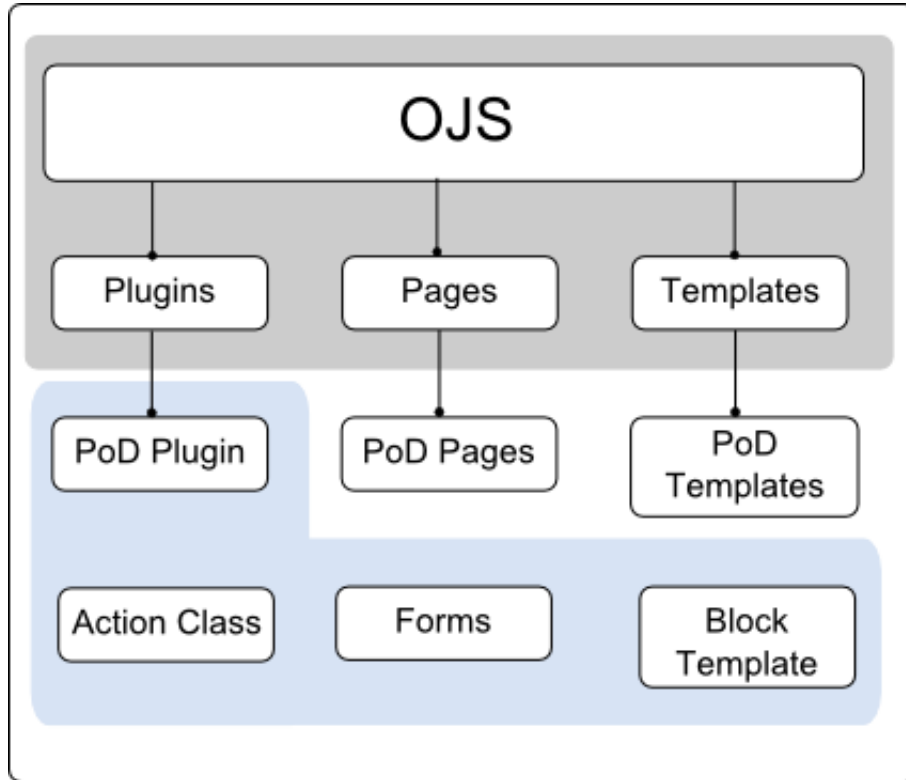
Figure 26: Plugin architecture

Figure 26 shows the original OJS structure with a gray background. The components beneath them are added to the framework in order to implement the print-on-demand functionality. The plugin itself is a ZIP-file which is going to be described in the installation sections. But as mentioned before this plugin is a block plugin and could take a limited amount of space form the web site to fulfill its tasks. Therefore its functionalities were expanded using pages and templates. Plugins work as a small system within a system so the plugin itself had to implement action classes, forms and templates for its intended purposes. The action classes are the controller part of the plugin, accepting and processing requests. Forms even thought a complex mechanism for simple user interface, turned out to be very convenient for the settings form validation. This is the interface which handles the user data, partner ID, secret key and other information. For rendering the *block* user interface as in rest of OJS it was used the template structure.

3.5.2 Plugin Use Cases

The PoD plugin was designed for simplicity offering the user, with as less actions as possible, full printing-on-demand functionality for the desired material. This is possible because a big part of the formalities are transferred to the PoD provider. Figure 27 describes how the system borders are defined and what actions are requested by users for the specific system.
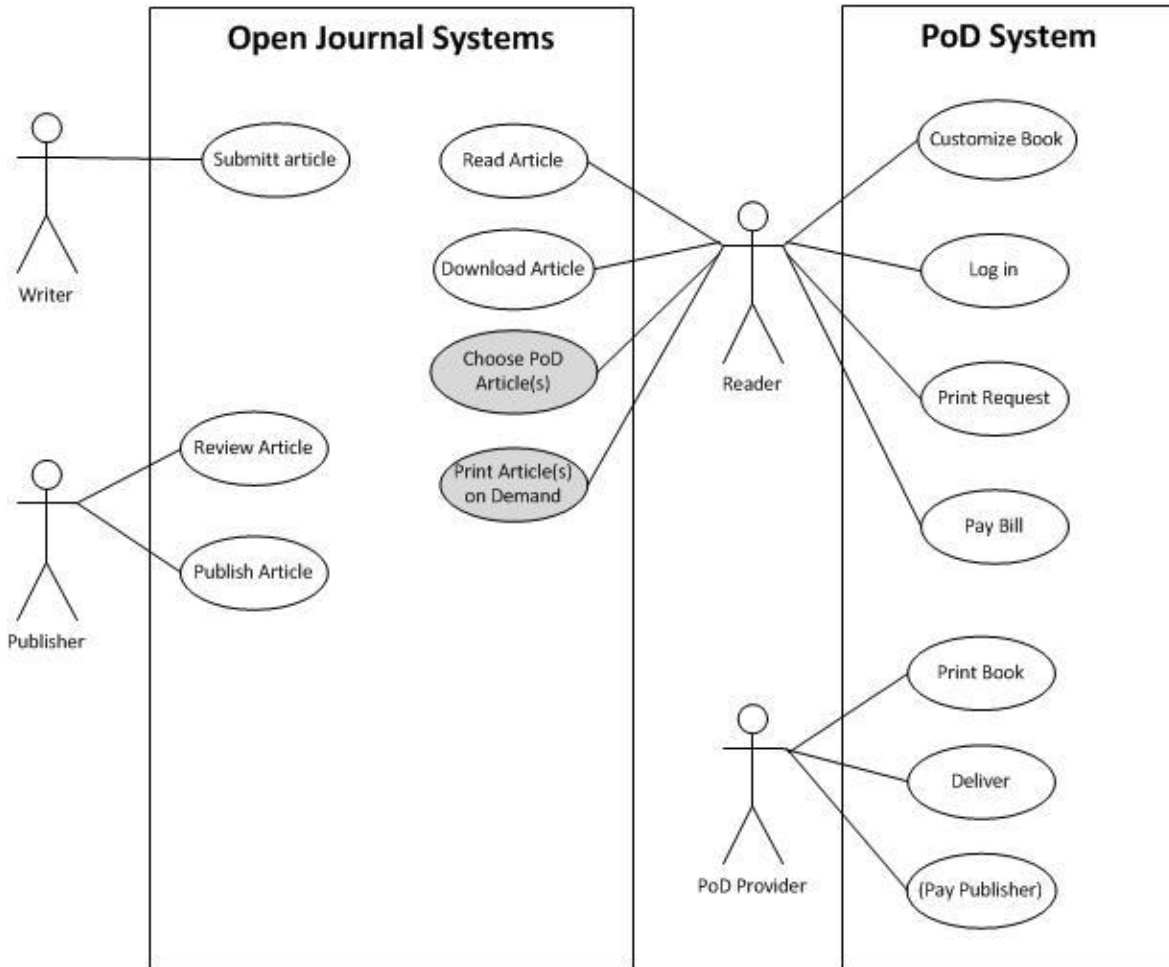

Figure 27: OJS and PoD System Use Case

There are two separate systems the user has to interact with in order to finalize an automatic print on demand request. The use cases in gray background are those added by the PoD Plugin to the system. There are four active roles in this diagram.

- **Writer** – the writer is the contributor to the repository. His/her task is to submit an article and wait for the review process and feedback.

- **Publisher** – represents the underling infrastructure which administers the systems and the publishing processes. This group includes editors, section editors, layout editors, copyeditors and proofreaders which take part in the reviewing process and

publishing the article.

- **Reader** – the reader is the link between the two systems. In OJS he/she can read articles, download them if he likes and even go to some providers to print them. Since the plugin users can also choose specific articles to print. He/she can rearrange the order and send the bundle directly to the PoD provider with just one click. Once all these actions have been done the user will be redirected to the *client user interface* where he/she can take further actions regarding the paper quality, color, format and other formalities which don't necessary concern the OER framework. The users can also login to the system where they can save the project for a later time, discard it if necessary or make the payment to start the printing process.

- **PoD Provider** – is an automatic system responding to user requests with actions like printing the book, delivering or generating voucher and other user interactions. If the publisher requests a commercial cooperation then the provider returns to the publisher the amount contributions for the PoD service. How this feature technically works is going to be explained in the workflow section.

The value-added they bring into the whole system is a matter of business strategy that is going to be discussed in the next chapter.

3.5.3 Workflow

This section analyzes the two successful workflow models. It doesn't concentrate on the special cases of failure or user faulty inputs. The two models are similar in the handling and there is no difference in the user interface. The only difference is how the system generates the request and sends it to the provider. During the initial steps of the workflow there are no differences between the two models. The first alternation appears in case the publisher is accepting contributions for the print-on-demand service splitting the workflow in two models:

- **Free** – the author/publisher doesn't request any contribution for the extra service of printing on demand. The system doesn't charge an extra amount. The job consists in forwarding the user to the PoD provider with the desired content.

- **Costly** – the publisher/publisher requires a small amount for the printing service delegating the costs to the PoD partner which then charges the users for this amount. The costs are dynamically calculated and the request is secured with cryptographic mechanism.
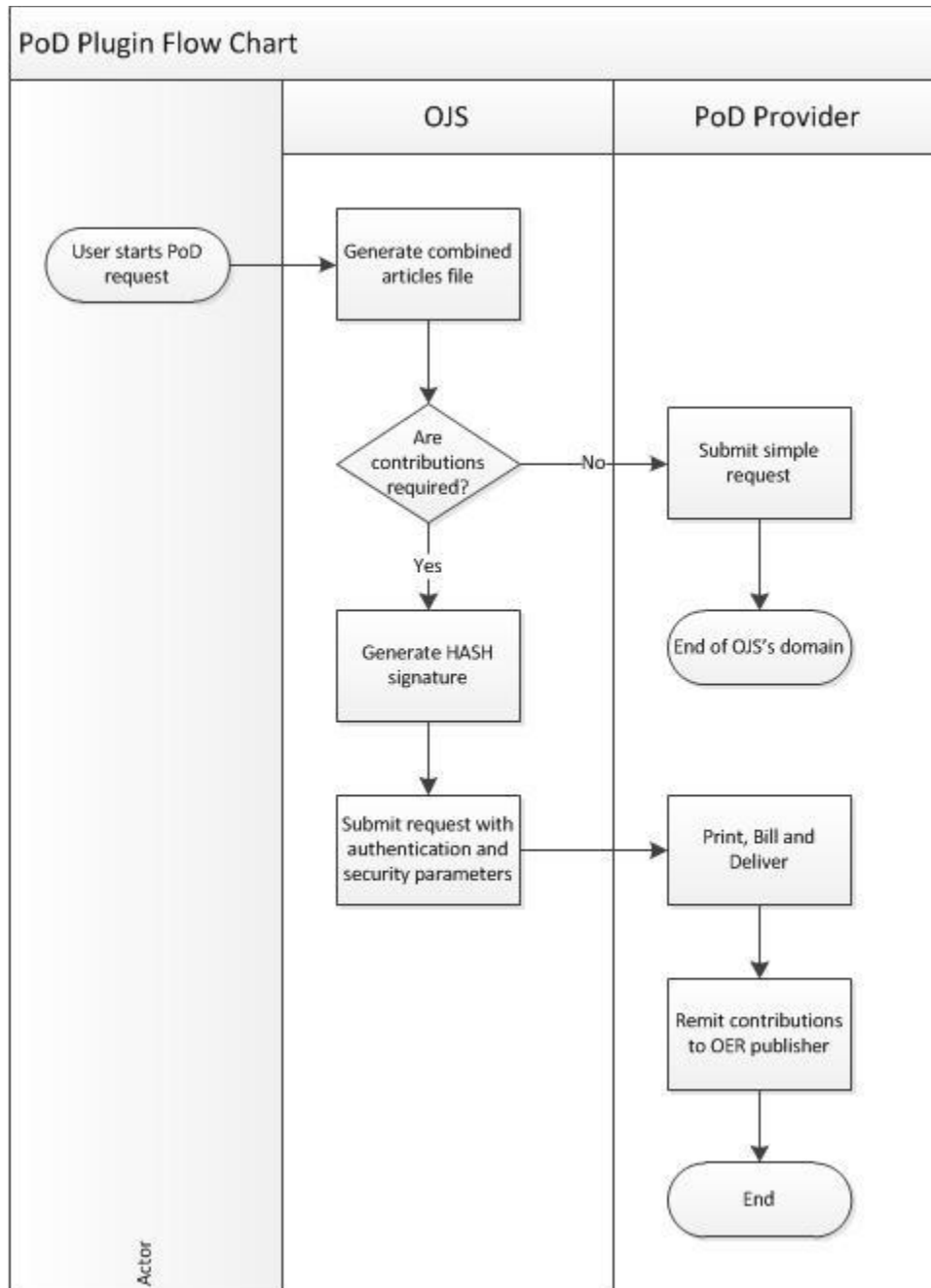
Both cases are visualized in figure 28.

Figure 28: PoD Plugin workflow (System perspective)

There are two different types of requests which engage different mechanism in the preparation of the request. If the journals require contributions then there must be a secret key to generate a signature of all available URL parameters. This cryptographic signature together with all other parameters is going to be compared and validated once they reach the providers repository. After the request is sent, OJS leaves its field of actions. The user is redirected to the PoD Provider's user interface where he or she can take all necessary

actions to finalize the request. This is a very convenient feature which separates the tasks, making it possible to focus on the core competencies. This way could

Authors → concentrate on writing quality material

Publishers → reviewing and taking care of the repository

PoD Providers → in their core business, printing, and billing

There are also other ways to reach the same result. One could be to accept payments through system plugins and then requesting the print job with the web services interface. This would bring the advantage to have full control over the price as the plugin can send requests asking for bills before activating the printing process. Every advantage has its weak side as well. The publisher would have to take care of user data, the addresses, the shipping, the billing and the customer formalities adding a hotline or email service. All these extra tasks have their costs which at the end are transferred to the end user increasing the price.

Besides the system interaction there is the user action framework. Here are described the domains where the user takes action and the precise order. The flow chart starts from the user's browser when the journal is previewed. The plugin gets involved only if the user is interested in printing any content out of the journal. In this case the plugin offers the possibility to choose between singe articles or the entire collection. The user can also include articles from different issues and mix them together. There is no restriction about the copies of an exemplar, so the user can choose two copies of the same article. This might make sense for exercises for example, in case the user wants to make notes on one copy and leave the other copy in the original form to correct during classes. After having set a final order of the content the user sends the request to the plugin (OJS) which generates the final PDF file by taking these actions

- combines the content
- adds the front and rear cover
- adds the journal and its description
- lists the articles
- checks the book is restlessly divided by 4

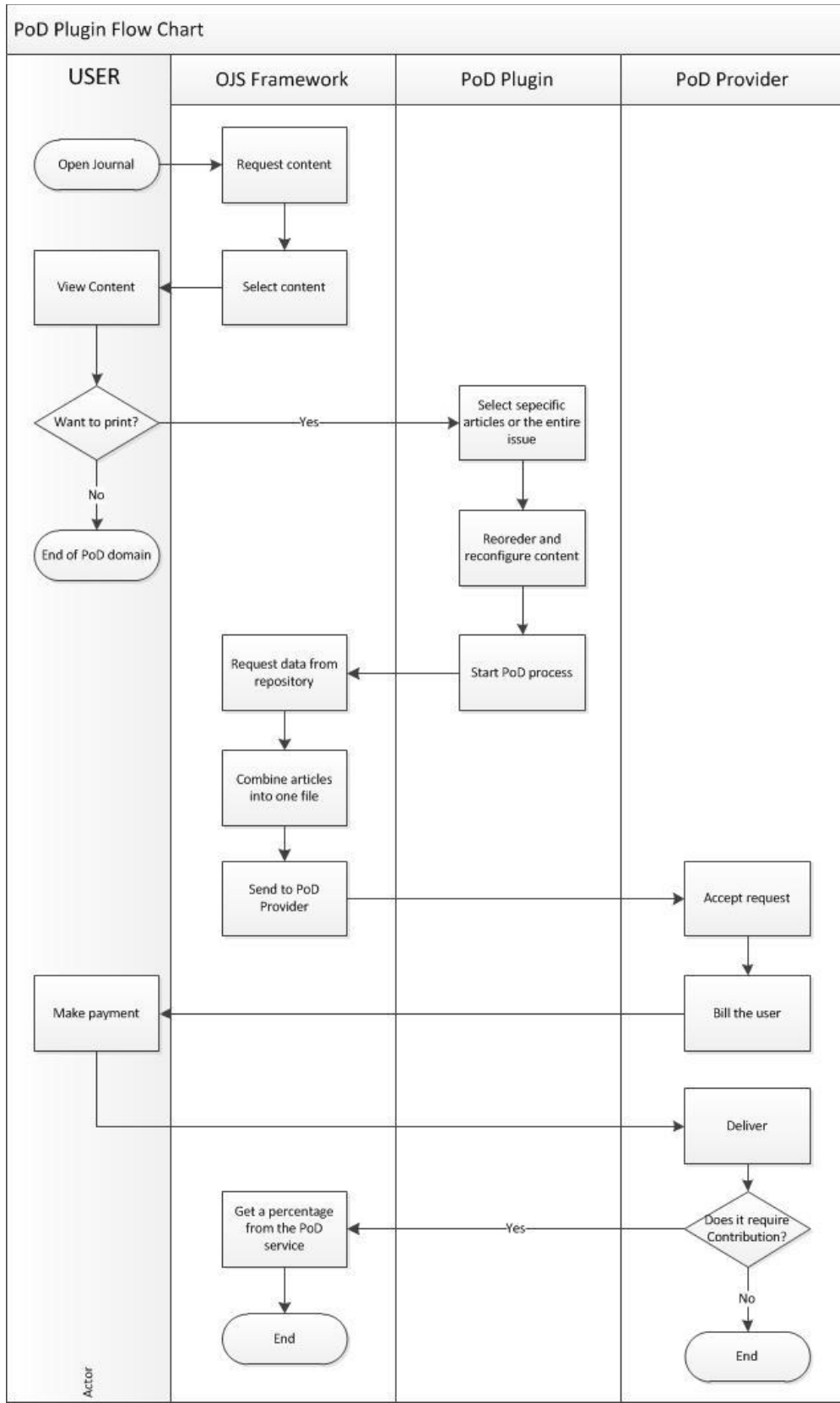After the PDF file is generated the address is added to the request.

Figure 29: PoD flow chart (User perspective)

3.5.4 Functionalities and Screenshots

This section will describe the functionality and usability of the plugin. The visible features are going to be illustrated in figure 30.

The plugin can only be shown at the right block but its fix position is determined at the layout manager. This part is explained at the installation section. The Plugin is context sensitive. Not every action is always available. *Show cart* and *Print book* are the ones which are always visible.

Show cart (*Warenkorb zeigen*)

Show card is a function which allows the user to list all the chosen material for printing. The space in the block is limited so the user wouldn't have a practical overview of the articles. For this reason it was decided to implement this function in the main window. To do this it was necessary to add the extra page content outside of the plugin bundle. From this point it was possible to implement other functionalities which are going to be explained together with figure 31.

Figure 31: Show card overview

The documents are listed in a sortable table which can be adapted by dragging and dropping elements in the vertical axis. Along with that there is the possibility to

- view the PDF file directly before printing,

- print this one article

- add another copy of it

- remove this item

- or deselect it so that it doesn't get in the print list

The print action can be executed from the button on the bottom or from the "*print book*" link with the print icon on the top right.

Print book (*Buch Drucken*)

Print book is a function which doesn't have a direct output to the user. But it accomplishes a major part of the computations and therefor is the most complex. The process is going to be explained in the following two steps.

Preparing the Book

In this step it gathers the selected items and merges them to a file together with the predefined journal cover[41] and padding the back of the book so that its page number is always dividable by four. The book gets than a random URL where it can be accessed from the PoD provider in order to download it.

Serializing the parameters

After finishing the generation an important function is to decide whether the author will charge for his/her journal and in this way chose one path of the workflow. In case the function is active all parameters are hashed, afterwards the hash code id is added to the URL itself. The request has following shape

```
http://ww.epubli.de/interfaces/partnerInterface.php?
    Title    =Journal&
    Author   =Author&
    pdfURI=http://l3t.eu/index.php/LehrbuchEbner10/pod/downloadPOD/qs27j5bme7&
    partner  =tugraz&
    failure_url=/hilfe&
    price    =1&
    action   =workbench&
    mandant  =epubli&
    repository=tugraz&
    timestamp=2012-03-22T21:03:03.332450183Z&
    signature=+++ sha-256 signature +++
```

In this request there are some static parameters like the *title* of the journal, *author* and *partner* but there are also some dynamic ones which need to be calculated during the request. *pdfURI* is the random URL which is unique for every generated document. The *price* parameter is also generated during the request because it depends on the amount of pages and the charging strategy which is going to be explained in the discussion chapter. *Time stamp* and *signature* are two parameters which enforce the security mechanisms.

After having generated a valid request the user is redirected to the print-on-demand provider which has the possibility to check the parameters with the signature. After verifying the request the user is allowed to proceed with the order. There are different

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[41] The journal cover can be added to the settings so that every article has a uniform cover. It is not mandatory and if it is not set the cover will be the journal title and its description.

actions which force the users to reach different interfaces. The default one is the *workbench* which sends the user to the workbench (epubli create book interface) that was shown in the previous chapter.

Adapt Journal (*Journal Übernehmen*)

Is a context sensitive function which is displayed when the website shows a journal. The reason for that is offering a dynamic interface for selecting articles. It gets activated anytime the user enters the journal giving the opportunity to view all current articles in select mode. Journals have different issues and this function offers a quick link just for the current issue. Archives and others are discussed later on.

Figure 32: Plugin adapt journal overview

The presentation of the articles and the authors was kept similar to the default presentation in order to provide similarity and integrate the plugin in the best way. The added features are the same as in the cart overview where users can view the PDF file, add this article or remove it.

Select issue (*Ausgabe anzeigen/auswählen*)

It offers the same results as adapt journal but for all previous issues including the current one. This means that the user can mix articles and chapters form different issues or even have them both previewed.

Select articles Box (*Artikeln zum Auswählen*)

Another context sensitive function is Select Articles which enables the users to add articles directly from the plugin without having to switch to the journal or article view. Articles loaded in the context are also shown in the dropdown box in order to be selected for print.

Figure 33: Plugin select article overview

This feature has the same functionality as the adapt journal and issue but located in a place where the user can access it without changing the current page.

PoD Operator (*print-on-demand Anbieter*)

Although this plugin was developed in very close cooperation with epubli, it is part of the open ideology to offer the possibility for alternatives. Principally the ways to pass the information to a PoD service are those discussed before. Other vendors might have

different parameter names and additional security requirements but the technology is mostly the same. As long as the code is open source anybody can change it and adapt it the way it fits their best interest.

Empty cart (W*arenkorb leeren*)

This function removes every chosen element from the cart and clears the cache memory. It resets the order of the elements as well so in case of sorted elements, the sequence will be set to default.

3.5.5 Installation

Before was mentioned that the plugin is made out of different parts that fit into OJS. The block plugin is a compressed file which only needs to be uploaded into the system. The rest of the installation like setting up the parameters and database connection is automatically done by the system.

With the block plugin a second bundle will be delivered containing

- *Page Folder* (directory named: pod)
  The page folder contains obligatory files for the request handling and preparation of the book. It also contains the libraries necessary for the book compilation and other features regarding interaction with PDF files. This part is the plugin's controller

- *Templates Folder* (directory named: pod)
  Temples are the view part. They render information delivered by the page and format a HTML file.

This step is not fully automatic so it just needs to be copied in the right position. Under every OJS installation there are *pages* and *templates* folders where these directories can be copied.

3.5.6 Configuration

After installation the Plugin is ready to be configured and used. The plugin can be found at the following path

```
Journal administration > Plugins > Block Plugins > Pod
```

Figure 34 shows the necessary parameters and how they should be configured.

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Print On Demand

Dises Plug-in fügt "print on demand" zu den Funktionalitäten.

Aktiviert*	yes
Partner ID*	tugraz
Sicherheitsschlüssel*	‖ ‖ ‖ ‖‖‖‖‖ ‖‖ ‖ ‖‖‖‖‖ ‖█‖ ‖‖‖ ‖ ‖ ‖‖‖‖‖ ‖ ‖ ‖‖‖█‖ ‖‖‖
Mandant*	epubli
Aktion*	workbench
Repository*	tugraz
Authors	Martin Ebner und Sandra Schön (Hrsg.)
Cover	/cover/89-548-2-PB.pdf
Format	94
Farbig	
Preis	5:10
Wärung	
User ID	
Vorname	
Familienname	
Straße	
Straßennumer	
PLZ	
Stadt	
Land	
Fehlerumleitung URL*	/hilfe
E-Mail	

Speichern　Abbrechen

Mit * gekennzeichnete Eingabefelder sind Pflichtfelder.

Figure 34: Plugin Settings Configuration

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For simplicity reasons this section is going to discuss the mandatory parameters and some of the most important optional ones. Most of the parameters were discussed before together with their options. A default configuration looks like following:

- **Activated**

  If this option is true then all the necessary parameters must be set. Otherwise they are ignored.

- **Partner ID**

  The ID is given to partners who have cooperation contracts with epubli. It is not the same as the username the user gets automatically after registration. The ID is delivered by epubli.

- **Security Key**

  Is a SHA-256 key used to generate the hash which is attached to the URL. The key is also generated and delivered by epubli.

- **Mandant**

  The mandant is just a tag to recognize the partner's origin.

- **Action**

  Workbench is the default one. The user gets to the web interface showed in figure 20.

- **Repository**

  The repository name is also delivered by epubli.

- **Authors**

  These are the default authors which are going to be printed at the book spine.

- **Cover**

  If the publisher decides to deliver a standard cover for all the issues then this parameter should point to a static cover within the journals repository. The simplest way to achieve it is to enter the file management through the journal administration and create a folder called *cover*. Afterwards upload the file within that folder. After this procedure is finished write the path in the settings. If the cover is not set, the default cover will be the first page of the document consisting of the journal title and the respective description.

- **Format**

It is the default page format the user gets in the workbench. This parameter is adjustable so the users can change it once in the user interface.

- **Price**

  The price is the amount of contribution the publisher agrees to require for its work. It can currently be set in two different ways

  - The static way where the publisher puts a fix price into the textbox

  - Range where the publisher sets the price and the range divided with a colon. For example 1:100 means that the author wants to get 1 Euro if the user printed more than 100 pages and less than 150 pages. From page 151 the user will be charged 1 more Euro. If the range is too big than the admin can put 0.1:10 so he gets the same percentage but in a more accurate step.

- **Error Forwarding URL**

  In case of an error the URL will be called with the respective error code in a parameter called err.

The rest of the parameters are optional and are not used in every case.

During tests there were cases like L3T where the cumulating articles reach a size of some hundred megabytes. This is a problem for PDFMerger[42] which requires runtime memory to combine the files. The application can cause a runtime error and run out of memory. This issue is present if the material printed is over 400 pages and there are relatively a lot high quality pictures within the chapters. It might not be the case for every publisher so the tests have to be made individually by the administrator. The solution if this error occurs is to raise the memory limit a script can consume for the PHP interpreter. This can be done at the *php.ini* file.

```
memory_limit = 512M
```

Another physical limitation is the amount of pages an instance of a book can have. Epubli has following limit values:

- Softcover: 700 pages

- Hardcover: 868 pages

- Ring binding: 600

---

[42] http://www.pdfmerge.com/ (last visited: 11.03.2012)

- Booklet binding: 60

3.5.7 Security

Like every web application there are some security standards which the Plugin has to fulfill. Luckily the OJS framework already offers many of the mechanism needed to prevent standard attacks like SQL injection. Every parameter goes through a centralized class which escapes the request and builds a well formed parameter list. The *plugin pages* are an extension of the *issue pages* from the OJS standard installation so they already took care of the access rights and account management. What's new in this plugin is the access to the PDF file which is than downloaded by the PoD provider. The provider' framework gets a URI where it can access the file and then integrate it in the user interface. The URI is also open by everyone else if they know it. But it is always generated by a random suffix and the user himself doesn't get to see this URL. It is automatically forwarded to the provider and the only way of getting it would be to sniff the traffic between the OJS provider and the PoD provider. This is more a copyright concern than a security issue but it has to be controlled through security mechanisms. Other concerns like XSS injection were also analyzed and the result is that the new Javascript functions do not operate with user sensitive data. They only take care of the article management and UI animations.

4 Proof of Concept

The previous chapters talked about the new concepts of publishing open access publication, as well as the technologies which support these ideas through the World Wide Web infrastructure. Chapter 3 gave detailed information about the implementation and how it supported the print-on-demand plugin. This chapter is going to talk about the specific features of the system and the arguments for their implementation. First it is going to concentrate on the case study framework examining the impact of this new feature and explain the advantages it brings to the available environment. The process from the user's point of view will be introduced later on in this chapter. Afterwards the discussion is going to compare the advantages and disadvantages of the print-on-demand strategy and the traditional publication. It is also going to explain the advantages it offers to the user and why is it profitable for OER models. Before going into the individual benefits for each stakeholder, it is appropriate to see how they are connected together in this business model.
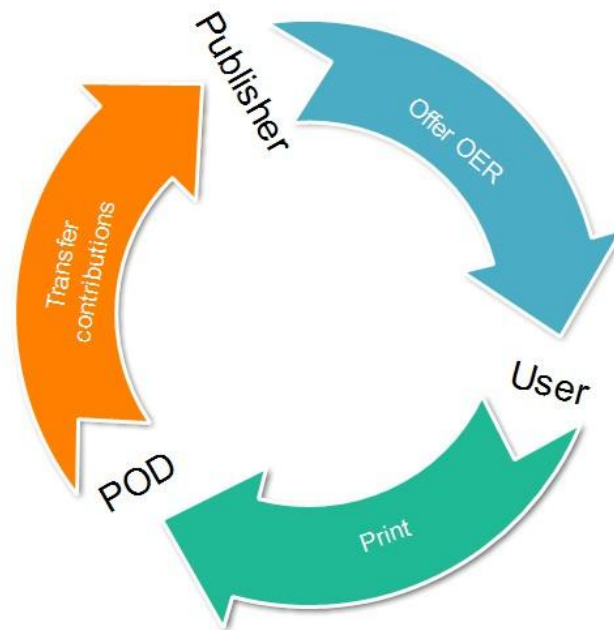
Figure 35: Business Model Cycle

Figure 35 describes the service flow starting from the publisher who offers Open Access Journals to the users. The users who like to print the documents use the Plugin to directly access print-on-demand services with the desired material. After having finished with the formalities, the PoD Provider transfers the contributions to the publisher. This way the system keeps going and offering better services.

4.1 Advantages for Publishers

In the previous chapter it was explained how the plugin is built, its graphical user interface works and how the use cases bring the user to interact with the system. Now it's time to talk about the publishers benefit out of this model. The first chapter offered an overview of the costs and the participants' engagement. In most cases, participants were willing to invest few hours a week on an OER project which means that whether the project should be self-sustainable after publication or there have to be other participants taking care of the maintenance. L3T and bildungsforschung.org are (partially) supported by TU Graz which offers web space and the occurring traffic. Nonetheless possible incomes are important for other activities like marketing, operating costs and access to different commercial services. From the publishers point of view the system can be analyzed in the economical way. In this section it is assumed that the plugin is run in "*contribution*" mode as it is discussed about the economic benefit. The other way adds of course value to the system from the user perspective, but doesn't affect the business model. The costs of installation for the publisher are minimal in both cases. In the installation section there are only a few minutes work to deploy the plugin and insert the authentication data. After the setup there are no maintenance tasks or reconfiguration issues. The publisher has the possibility to set the contribution in

- **Fix rate** – this mode requires the PoD provider to increase the price by a fix rate. It has the advantage of statistically measuring the amount of contributions during a period, without taking account of how many articles the user decides to print. The publisher submits into the request a fix amount that the PoD Provider will forward to the user regardless of the other properties.

- **Percentage rate** – also considered the fair rate, as the user is charged by the amount of pages he/she intends to print. The amount that the user is going to be charged for is automatically calculated from the end price. An important thought about this method is the point in time when the price is calculated. By setting the range, like it was shown before, the publisher gives a price for every page. This price doesn't reflect the price which the PoD provider requires for a page. Indeed the user can change the parameters like, paper type or color and result into a much higher end price. This means that the price the author requires is absolutely bound to the intellectual value he/she gives to the work and not to the profit the PoD provider achieves.

After having made this decision the system runs automatically. The PoD provider will then transfer the gathered contributions to the publisher. So from the publishers' point of view there are basically no costs in implementing this strategy.

There are also other ways of publishing OER and having direct access to print-on-demand. Open Access for example offers the possibility to download the material and then upload it to your print-on-demand provider to achieve your goal. But it doesn't offer an all-in-one solution to the problem, providing the user with a closed workflow as well as assuring the publisher that he/she gets his share for the contribution. One example which fulfills these requirements was the Flat World Knowledge Company. Collaborating with FWK brings many benefits

- It has access to a wide audience

- It has a developed marketing structure

- Offers enhanced reading tools

- Has collaboration systems for
    - Teacher ↔ Students
    - Student ↔ Student

- Sophisticated version management system for editing the materials

- Delivers the resources in different file formats and hard copy

But FWK is a profit-oriented company, which means that they are always going to charge more than the real costs in order to pay for the infrastructure, the employers and the shareholders. Of course the costs of sharing per unit are going to be lower than self-hosting but the overall price for printing the material will be higher to cover the rest of the expenses. The fact that in self-archiving there are two entities which want to earn something out it by increasing the price doesn't mean the price is necessarily going to be higher than FWK's model. Some of the publishers might even wish to charge more for their work, which means that they would have to negotiate with FWK, losing this way some flexibility. In this content self-archiving with OJS, the PoD Plugin and the collaboration with a PoD provider would be of a greater benefit for the publisher and at the same time offering more space for action.

4.2   Advantages for Users

For the end user there are three main issues that need to be considered

- The price

- The access rights

- Usability

There are no costs for using OER. And if the Plugin is configured not to charge for printing on demand then the price the user has to pay is as reasonable possible. This result is achieved even if the Plugin is configured to charge a small amount for the extra service. If the user downloads the file and then separately logs into a Print-on-Demand provider to have this resource printed he/she can avoid being charged for the service. This part of the issue is clear as the user gets the possibility to download the material and after that the framework is not able to trace the file anymore. A solution to this problem might be to have a collaboration with PoD Providers which allows them to trace the files. A way to do this is by uploading the file to the provider so that they can build a digital signature of the file and know the source. Anytime users print the file from these providers, they would have to be charged after the same conditions as through printing directly through the plugin. Again small changes in the file will result to different hashes so that the mechanism would be bypassed. To scan for the content is another countermeasure. But that is not the point of OER to make a print-proof mechanism. For practical reasons as well.

Charging for open educational resources is a sensitive topic. But are there similar business models to compare this charging strategy and maybe make it righteous. It would be interesting to compare prices between the solution described in this study and the comparable framework Flat World Knowledge. Moreover it would be even more interesting to take a representative example out of the traditional book printing industry. To test it a random example was taken out of the FWK repository and compared with the costs of printing on demand from epubli and a book with the same topic from Amazon. The random OER book that was chosen was *Elementary Algebra*[43] by John Redden which had 274 pages. Amazon offered over twenty different choices about elementary algebra and the prices where between 120€ and 220€. The choice was Elementary Algebra[44] by Jerome E. Kaufmann and Karen L. Schwitters. As about the FWK book, it was not available for free download. So another file with approximately the same qualities was taken instead. In order to have the same amount of pages to compare for printing, a search

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[43] Elementary Algebra - http://students.flatworldknowledge.com/course/706888 (last visited: 01.04.2012)
[44] http://www.amazon.de/Elementary-Algebra-Jerome-E-Kaufmann/dp/1439049173/ref=sr_1_7?s=books&ie=UTF8&qid=1333910204&sr=1-7 (last visited: 01.04.2012)

on Google brought the first result[45] of a public book of 274 pages in PDF format. Both examples were chosen to give prices in black and white option. The book from Amazon is of course in color and has 539 pages. It is not include it in this diagram to compare it with the two open educational resources, as they belong to different business models, but to give an impression about substitute products. The prices are compared in figure 36.
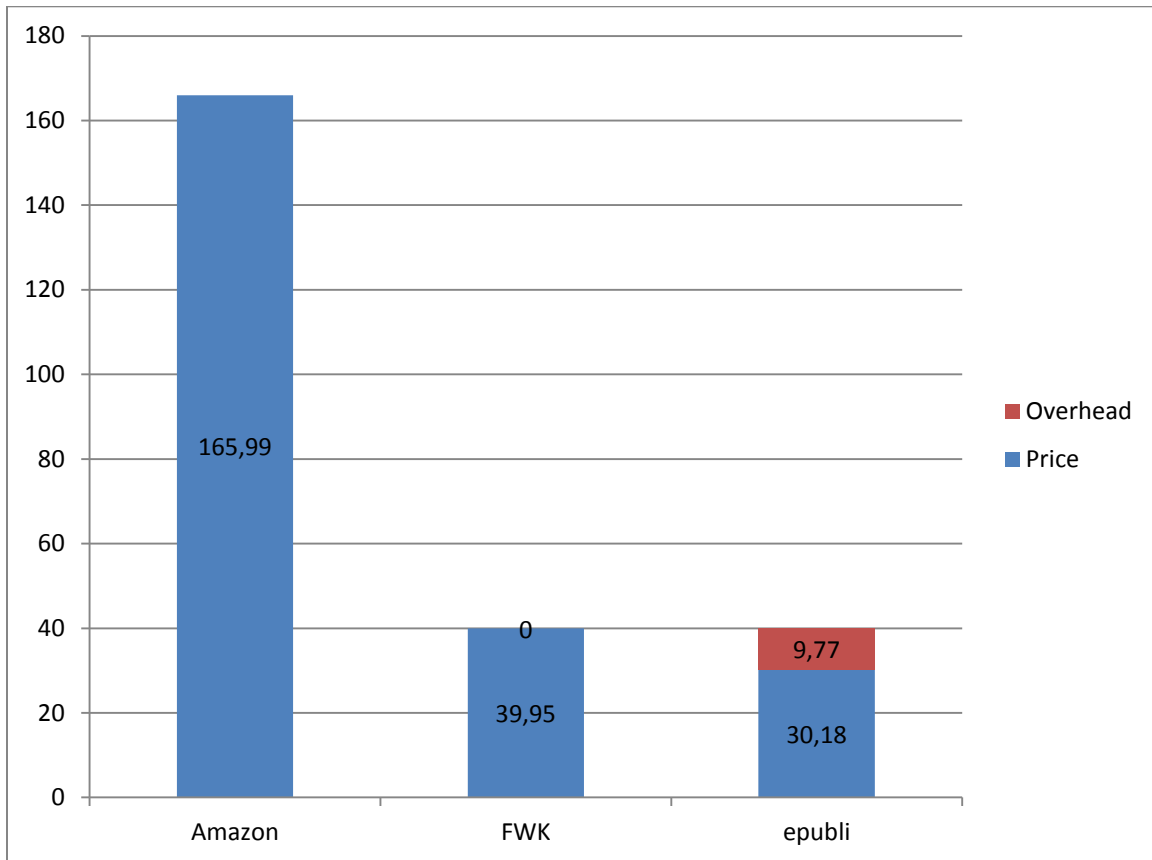
Figure 36: Prices for printing-on-demand from FWK and epubli

The prices at *epubli* are in euros, so the book costs 22.91 Euros. At the exchange rate for the date[46] that amount was 30.18 US Dollars. The price for Elementary Algebra was 39,95 US Dollars. Out of the diagram it can be noticed that the prices for the same amount of pages are ¼ less for epubli. That amount represents the overhead or the limit self-archiving publishers have to consider. This difference could be due to different taxation policies for paper and other machinery in the US and Germany. The delivery prices as the companies are situated in different continents also weren't taken into account. The situation is that

[45] Fiscal 2011 Budget, Bloomington, Minesoty -
http://www.ci.bloomington.mn.us/cityhall/dept/finance/budget/budget11_full.pdf (last visited: 18.03.2012)
[46] 18.03.12 from http://www.fx.echange.com

FWK offers one of the best OER and print-on-demand services which can very well be used as a benchmark and an industry leader in this field and at the other hand our PoD Partner is situated in Germany. There are differences in governmental policies and the kind of support or subnational mechanisms they deliver to OER and printing industry which affects the prices, so the comparison is to be perceived with some degree of reservation.

Another inconvenience for the user is that FWK doesn't offer the possibility to download resources for free and print it at home. Only the online version is free to access. The PDF and eBook (epub & mobi) file *for Elementary Algebra* costs 24,95 US Dollars. When recalling the definition of OER, is says that everybody can get access to the resources, change it and redistribute it. Only the first point is fulfilled by FWK. The users do indeed have access to the content but only with an internet connection and due to the sophisticated user interface they need a good one. The other two points are just partly fulfilled as the editing and redistribution is done only within the FWK frame work and the redistribution as well. Redistributing the downloaded copies would lead to copyright infringements. Before was discussed about the broad definition of OER in the first chapter and noted that there is space for interpretation. FWK is of course an OER supplier and contributor but not in the traditional way pictured by the movement's initiators.

4.3 Advantages for PoD Provider

The third party to profit from this business model is the printing company. Through this new opportunity there are a lot of reasons for notable advantages for the PoD provider.

- **Increased turnover**
  Of course the first one is an increased turnover due to the new customers which might have otherwise not printed their book with print-on-demand model. Reasons for that are that not everybody has the knowledge to download and merge the files. Even if they had that skill, L3T has currently 48 chapters which would be a very time consuming activity. After that the user has to upload the content, choose the format and enter other information into the interface.

- **Marketing**
  Another advantage is marketing. Having a link in the front page of many OER institutions even if some of the users don't finalize the request, it makes good marketing. To be able to print the book the user has to login or register in case there is no previous registration. In this way the company gets new customers which are probably going to reuse their services in case they need it.

- **New technologies**
  Another advantage for the print industry is the connection to the ever growing

market of digital content. Amazon reported that for 2011 sales of eBooks went up with 175% compared to the year before (Vijayaraghavan, 2012). This numbers will put the print industry in the situation where they would have to rethink their cooperation with digital content.

4.4   Proving the solution

The way this project links the *content generating institutions* with the *printing industry* by offering a free and open source *plugin* is totally independent. This plugin gives the freedom with low costs to automatically bind your content with a professional publisher. Authors are given the time and possibility to take care of their work leaving the printing, billing, shipping and support to the professionals. In this case the system could be perceived as a pre-out-sourced mechanism giving the free space they always had and not submitting each other to unnecessary rules and pressure. Figure 37 demonstrates the cooperation between the parties in case of using independent OER publishing repositories.
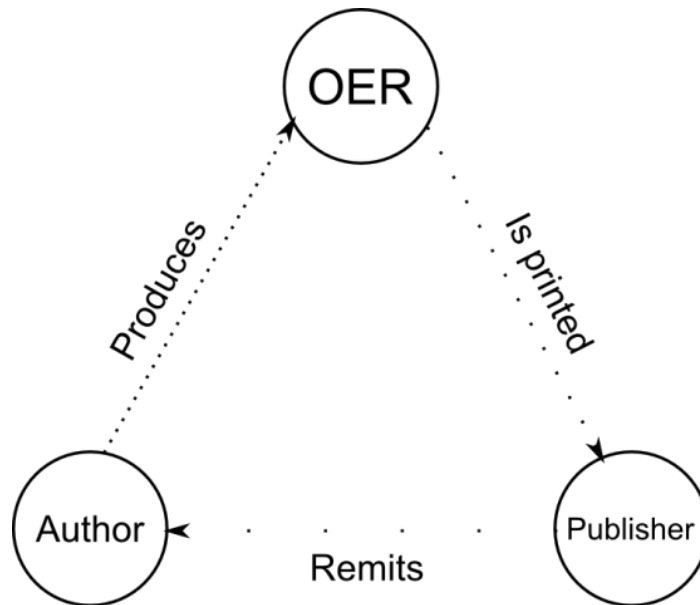
Figure 37: Cooperation between parties before POD Plugin

Authors were regular contributors to OER repositories, denoted by the density of the dots. OER at the other hand sometimes landed to Print-on-Demand publishers. But the weakest link was between private publishers and Authors. There was no reason to finance the

independent authors. There was not even a way to track that their work was printed there. Most of the financing was done as a donation or other non-business related transactions. In this master thesis a new solution is provided. Figure 38 shows the plugin in the middle of the diagram connecting the repository as the source of the material which is now directly accessible to the print-on-demand publisher. The plugin also connects the author as a major stakeholder configuring and setting the terms of usage starting from the amount of contribution to the direct access into the provider's repository with the login data. And at the other side the publisher which is directly referenced by the previous entities allowing the recognition of the source.
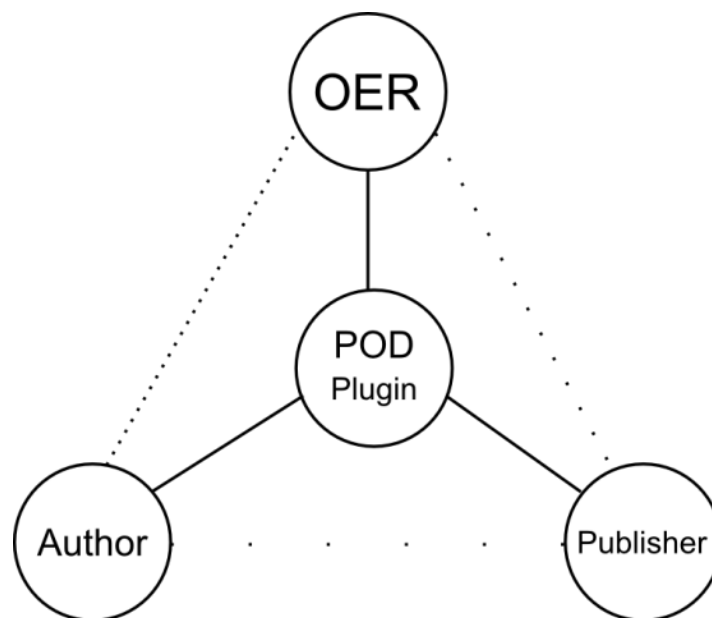
Figure 38: Cooperation between the parties with POD Plugin

Of course there are similar concepts like the one discussed before about FWK. Practically they cooperate with OER institutions and have the printing and repository system within their company. This method offers the user a very good all-around solution with virtual classes and forums but it has its costs. The bigger the entrepreneurship gets the more manpower is needed to maintain it. Manpower which on the other side is translated to costs which are transferred to the user. Of course this doesn't mean it is a disadvantage. On the contrary, it opens the possibly for far better integrated solution.
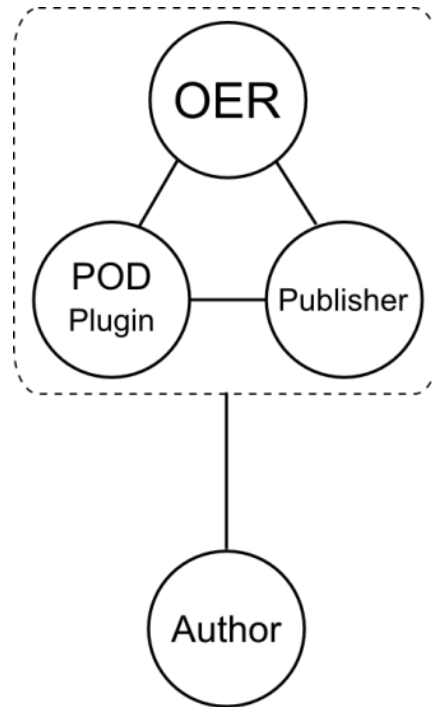
To give an idea of how these interfaces are organized under FWK figure 39 shows a picture which simplifies the understanding by adding our components to the diagram. FWK doesn't exactly distinguish the three elements within the frame like in this figure. It was added to the diagram for comparison and better association with the model showed before.

Proving that this plugin brings a solution to the missing link between the parties is not a statement that can be made after just analyzing the functionalities. Like all other products in the market it has to undergo a certain period of time in use so that the user acceptance, usability and other features are tested in order to make a conclusion.

On the other hand the conclusion for the project is clear, having achieved the goals made at the beginning. Which were to

- develop an open source plugin which gives small and medium OER institutions the possibility to refinances themselves

- analyze the chances of success of this new business model by examining the economic and technical perspective of the new plugin and existing solution in the market

- starting a topic for discussion about financing OER

5 Discussion

This chapter is going to discuss about the general impact of this system. How can business cases contribute to the long term sustainability of OER initiatives? What are the competitive technologies? Why still printing a book when digital storage is cheaper than ever and much more flexible? What are the ecological costs now that we are shifting more and more to the digital documentation to reduce the deforestation? It is also going to discuss the sustainability of OER in a broader spectrum. And finally give an opinion about the future of this market.

5.1 It's just business

Chapter one introduces OER, which added value does it bring and how can this value be translated into income for the producer. This section is conceived as a discussion about the possibilities and their implementation. Why isn't it yet the main stream publishing strategy and what might be the flaws of this approach.

5.1.1 Perception

In fact OER is already increasing its general acceptance. Other than writing some material and posting it for free, OER requires a change of mentality. When someone thinks of free they think of something that was of no value or no use to someone else. That's because people are bound to the understanding of value with material value. But with the digital revolution material value has lost its power. Information and access to it is more important than ever. This manly because information needs to be generated only once and has almost no costs of redistribution. So the first step towards understanding OER and all other open movements is to understand that the real value doesn't consist in the resource itself but in the tasks it fulfills. After understanding that the real value of OER is in the education of people, the discussion can switch to the next issue which is quality. In our brains when people see cheap products they automatically think of low quality. That's because it is true in the material production. No one is going to build better products and require less money than the competition. At least in capitalism the market will sooner or later penalize the unfair. This understanding is common sense for every part of our lives and to make things worse think about the cheaper (lower quality) product to be totally for free. It would be natural to think that there must be something behind it because even producers have to earn money in order to survive. As a matter of fact many of the authors of OER do pay their bills out of tax payer's money. That's because mostly they are teachers or professors who do this out of their own initiative. When they see value in it, not just for the small group they developed it for, they share it with the rest of the community. The authors as public employees are paid from tax payers. So in fact it did cost something and it is so cheap that it converges to the free because everybody pays taxes. Major roles in this direction have

played internationally recognized institutions like MIT. But it's not just about the reader's perception when it comes to OER. As Neil Butcher argues in his article about the flaws of OER, "giving away" their intellectual property is a big concern for the authors which are mostly educator and senior managers of educational institutions (elearning-africa, 2011). They would potentially lose commercial gain that comes with it and furthermore the idea that someone else will take unfair advantage of their intellectual property, benefit by selling it, plagiarizing it or other exploitations. He thinks that there is an ingrained resistance to sharing resources. But OER is increasing numbers of government commitments to sharing investments under open licenses which brought to a flood of openly accessible content online and now the momentum towards sharing is overcoming the resistance against it (elearning-africa, 2011).

5.1.2 Implementation

MIT is not a public institution and doesn't get paid by the government to share their course materials, articles and research studies for free. The value they see in OER is through passive advertising. Promoting itself as a major free contributor to the world wild high class education brings enormous advantages to the institution. MIT is a profit oriented institution and they wouldn't do it if they would think it doesn't return the investment. As was already showed OER not even is not cost-free but is also comparable with commercial publishing when it's about the creation of the content. So there is a clear business model behind their actions. One outcome in favor of the institution is marketing. But the advantages don't end up here. By offering low to free text books the institutions makes the study fees more affordable. Now to think that some books are going to make a difference in the decision about studying at MIT or not is a bit overrated, but the costs are not that negligible at all. Besides the indirect sales revenue generated from the open strategy there is also a direct impact in the student's budget which can be measured. Figure 40 shows a picture of OpenStax[47] Student Savings Calculator which shows the amount of money students can save through this model.

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[47] http://openstaxcollege.org/ (last visited: 01.04.2012)

Figure 40: OpenStax Student Savings Calculator (Stacy, 2012)

OpenStaxt is a government sponsored program to create free course materials that would save college students millions of dollars (Caswell, 2011). Their goal is to make text books affordable and end the 200$ price policy. The fact that they reached their goals means a lot to the public opinion. Maybe overpriced textbooks are promoting the OER initiative. It is the case to mention the fact that the state of Washington as a public agency is trying to regulate the market by offering alternative product (Stacy, 2012).

5.1.3 Innovation

"What makes open different is not so much what it derives economic returns from, but "how" it does so." (Stacy, 2012)
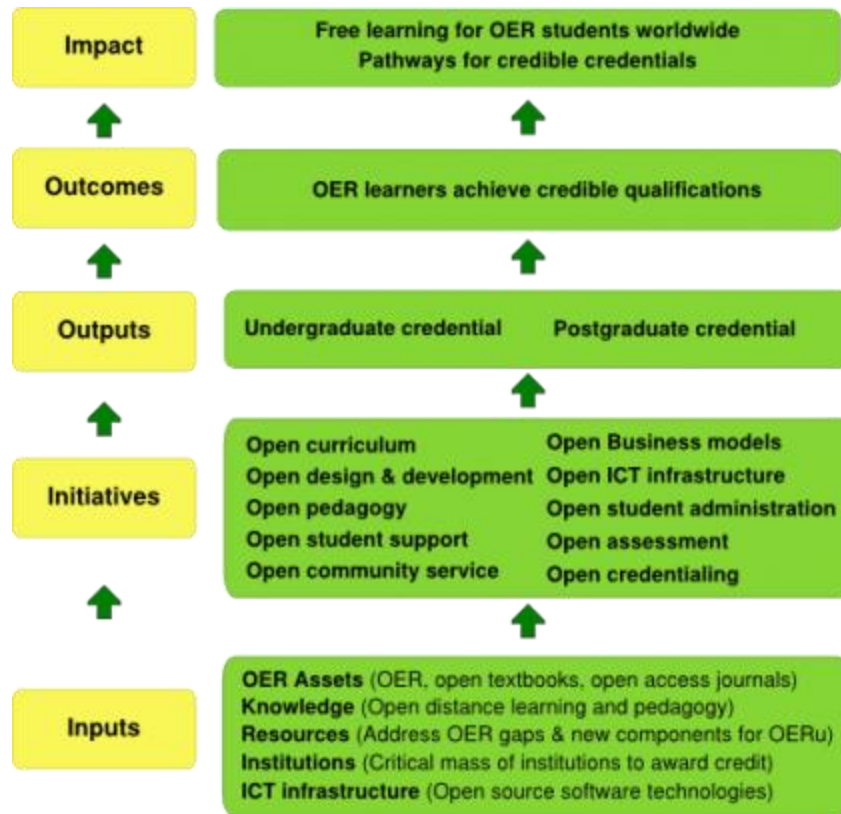
Figure 41: OER logic model (Stacy, 2012)

The whole idea is to make OER the motor of a new system where education is not a matter of money anymore. And it doesn't end up there. Through the cooperation much more innovation is stated. Innovation is an economic driver. It will bring up the quality of OER and change the situation where the scarcity of good products generates premium prices.

Nowadays the economy is based on mass production where the product is accustomed to fit as more customers as possible. With OER the products are customized to the needs of every entity which in return will contribute their changes to the community offering a variety of choices for the same product.

5.1.4 Possible flaws

One of the major flaws of OER is that it is an open initiative. In the eLearning Africa 2011 debate discussions addressed following motion:

"This house believes that the OER movement is fundamentally flawed because it is based on the false assumption that educational institutions are willing to share resources freely and openly." (elearning-africa, 2011)

It is true that educational institution don't see OER as their primary goals. For the initiative to work it needs the continuous growth and acceptance of new institutions. New regulation for public institutions have to be created in order to make sure this initiative doesn't end up in stagnation (elearning-africa, 2011).

OER is mostly a free initiative and individuals are driven by personal selfless reasons. This makes it hard to set requirements even if there might be space for new business models. This problem is solvable as long as the right license is used in order for interested successors to take over.

Considering the example of MIT where the institution is indirectly earning something out of it. The authors, which are the work originators are not directly profiting from publishing. From this perspective it might be acceptable as long as the institution is not directly earning money which can be measured. But if it would, the authors would be in a serious dilemma about the righteousness of the system. If MIT decides to sell printed copies of its OER repository, it would be fair from the authors to ask for a percentage. This would cause some serious organizational issues as the contributions would have to be calculated and shared not only with the current institutional members but with all participants.

There is space for discussion about the topic; if OERs are open to the community or like in some cases the community is just a set of restricted students who belong to an institution. You can still argue that even if not charged directly these students mostly have to pay registration fees to the institution itself. (Downes, 2007, p. 37)

5.2 New technologies

By the time this work was written, Apple had introduces iPad about three year before, bringing up a new way of perceiving reading digital content. There were eBook readers before, like Amazons Kindle or and Barnes & Noble Nook but they were highly specialized for static content and were mainly conceived just for that. Apple tries again to revolutionize the marked by introducing a new eBook format *iBooks,* which would make reading more comprehensive. This is particularly more interesting for scientific journals which often offer additional content to the articles. Within this new format it is possible to embed other file formats in a dynamic structure. With the new free writing program *iBook Authors* Apple made it easier to create eBooks with predefined templates and by dragging and dropping content into the program (Apple, 2012). Somehow it is becoming clear that iPad and other tablet products are not just competing with traditional books but with Amazons Kindle and Fire, which are the representative of the traditional eBook reader, as well. A study about the impact of tables on the Kindle showed that this wasn't necessarily the case. Just six out of ten tablet users were using it as an eBook reader. At the same time most of the interviewed readers were also interested in having a traditional eBook reader

such as Kindle (heise, 2012). This may be due to the high price of quality tablets but also to the variety of functionalities tablets offers where not every user might consider it for reading.

After having cleared the position of traditional eBook readers and the new tablets, it is time now to analyze the situation between printed books and eBooks. A new study showed that in Germany just 15% of the population is ready to pay for eBooks. The rest (85%) is not interesting in buying books in this form. eBooks were between the age of 30 and 40 most popular with 22% of the interviewed. For those from 18 to 29 years it had a popularity of 19 %, from 45 to 59 years it was 16% and for the older just 6% (stern.de, 2011).

This numbers were quite surprising as the study was made just before the book tradeshow in Frankfurt Germany (*Frankfurter Buchmesse*) in October 2011, which had forecasted a breakthrough of the digital format. Although very convenient in using the readers aren't quite used to the electronic format yet. But for how long is it going to be like that? The Economist[48] made a forecast about the market share of tablet for the following years.
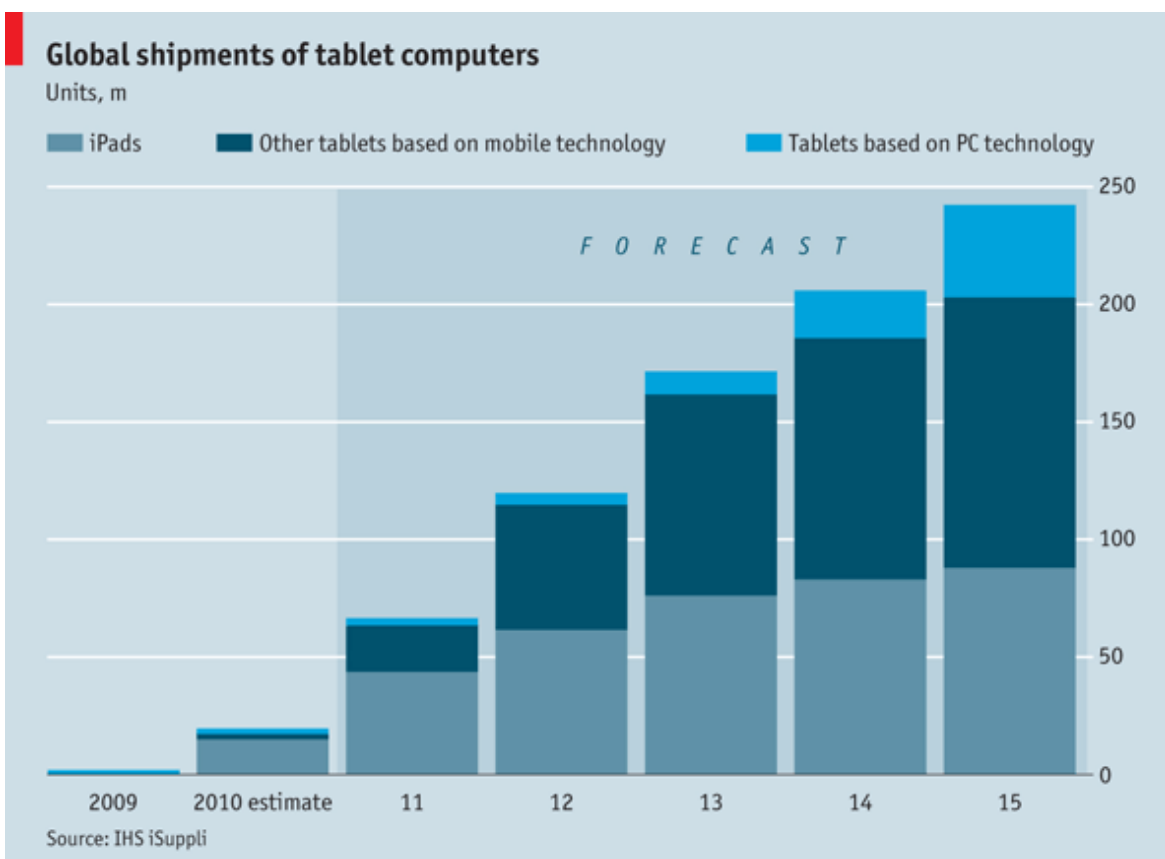

Figure 42: Forecast tablet market share (The Economist Online, 2011)

Figure 42 shows clearly that the market is booming. Considering these data with the survey

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[48] www.economist.com (last visited: 01.04.2012)

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from Germany which concluded that six out of ten tablet owners read books with it can be concluded that the number of eBook readers will increase. In 2010 Amazon announced that it had sold more eBooks that printed copies and the rate was 143 eBooks for every 100 hardcovers (Houle, 2010). David Houle also gave a forecast in 2010 when he wrote his article for the following years and he was quite accurate about 2011 considering the study from Germany about printed vs. digital. Here we see his forecast about purchasing in electronic form:

2010 10%
2011 15%
2012 20%
2015 40%
2020 60%
2025 75%

He also mentioned in his article about the competition between Kindle, iPad and Barnes & Noble Nook for the eBook market where multiple format readers like iPad are clearly more advantaged by the fact that they can reach a bigger eBook format market.

5.3   Environmental Issues

Of course when someone thinks about printing they have to consider the costs of paper in the eco-system. Is it just the paper that causes damage to our environment and electronics come with zero costs? According to Morgan Clendaniel one average book produces 7.5 Kilogram CO_2 emission. On the other side iPad takes 130 kg CO_2 and Kindle 168 kg CO_2 to produce (Clendaniel, 2010). For an average reader who reads 5 books a year it would take on average up to 4 years to reach the same carbon emission. But books are thicker than journals which have on average 70 pages. In our case L3T is a book compound of 48 articles with around 500 pages. But it is not issued monthly so the ecological costs are not higher than reading online. FWK for example offers the material just for online reading which assumes at least a personal computer with internet access. It is difficult to decide which one of both formats is the best, as it depends on many factors. But it is an issue which affects all of us and maybe it will be examined further on in other studies.

5.4   Open Movement compatible

In the last section of this thesis it was discussed about the moral issue of charging users for Open Educational Resources. The main question is: "is it right for the publisher to ask for a percentage of his work if others earn something out of it?". During the previous chapters it was shown that there are different states of openness and many licensing strategies. So

what arguments could be brought to light in order to defend the strategy this study is offering?

5.4.1 The right to share

Open Educational Resources is about sharing your intellectual property, for free with everybody. In this case the creator is the source of sharing and the user is the destination. On the other hand now there is a new player on the field, the print-on-demand Provider. For them it is business as usual no matter if it is an open resource or the next commercial best seller. But if a closer look is done to the whole system where all three players, the Publisher, the Provider and User, are interconnected it is easier to understand that the only entity which is sharing something is the publisher. So the argument is, *if the publisher is sharing something he/she owns, why shouldn't the PoD provider share some of his/her revenue which came out of the publishers work in the first place and wouldn't even be there if he didn't share it*. Wouldn't it be fair if the work originator would get a small share for his contribution if others make business out of it? The presumption is that many people including the users would find it legitimate.

5.4.2 How much overhead is right?

If it is right to ask for some contributions, where is the limit between fair charge and overpriced? This is a personal decision that every publisher has to make on his own depending on his/her needs and the value he/she sees in his/her work. Reviewing figure 42 about the prices on printing OER from FWK and epubli to have some numbers leads to following thoughts. The diagram shows that printing from epubli was ¼ cheaper than FWK. But is it right to ask for ¼ of the total price? FWK is a profit oriented company and has to pay the bills and at the same time make some revenue for further investments, so the overhead is justifiable. OER publishers don't always have these kinds of costs and in the most cases they are public employees which anyways get paid by the tax payers. A practical argument would be to repay the contributors for their invested work. But it would be hard for this approach to calculate the overhead if the sales amount is not known beforehand.

The contribution should justify the purpose and maybe some small gain as an incentive for the author. The limits than are free to choose.

5.4.3 The proposition

By the time this Plugin was developed there was only the possibility to add the contribution fee to the providers bill. This means that if the book would cost 10€ then the

contribution, let's say 1€ will be added to that bill and the sum would be 11€ for the user to pay. In the domain of sharing the right thing to do is, that the provider would share this 1€ cost with the user and instead of charging 11€ it would cost just 10.5€. The example tries to deliver the idea of sharing and not the goal of saving every user 50 Cent or lowering the revenue of the PoD provider by 50 Cent. The provider on the other hand can ask for governmental subventions for this extra amount or the government can pass extra laws to compensate it through taxes. Returning to the example of the OER initiative form the state of Washington it is clear that it is in the government's best interest to promote OER. As the report says the state of Washington spends at least $125 million a biennium on textbooks in K-12 alone (Reuven, 2012). It is on the government's best interest to save money so this case isn't as difficult as it seems.

5.5 Conclusion

Education is the best choice for developed countries to sustain their standard of life in the long term. It also is one of the few possibilities for countries in development to raise their social and economic value. Public and private investments are consistently increasing, and by doing so, creating space for new ideas. How these funds are shared out between the stakeholders is very important for the balance of the whole system. OER as one of these new ideas, in creating and sharing educational resources, is steadily gaining popularity. But it is also facing some difficulties like every new concept in the market. Probably the most important is its acceptance as a comparable and equivalent product with the traditional book industry. Another topic available for discussion is the funding models of OER and how to make OER attractive for each involved party. Even though these resources are free, it doesn't mean that people shouldn't earn something out of it. Especially the authors as the source of this knowledge should be able to retrieve some profit out of the business. This master thesis tries to promote the flow of contributions to the resource originator, hence the author. It also defends the already available OER publishing strategies, by offering the possibility to download and view the content for free at any time. In case the user finds an added-value and decides to pay for it, then sharing this revenue with the author would be a fair business model that would satisfy both, the print-on-demand provider and the publisher. OER authors don't usually start their projects with the idea of earning a living out of it. In many cases these resources are connected to their daily jobs or are shared for personal non-profitable reasons. But this could change if authors recognize a possibility to acquire a livelihood out of it. In fact authors writing these materials are the same qualified individuals who would otherwise publish under other terms of conditions. Making it interesting enough for them to publish OER doubtlessly depends on the monetary incentives the system has to offer. The plugin included in this master thesis was exactly developed for this reason. Building integrated links between the parties and promoting the financial redistribution of the revenue. It is important to mention in this conclusion that the

concept is still in its early phases and it is up to the user acceptance to prove its added value. The theoretical aspects about is benefits still have to undergo the analysis of market economy.

5.6   Personal statement

Working for this master thesis was a very illuminative experience. Getting to know that there already are so many possibilities to educate people with first class materials all over the world was very motivating as well. To my opinion OER is going to impact the traditional school book printing industry in a similar way Skype did with telecommunication. I don't think it is going to replace it. It would more offer an alternative product which is competitive in the market. This would probably lead the publishing industry to rethink their market strategy and concentrate on a product segment like the car industry does with its elite and economical classes. To reach this state, it would have to be attractive for authors and students at the same time. User's only concern after the proved economic benefit is the quality. Quality is reached through the broad participation of qualified authors. In this sense the next step would be attracting authors to this system.

During this master thesis there were almost no theoretical shortages. The topic is well discussed from the community. Implementing the plugin was a bit trickier as OJS and epubli were not conceived to operate with each other. But thanks to eplubi's flexibility we could customize our interfaces and offer the best possible solution.

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