

Cross Media and E-Publishing

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Abstract

Since the invention of Gutenberg's printing technology, paper has been the predominant medium for the distribution of information. However, in the last century new technology such as like radio and television has emerged, partly complementing and partly replacing paper. In the 1990s the Internet established itself as another major distribution channel for information. The multiple distribution channels make it necessary to efficiently serve the different formats of the media. These efforts are termed Cross Media. Over the past few decades Cross Media and ePublishing have become regarded as important success factors not only for publishing houses and media companies but almost for any company regardless of sector. While there are many sophisticated concepts within Cross Media, a rather down-to-earth facet - the printability of Internet documents - has been investigated in this study. For example, does it make sense to offer a rotogravure, high gloss brochure that one gets in a car-dealer show room for download and print-out on an ordinary black and white home printer. Should companies offer optimized plain black and white print-outs that reduced print-out time and costs for the end user? Should companies offer even multiple formats to suit the different needs of customers. Our analysis can be taken as an indicator of the degree of maturity and awareness of Cross Media and ePublishing - if these rather simple issues are not perfectly solved then Cross Media can be regarded as still in its very beginnings. Therefore, we analysed the print-outs of institutions and companies of several industries and compared the results within the industries as well as between them.

Keywords: *Cross Media, ePublishing, Printability of Internet Documents*

1. Introduction

Cross Media Publishing is an important consideration for classic publishing houses and media companies. It is their core business to sell information to their customers. They use all major channels, including paper, radio, television and the Internet, to distribute their content. However, the importance of Cross Media Publishing is not limited to publishing houses and media companies but is essential for almost any organisation (companies, government bodies, foundations etc.) that need to inform their stakeholders. For example, the main stakeholders of a company include employees, customers, the public and shareholders. Government bodies may need to inform about new laws, publish safety regulations and warnings besides and many others.

The increasing importance of Cross Media Publishing is fuelled by several factors. These include the introduction of new media technologies, change in user behaviour and new documentation technologies. A major trend away from information provided on paper

towards the electronic distribution of content is obvious. This trend has recently been accelerated by the breakthrough of tablet computers and ebook readers.

Nevertheless many people still prefer to access information printed on paper. In our article we do not want to analyse who still prefers to print and we do not want to study the motivation for printing-out electronic documents in detail. A reason might be that this is a question of age, i.e. older people might stick to their old habits and prefer to access information provided on “real” paper while younger have already grown up with electronic media and therefore do not have the needs to print out electronic documents. However, there is obviously still a big need for information on paper.

Hence, the objective of our study is to investigate how selected media houses, companies and public bodies support the printing out information that is originally provided on their websites.

The remainder of the article is organized as follows. In the next Section we introduce some foundations of Cross Media. In Section 3 we describe and discuss the setup of our analysis and present selected results. The paper concludes with a summary in Section 4.

2. Foundations of Cross Media

2.1 The Increasing Importance of Cross Media Publishing

As already mentioned in the previous section the increasing importance of Cross Media Publishing is fuelled by several factors, in particular the introduction of new media technologies, change in user behaviour and new documentation technologies. These drivers behind Cross Media Publishing are addressed in more detail in the following paragraphs:

Introduction of New Media Technologies. Information printed on paper dominated the mass distribution of information until the 1930s. Then radio emerged as a new medium and in the 1950s television was established. In the mid-1990s the Internet revolution began. Presently the expansion of the Internet onto mobile devices (phones as well as tablets) is forced by major IT companies like Microsoft and Google as well as telecoms like Deutsche Telekom or Vodafone.

Change in User Behaviour. The introduction of new media technologies has changed how customers access information. For example, the Internet has not only partly replaced paper newspapers but has partly replaced television as well. The Internet has also become an important source of information on products. As mentioned above, major companies have been establishing multi-media solutions for the mobile market.

New Documentation Technologies. For many years information and its representation have not been clearly separated. While there have been concepts suggested for many years (eg GML - Generalized Markup Language - as early as 1966 [1]) it took until the beginning of this century to establish a well-accepted technological standard for the separation of information and its representation, namely XML - Extensible Markup Language (<http://www.w3.org/XML/>).

Against the background of these fundamental developments, we addressed the question “How well Internet documents are formatted for print-outs?”

2.2 Cross Media and ePublishing

Nowadays information has an essential impact on economic and private life. Thus it is important to provide it quickly and effectively. Cross Media Publishing exists for this

purpose. With Cross Media Publishing versatile data with identical content can be made accessible as texts, pictures, news and music through different media. This includes classic print media and application on electronic devices like radio, TV, personal computers (desktops, laptops and tablets), mobile phones. In particular, electronic media like personal computers, mobile phones and TV have begun to merge in function and usage.

Concerning the distribution of information – amongst others on the Internet – the topics Single Source Publishing and ePublishing play a decisive role in the Cross Media Publishing sector. Single Source Publishing (SSP) is not only a specialization but also an optimization of Cross Media Publishing. SSP is a process that allows the storage and administration of information in one single data source in order to publish it in various formats and/or even through different media afterwards. Various formats can include a screen version, a mobile phone version and a printer friendly version of documents, reports, presentations, manuals, specifications and forms [2, 3, 4]. The aim of the application of SSP is to create a separation between content and presentation (design) and the storage of information in one specific place in order to automatically recall, process and publish it in different formats for the purpose of re-use [5, 6].

When using SSP, identical contents do not have to be authored several times and the occurrence of errors and inconsistency is minimized. Furthermore efforts resulting from uploading data are reduced significantly due to the existence of only one database. Within the SSP process usability is strongly emphasized by the adaptation of content and presentation to a layout that meets users' requirements (e.g. generation of optimised PDF files which are applicable not only online but also as print-outs) [5, 6].

The idea behind SSP sounds simple in theory but in practice it demands a challenging realization. Within an efficient SSP, content management and XML technology have to be combined whereas it is not always obvious in which manner this is performed by companies. There exists no precise approach to its realization but there is work on the development of standards and guidelines. Most of the SSP users prefer applying XML [7].

XML is primarily used for the media-independent storage and structuring of information. Content is assigned with metadata along with information about the stored content. With the aid of these metadata it is rendered possible to provide readers with relevant information in adequate formats. An illustrative example is an article which needs to be published online and in a newspaper. The article emanates from one XML file and is published summarized online while in the newspaper it is written in more detail and contains graphics and pictures with a higher resolution [4]. As information is mostly stored over a longer period of time the use of XML turns out to be very profitable for content management. Thanks to XML the technological obsolescence of content due to new software versions and publishing formats is bypassed successfully [2].

ePublishing is the abbreviation of electronic Publishing and refers to electronic publishing of content. It is part of Cross Media Publishing as it focuses on electronic media like personal computers, mobile phones and TV. Computer publications can be provided on the Internet, Intranet, in databases or on CD-ROMs. On mobile phones information can be transmitted through WAP (Wireless Application Protocol), MMS (Multimedia Message Service) or SMS (Short Message Service). Televised information is sent with the aid of DVDs, TV shows and teletext [8, 9, 10, 11, 12]. ePublishing can be carried out according to SSP principles but it does not necessarily have to. This study focuses on ePublishing solutions that are made available to the public via Internet.

3. Printability of Internet Documents

3.1 Printing Challenges

This study gives insights into the diffusion of Cross Media Publishing into rather simple real life problem, the printing of internet documents. Let us consider an example, the printout of a newspaper article as depicted in Figure 1.



Figure 1. Print out of a News Paper Article

While the layout of the article is perfect for computer screens and also a coloured high quality print looks surely appealing a standard printout “just” for reading the article might have the following drawbacks.

- The orange header and the large figure do not contribute to the content of the article. When printing the article the layout costs unnecessary ink or toner. Besides financial aspects which may cumulate to substantial costs in a company such a printout is in striking contrast to sustainability objectives.
- Although colour printers have gained a reasonable market share, b/w printers are still widely used. However, the article is optimized for colour prints rather than for b/w prints.

Generally, further examples for printing challenges include:

- Normally an automotive dealer provides customers with rotogravure brochures printed on heavy high-gloss paper. But does it make sense to provide the same brochure as a PDF-download on the website of the company? A print-out of such a brochure never matches the quality of the original; the printing takes much time and is rather expensive.
- An insurance company application form provided as a PDF-download is shaded. Compared with a fully sufficient pure black and white form the printing costs are much higher.
- In print-outs of newspaper articles the figures are unreadable small; the figures may have to be printed separately.
- Pages from a company website must be printed together with the (colourful) header, menu tree and the footer. This superfluous information makes a print-out more expensive than necessary. Furthermore such formatting is far from optimal.

Therefore, in this study we analysed the print-outs of institutions and companies in several industries and compared results within industries as well as between them.

3.2 Common Features of Print Versions

To analyse printout we have identified important features:

- Type of Print Version
- Mode of Document Request
- Visual Features
- Way of Generation of the Print Version.

They are discussed in more detail in the following sections:

3.2.1 Print Versions

Basically there exist three different types of print versions:

- **Document Print Version.** The document print version is mostly a PDF or a DOC version of the information seen onscreen.
- **Website Print Version.** When requesting a website print version (e.g. HTML, PHP, JSP) an additional browser window appears with the information for printing. In comparison to the document print version there is sometimes the possibility to choose settings mostly regarding removing or showing graphics/pictures in the print version.
- **No Print Version.** Sometimes there are Internet pages with no print version at all. In these cases the information has to be printed as it appears onscreen. Consequently information that is actually not needed is transferred to paper. Sometimes these

unnneeded elements like banner ads or navigation bars cannot be printed completely as they do not fit to the DIN A4 size. And if they fit to the size they lead to a high wastage of printing stock.

3.2.2 Mode of Request

In order to bring information onto paper, the print version has to be concretely requested. There are often links to printer friendly versions around the content the reader is interested in. After the user clicks on the link in most cases the print version is shown before the printing process. So before printing, the reader can make settings on the content appearance that deviates from the standard format. These settings include paper format (e.g. DIN A3, DIN A4, DIN A5), alignment (vertical and horizontal format), content size (e. g. the letter size) and duplex printing. The study of printing stock consumption by print versions focuses on standard formats.

If a print version is requested a certain amount of data has to be downloaded. In most cases the download proceeds in an acceptable length of time. Downloading PDF files could take longer. This is due to capacious data volumes resulting from a high number of pages and an extensive design of content elements.

3.2.3 Visual Features

On generation of printer friendly versions the visual features of the documents change in support but also in account of the printout. The changing visual features include texts, graphics/pictures, company logos, the alignment of contents and the takeover or omitting of unnneeded elements.

3.2.4 Way of Generating Print Versions

There are many ways to generate printer friendly versions. The two major methods are request of printer friendly documents and printer friendly transformation of Internet pages.

In order to request printer friendly documents there are links built in to the documents in the code of the website. These documents can be generated almost completely automatically and contain in advantageous cases only elements which are needed for the printout. These elements should have a design that is appropriate for the printout. The type of print versions is document or website versions. On requesting the printer friendly version these documents are opened and shown to the reader. After that the reader can make desired settings and decide on the printout of the document. In individual cases the printer friendly version is not shown to the reader but is directly sent to the printer. Generating printer friendly versions leads to the further possibility of transformation of websites by their source code. Elements of the website are altered by the aid of Cascading Style Sheets (CSS) or JavaScript commands so that the website takes a form that is adequate for printout. The commands are automatically started when the reader requests the printer friendly version of the website.

3.3 Consumption-Related Issues of Print Versions

Some web page providers force a wasteful usage of printing stock by the design of their Internet documents or print versions. In our analysis we identified the following as the main cost drivers:

- Improper Colour Usage
- Company Logo
- Additional Contents

They will be discussed in more detail in the following sections.

3.3.1 Improper Colour Usage

One of the reasons for a high printing stock consumption concerning printed online documents is improper colour usage. This applies to documents in which only the text is interesting to the reader. Improper colour usage means the usage of different colours for elements like texts, headings, text shadings and background. An improper design of content causes a high printing stock consumption, too.

3.3.2 Company Logo

The company logo is often too large and colourful. Graphics and pictures are also quite large; in many cases they could easily be visible in a smaller format. A further reason for high consumption is the improper alignment of content including text, headings, company logos, pictures and graphics. The spaces between these elements are often too large, the margins are too broad or the alignment is so disadvantageous that more paper is needed for the printout than necessary.

3.3.3 Additional Content

Very often additional webpage content is printed with irrelevance to the topic. This unneeded content could be advertisements, lists with further articles, frames and irrelevant pictures and graphics. The final major reason for a high printing stock consumption is programming errors which have a visual impact; there are for instance printer friendly versions that indeed contain the information needed for the printout but on the rest of the pages there are unneeded signs and lines.

4. Analysis

4.1 Analysed Industries and Companies

German companies with a common awareness level were considered. Below is a list of the industries and companies analysed.

Newspapers

- Handelsblatt (www.handelsblatt.de)
 - Die Zeit (www.zeit.de)
 - Welt Online (www.welt.de)
- Sueddeutsche (www.sueddeutsche.de)
 - F.A.Z. (www.faz.net)
 - Berliner Zeitung (www.berliner-zeitung.de).

Magazines

- Stern (www.stern.de)
- Spiegel Online (www.spiegel.de)
 - Focus (www.focus.de)
- Manager Magazin (www.manager-magazin.de).

Tabloids

- Bild (www.bild.t-online.de)
- Freundin (www.freundin.de)
 - Brigitte (www.brigitte.de)
- Menshealth (www.menshealth.de)
- GQ (www.gq-magazin.de/gq)

Automotive Industry

- BMW AG (www.bmw.de)
 - Audi AG (www.audi.de)
- Porsche AG (www.porsche.com/)
- Volkswagen AG (www.vwn.de)
- Daimler AG (www.mercedes-benz.de)

Insurance Companies

- Hannoversche Lebensversicherung AG (www.hannoversche-leben.de)
 - Allianz SE (www.allianz.de)
 - Gothaer Versicherungsbank (www.gothaer.de)
 - DEVK (www.devk.de)
 - Victoria Versicherungen (www.victoria.de)

The document types analysed were articles on various topics, weather forecasts, insertions, forms, degree course schemes and information brochures.

4.2 Process of Consumption Analysis

4.2.1 Preliminaries

Importantly we will define the method of analysis first. An agreement will be made on prevalent features concerning PC users. The features standardized were:

- Printer Technology and Formatting Standards

Banks

- Deutsche Bank AG (www.deutsche-bank.de)
- Dresdner Bank AG (www.dresdner-bank.de)
- DAB Bank AG (www.diraba.de)
- Bayerische Hypo- und Vereinsbank AG (www.hypovereinsbank.de)
- Sparkassen (ww.sparkasse.de)

Internet Service Providers

- T-Online (www.t-online.de)
- Alice by HanseNet (www.alice-dsl.de)
- 1und1 (www.1und1.de)
- freenet AG (www.freenet.de)
- AOL Deutschland Medien (www.aol.de)
- Tiscali GmbH (www.tiscali.de)

Universities

- Hochschule München (www.hm.edu)
- Ludwig-Maximilians-Universität München (www.uni-muenchen.de)
- Technische Universität München (portal.mytum.de)
- Universität Heidelberg (www.uni-heidelberg.de)
- Universität zu Köln (www.uni-koeln.de)
- Fachhochschule Köln (www.fh-koeln.de)
- Heinrich-Heine-Universität Düsseldorf (www.uni-duesseldorf.de)
- Technische Universität Dresden (tu-dresden.de)
- Fachhochschule für Wirtschaft Berlin (www.fhw-berlin.de)
- Universität Augsburg (www.uni-augsburg.de)

- Document Types
- Graphics and Images
- Printing Stock Consumption.

Printer Technology and Formatting Standards. Standard office paper, inkjet and laser printers were used. The printing colours were black and white and there was be no draft print. The paper format was DIN-A4 with a panel format, the dimension of the printout was 100% and it was one-sided.

Document Types. Only the same document types with same or similar content were compared. For example, life insurance forms were compared with other life insurance forms and not with political articles. Only printer friendly versions with a similar number of words were compared, otherwise there would be great differences in consumption due to text length and not design. Longer texts lead to not only greater paper consumption but also greater ink/toner consumption due to additional images or unneeded content.

Graphics and Images. A distinction was made between Internet documents containing graphics/images and documents with no graphics/images. Documents that provide the possibility to blank out graphics/images or automatically blank out graphics/images in the printer friendly version are classified in the aforementioned distinction field.

In our analysis, the possibility of blanking out graphics/images was regarded as an advantage concerning consumption. Internet documents with the possibility of blanking out graphics/images or with automatically blanked out graphics/images were evaluated in both distinction fields. They were analysed with blanked out graphics/images in the field “Internet documents with graphics/images” if the given graphics/images were not necessary for text comprehension. Moreover they were evaluated with blanked out graphics/images in the field “Internet documents without graphics/images”. Graphics/images remain only faded in if they are essential for text comprehension. In this case documents with the possibility to blank out graphics/images were considered in the field “Internet documents with graphics/images”. In other respects, text documents were compared with text documents, and documents with text and graphics/images were compared with documents with text and graphics/images, as documents with graphics/images cause higher consumption.

Printing Stock Consumption. The printing stock consumption caused by a document is determined independently of monetary values. The reason for this is that paper and ink/toner costs vary with time and differ depending on paper and printer type. For the purposes of analysis, it was assumed that standard paper (1.26 Euro Cent per page) [13] and printers were used.

If these factors had not been considered, variations would result between Internet documents of different companies that could not be attributed to fair comparison.

4.2.2 Analysis

We concentrated on consumption of resources when printing an Internet document. Criteria considered were:

- Paper Consumption
- Amount of Colour
- Unneeded Content

- Number of Graphics/Images.

Paper Consumption. Paper consumption per Internet document was determined first. The frequency of the letter “n” (copied from the Internet document) on a DIN-A4 page was calculated. The paper consumption can vary depending on the font and width and length of the letters. In order to determine paper costs per Internet document that were comparable, the letter “n” was copied from the document and pasted in a Microsoft Word document. Paper costs were then calculated per document by multiplying the number of pages of the Microsoft Word document and costs per DIN-A4 page. Additionally the actual paper costs were calculated depending on the actual number of printed DIN-A4 pages. Differences between the number of pages needed and the number of pages resulting from pasting the letter “n” into a Microsoft Word document were due to the fact that the Internet document (unlike the Microsoft Word document) can contain graphics/images, different spacing and unneeded elements.

Amount of Colour. The amount of colour used was determined by the brightness value of the Internet document. Each Internet document was converted to the TIFF format which afterwards was transformed into a greyscale image in order to simulate a black-and-white printout. The brightness value can be derived from an Adobe Photoshop histogram. It can vary between 0 and 255. 0 means “black” and a high colour consumption whereas 255 means “white”; if a document had a brightness value of 255, an empty sheet of paper would be printed out.

Furthermore a comparison was made between the optimal and the actual consumption per document in order to show possible savings. The optimal consumption was calculated by determining the number of pages and the brightness value that would result if unneeded contents were removed and a more appropriate font design (Times New Roman, 11 pt) were chosen. The lower the room for improvement the lower was the printing stock consumption.

Unneeded Contents. Analysis of unneeded content led to further comparison of consumption. Unneeded content in the Internet document being tested was placed on an empty DIN-A4 page with the help of Adobe Photoshop. The brightness value of the unneeded content was then determined. A brightness value of 255 would be optimal as this would represent an Internet document with no unneeded content. The deviation of brightness values from the optimal value 255 was a basis for comparison of printing stock consumption. The higher the variation of the optimal brightness value the higher is the consumption due to the amount, size and design of unneeded content.

Number of Graphics/Images. The average number of graphics/images per Internet document were also determined. The number of graphics/images in documents has a great impact on printing costs. The conclusion must not be drawn that a greater amount of graphics/images causes a higher printing stock consumption as not only the size of the graphics/images but also the colour design has a deciding impact on the consumption. The aim of this part of the analysis was to investigate the average number of graphics/images per document in each of the considered branches. Intra-branch documents with the same or comparable topics were used.

On analyzing, comparing and evaluating the printing stock consumption by Internet documents the principles of fairness and seriousness were adhered to as well as possible.

4.3 Results

4.3.1 Exemplary Results for Newspapers

Due to space restrictions, only results of our newspaper-related analysis are included. A comparison is made between the newspaper with the most economical printing stock consumption “Die Zeit”, and the newspaper with the least economical printing stock consumption “F. A. Z.”.

	Die Zeit	F. A. Z.
Average number of the letters “n” per DIN-A4 page	2448.33	1904.40
Average paper cost per document	€ 2.10	€ 3.78
Average brightness value of documents	244.86	241.52
Average room for improvement concerning the brightness	0.11	3.32
Average room for improvement concerning number of pages	0.22	0.40
Average variation from the optimal brightness value 255 of unneeded content	0.12	8.54
Average number of graphics/images per document	0.56	3.2

“Die Zeit” proved to have a more economical printing stock consumption than “F. A. Z.” at all points.

4.3.2 Summarized Ranking of the High Scoring Companies regarding Most Economical Printing Stock Consumption

Based on analysis of selected Internet documents, the following companies have the most economical printing stock consumption.

Newspaper

1. Die Zeit (www.zeit.de)
2. Handelsblatt (www.handelsblatt.de)
3. Welt Online (www.welt.de)

Insurance Companies

1. DEVK (www.devk.de)
2. Hannoversche Lebensversicherung AG (www.hannoversche-leben.de)
3. Allianz SE (www.allianz.de)

Magazine

1. Focus (www.focus.de)
2. Spiegel Online (www.spiegel.de)
3. Manager Magazin (www.manager-magazin.de).

Banks

1. Bayerische Hypo- und Vereinsbank AG (www.hypovereinsbank.de)
2. DAB Bank AG (www.diraba.de)
3. Sparkassen (ww.sparkasse.de)

Tabloids

1. GQ (www.gq-magazin.de/gq)
2. Menshealth (www.menshealth.de)
3. Freundin (www.freundin.de)
- 4.

Internet Service Providers

1. Alice by HanseNet (www.alice-dsl.de)
2. freenet AG (www.freenet.de)
3. Tiscali GmbH (www.tiscali.de)

Automotive Industry

1. Porsche AG (www.porsche.com/)
2. BMW AG (www.bmw.de)
3. Volkswagen AG (www.vwn.de)

Universities

1. Fachhochschule für Wirtschaft Berlin (www.fhw-berlin.de)
2. Technische Universität Dresden (tu-dresden.de)
3. Heinrich-Heine-Universität Düsseldorf (www.uni-duesseldorf.de)

It must be noted that these results are snapshots at a certain time. The dynamics of the Internet age bring about constant change in web representation of companies.

5. Conclusion

The analysis shows a wide range of approaches for printing of Internet documents, from excellent to improvable. Since the printability of Internet documents can be regarded as technologically advanced, the results are surprising.

A reason for suboptimal approaches may be that Internet representation runs on old legacy systems that do not support advanced features for optimal print-outs. There may also be a lack of awareness in companies of the need for printable Internet documents. A sound analysis of this issue is beyond the scope of our study.

The main result of our analysis is that an apparently simple feature of Cross Media, the print-out options of Internet documents, is still far from being optimal. If we take this as an indicator for Cross Media as a whole it can be regarded as still rather immature. The central challenge for companies is to continue trying to introduce new technologies and adapting them to user needs as closely as possible.

Based on this study various further developments can be made. So far it has not been possible to determine the toner or ink consumption caused by Internet documents. The aim of the intra-branch comparison concerning printing stock consumption was achieved with the aid of paper costs, comparison factors and room for improvement. It would be advantageous to discover a way of showing toner or ink consumption in exact consumption amounts (grams, millilitres). Thus not only paper costs but also toner/ink costs could be determined.

Further advancements could be made by developing a tool that - after entering the needed data - would automatically calculate the printing stock consumption of the considered Internet document. In addition the tool could make suggestions for improvement to web page designers after analysing the Internet documents developed.

In this study German companies were the focus. An additional international intra-branch comparison of printing stock consumption would also be very interesting.

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