

Human-Centric Design of Future Print Media

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ABSTRACT

In this paper we argue that the plain old “dumb” paper is overlooked as a platform for media. In addition to technology-centric innovations, such as smart paper, the pulp and paper industry should adapt a human-centric approach as well. By using our research on photo books as an example, we bring forth the qualities of paper media from a user-centric perspective. This perspective is critical in understanding the changing media business. For the pulp and paper industry, understanding the end-uses of paper from the users’ perspective means new opportunities for business, partnerships, products, and services. However, the situation calls for an active role: paper will remain an undervalued technology platform without an intervention from the industry.

INTRODUCTION

When it comes to information and communications technology (ICT) the pulp and paper industry seems to suffer from an inferiority complex. Paper based products and services are often perceived as old and “low-fi” technology in comparison to the bleeding edge “Web 2.0” or “social software” computer technology. We believe that this perspective is turning a blind eye to the potential of paper.

At the Helsinki Institute for Information Technology HIIT we have studied how people create, share, consume, re-use and communicate with media in their lives: why and how do people take photographs and videos, build their own games, create and maintain social networks, and manage identities and socialize in virtual and physical communities. Our approach to understanding personal media and content production is human-centric. We emphasize the study of people in their real life surroundings to enable us to understand the potential of latest technology. This approach does not limit us to certain technologies.

Based on our experiences we argue that the basic non-intelligent paper (“dumb paper” in contrast to smart paper) has been overlooked as a future technology for media. It has clear benefits over software and computer based technologies, and these benefits become obvious through a more human-centric (*i.e.*, user-centric) approach to innovation.

In this paper we discuss the role of paper in future media services and products. We draw attention to the need for more human-centric thinking and design methodologies. Human or user centeredness has been one of the major paradigm shifts in software design in the last decades, and

we argue that innovation in the pulp and paper industry has to adopt this perspective as well.

First we discuss the similarities between the computer industry in the past and the paper and pulp industry of today in understanding the needs and requirements of the end-users. Then we discuss the changes in media business and people’s activity in making media themselves, and the opportunities that paper and digital hybrid services or products have in this business. Then we discuss how new innovations that leverage the best of both digital and paper media are possible through human-centric methodologies and design. In the end we conclude the paper by stating that paper is already the kind of ubiquitous technology that computer technology aims to be.

A BRIEF HISTORY OF USER-CENTRIC DESIGN

A useful analogy to the themes of this paper may be brought from the progress of user centrality in software design.

Early computer systems were large-scale, centralized facilities only affordable, and used, by large hierarchical organizations. Specialized personnel, conscious of their high status not unlike the specialized workers who operate paper machines, ran them in batch mode far removed from the concerns of the end users of the applications supported by the systems. IBM was the undisputed emperor of the market.

The introduction of so-called “minicomputers” in the early seventies, by (initially) small and nimble companies such as DEC and HP, started to challenge this by making it practical for small teams of engineers or other specialists to acquire and run their own computers and computer systems. The applications ran on interactive time-shared terminals, making for the first their “user-friendliness” an important characteristic of their success. However, as the users still generally were technically educated specialists (engineers), this did not yet become critical.

All that changed with the introduction of the personal computer in early 1980’s. Almost instantly, the user population increased to include almost all knowledge workers and, with subsequent introduction of local area networks, all office and many plant employees as well. As the cost of computing declined, the importance of user-friendliness for the overall productivity gain increased: instead of CPU time, it was users’ time that mattered.

How to design and implement interactive systems so that they are easy to learn, efficient to use, and pleasurable? It was soon realized that these questions could not be addressed by developing new user interface technologies alone, but that they required new methods and viewpoints to the design of interactive systems.

By late 1980’s, a new area, called “usability engineering” or “user-centric design” was thus born. It attempted to find, validate, and integrate in holistic design processes methods that would facilitate designing good interactive applications for various kinds of end-user groups. Initially the focus was on evaluation: researchers,

and later also practitioners, established “usability laboratories” for studying the response of users to interactive applications intended to be used for specific tasks in specific contexts. Later the emphasis shifted to methods for eliciting and representing user requirements and needs, and methods for driving the design work on the basis of this. The ISO 9241-11 standard codified the results of this in a widely accepted and applied form.

Once again, however, the development of the underlying technologies and applications changed the domain of user centricity and challenged the existing views and methods for it. This was caused by the dual revolution of the 1990’s, first the introduction of the Internet to the general public, and almost simultaneously the introduction of mobile telephony. During the 2000’s, these technologies have converged, creating for the first time a truly global communications network that covers nearly the whole planet and its population.

With these developments, computing and communications have penetrated all places, contexts, and activities of the everyday life of most people in developed countries of the world. In recent years, nearly everybody else has also been included, with the number of mobile subscribers now measured in billions. Whole new classes of social computing applications have emerged, including applications emphasizing the sharing of presence, social context, and experiences.

Creation of useful, usable, and pleasing applications for such a wide domain challenges seriously the present understanding and methods of user-centric design. It is no longer really feasible to elicit user needs using the methods originally developed for studying office employees working on relatively limited tasks; nor is it possible to evaluate the systems in laboratories.

Instead, researchers and practitioners have started to use and adapt approaches and methods from those sciences that always have studied the behavior of people, groups, and communities in everyday life contexts: psychology, cognitive science, sociology and social psychology, microeconomics, media studies, etc. It has also been realized that design and field experimentation must be blended in a new interactive fashion in order to develop applications intended for varying real-life conditions.

This latest shift in user-centricity is still being studied in the research and practitioner community. Some success has already been gained from using methods such as ethnography, end-user innovation, extensive field studies combined with analysis, but the domain is still rapidly developing. The challenge is to find design approaches, methods, and representations that scale to the complexity and size of user populations, contexts of use, and nooks and crannies of everyday life, and that design teams can apply successfully and cost-effectively to create useful and pleasurable applications and services. One of the fields that is screaming for better design methodology is media business, which is going through fundamental changes.

PARADIGM SHIFT IN MEDIA BUSINESS

Perhaps the biggest change in media business in the last decades has been the digitalization of media and the rise of the Internet. Not only has media production technology changed in digitalization but all formats for media have become digital. In other words, more traditional media such as newspapers, magazines, and radio and television programs are consumed in digital form. The Internet has provided a new channel for broadcasting digital media but also new forms of media: web pages, media archives, automatic news feeds, and interactive media services.

The ongoing paradigm shift in media business is that consumers have become media creators and active users. Because digital and network technology is the same for consumer media as for professional media (e.g., picture formats, video formats, and web technology) potentially anyone can create media and publish it on the Internet like any professional broadcaster. Examples of consumers creating public media range from blogs (text) to images, video, music, speech, computer games, and virtual items. Producing media for public consumption is no longer a privilege of media companies and media publishers.

What is the media that non-professional consumers produce for other consumers? Because the Internet reaches so many people, almost anything can find an audience. Therefore, the media people publish includes all traditional forms of media (e.g., news, encyclopedias, feature films, documentaries, stories, articles, guides, recipes etc.). People also publish the kind of media that has not traditionally been media publishing business: home videos, vacation photos, personal stories, own music, and so on. Whatever the media that people publish on the Internet, it is clear that traditional business models, media services, and media products have to take this change into account. One example of a media business adapting to user generated media was the acquisition of MySpace (one of the most popular user-driven web communities on the Internet) by News Corporation (one of the biggest media companies in the world) in 2005.

Why Should the Pulp and Paper Industry Care?

For the pulp and paper industry the question is *how should it react to these changes in media business?* Generally speaking, the pulp and paper industry is not in the media business – it is the customers of paper manufacturers who are: newspaper, book, and magazine publishers. This alone is of course a good reason for the pulp and paper industry to understand the changing media business. However, we see two additional reasons why the industry should be aware of these changes.

First, there are new customers to be identified; new needs and requirements for paper products that are not based on the traditional publishing business. Examples of these are print-on-demand services, such as Lulu [2], and computer game products, such as the EON magazine for a

game called EVE Online [1] (the magazine's advertisements are paid by game's own virtual currency, not real money).

Second, the benefits and special characteristics of paper will remain overlooked without active intervention from the pulp and paper industry. Consumers and businesses need to be reminded the benefits of paper over digital technology.

One reaction to the changing media business environment by the pulp and paper industry has been to apply smart and intelligent paper technology into media applications. For example, RFIDs or visual codes embedded in magazines or newspapers to enhance the functionality of paper. A reader of a newspaper could, for example, point her camera phone on a visual code next to an article and receive a video newscast of the same article.

We believe that this technology-driven approach is an important part in understanding what future paper media products could be like. Innovation should take the latest technology and try to find uses for it. However, we believe that *this alone is not enough*. Innovation should, in addition to understanding technology, seek to understand the end-users of these technologies. As we discussed earlier, this is one of the key lessons learned in the history of information technology innovation: the importance of human-centric design in innovation.

HUMAN-CENTRIC DESIGN FOR PAPER MEDIA

In our opinion, innovation in paper media should adapt a human-centric approach. To come up with truly novel innovations, the manufacturers of paper should understand the people using their products, the end-users: why, when, where, and how do people use or do not use paper media; what are the meanings, values, attitudes, and emotions people attach to media – paper or digital? How can these be studied outside laboratory settings in people's everyday lives? Through questions like these, it is possible to understand the role of media in a new way, and then to understand where the potential for novel paper based media products is.

A Human-Centric Hybrid Product: A Photo Book

As a concrete example of human-centric design and its application into digital/paper hybrid products we describe a photo book study done at HIIT [3]. Photo books are photo albums for consumer use that are designed on a computer screen by adding own personal photographs into a book template. The designed book is then ordered as an actual physical printed book. Services providing the tools and ordering mechanisms for these books are a growing business. Photo book services are provided by printing companies, photo sharing web services, traditional photograph development companies, and photo management software manufacturers. In other words, the business environment for photo books is anything but established. Nevertheless, photo books are a popular digital/paper hybrid media service: the books are designed on a computer screen

using digital photographs, and the end product is a printed paper book.

In the photo book design system built at HIIT the user could design the book on a web browser interface. When the book was ready, it was rendered into a PDF. See Figure 1 for an example screenshot.

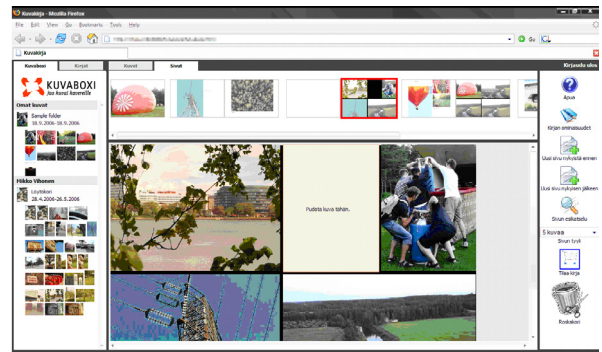


Figure 1. A screenshot of the photo book service created in [3]. In the middle is the layout of the book. On the left are the photos to be used. On top is an overview of all the pages in the book, and on the right buttons for functionality.

In our previous work we had studied snapshot photography in general: why do people take photos, with whom do they share them, what is the role of paper and what technology people use in personal photography. Based on these studies we designed together with KCL (Oy Keskuslaboratorio - Centrallaboratorium Ab) five physical photo books with actual photos taken as snapshots (see Figure 2). To understand the reasons, values, attitudes, as well as the uses and functions associated with photo books two specific user studies were conducted. First the designed photo books were given to a test group to evaluate: the paper quality, the look and feel of the book, the size and form, the price they would be willing to pay for them, and a general ranking of which book was suitable for what purpose. This user study was done by KCL.



Figure 2. The five concept photo books tested.

These results were then used to guide the system design process. Once the system was ready it was tested once more. This time with three people who brought their own digital photos to make a photo book using the system. One goal was to identify usability problems with the system, but the main goal was to simulate a realistic setting where people take the time to make their photos into a book, and to understand how the system fits into these situations. Few weeks after the testers had created their photo books they were given the actual paper books to see how their perceptions and expectations were realized.

This focus on the actual people who would be creating the books and their reasons for using and not using the system guided us to the following findings. The photo books were naturally built on the existing tradition of photo albums. The themes of the books were the same as for photo albums: family events and children. The books were also treated and thought as another photo album among the existing ones – not a separate thing. We also learned that people were willing to spend quite a lot of time in making the book and getting it right. Any mistakes that ended up in the paper book were disappointing. This was because the test subjects placed a lot of value to the final physical book. The three people in the second study all called the final physical book “a real book” and placed a concrete value for it (they were willing to pay 10-25 euros for the book they designed). All of them also thought about giving some copies of the books as gifts. Clearly, paper as a media platform had qualities that the digital version of the book could not match.

THE POTENTIAL OF “DUMB PAPER”

As the photo book example demonstrates, there are natural and obvious examples where paper as a platform for media is the best choice. And importantly, the paper does not have to be “intelligent”. From the point of view of digital media technology, and information technology in general, we identify paper having the following benefits over its digital counterpart. Here our focus is on people’s personal media and the end-uses of paper.

The majority of the benefits come from the fact that paper is a physical object unlike, for example, a digital picture. Paper is not a device. To consume digital media, there always has to be a device that transforms the digital information into analog. A device requires external energy – paper does not.

Due to paper’s physicality it is easily portable from one physical place to another, and it can be handled by anyone (compatible). Paper has a direct relationship to real space, and can be, for example, posted on a wall. To post a digital picture on a wall, a specific device, or a printer, is needed to make it physical.

Paper has individuality: the same paper photo in grandmother’s photo album is the same photo she put there – perhaps there are her fingerprints on it. In a digital world,

this kind of emotional attachment to individual objects is not possible.

Although paper can be easily destroyed, it is relatively long lasting in practice. For example, paper photos have lasted through generations. Digital photos, on the other hand, are in theory everlasting, but in practice there is uncertainty on how to store them for the following generations.

Paper is easily editable. Because it is a physical object, paper can be written on, folded, torn, and so on.

Paper media has less IPR (intellectual property rights) issues than digital media. One key reason is that it is not possible to make infinite copies of paper media. In practice this means that it becomes quickly too expensive to make several copies of media in paper format. Inexpensive copying of digital media is of course one of the key problems professional media companies are dealing with. To put it briefly, the intellectual property laws have a long history in adapting to paper media and the business around it – which is the opposite when it comes to digital media.

Lastly, there is a long tradition and culture for paper. Paper as a platform for media has a history of several centuries. For example, giving photographs as a gift is well accepted tradition in many cultures.

These use and user-centric benefits are an example of how paper should be seen as a *complement* to other platforms for media – not as the old technology that needs to be replaced or augmented. Especially innovation in digital media should identify where paper as a technology platform could be beneficial. The pulp and paper industry should perhaps remind itself of the competitive edge its products have over digital media. We believe that the future media products and services are the ones that take the best of both worlds: paper and digital.

CONCLUSION

Mark Weiser introduced in 1991 the concept of ubiquitous computing in the 21st century. His key idea was that “specialized elements of hardware and software, connected by wires, radio waves and infrared, will be so ubiquitous that no one will notice their presence.” He wrote that “the most profound technologies are those that disappear.” [4] Ubiquitous computing is currently a major trend in information technology. It is believed that more and more items will contain computing power and networking functionality, and therefore, computers become more embedded into our lives and we will not notice them any longer.

“Ubiquitous” literally means existing or being everywhere at the same time, constantly encountered. Generally speaking, in the last 5000 years paper has become the kind of ubiquitous technology that computers are trying to be. Paper is encountered in people’s everyday tasks and activities, and they pay hardly any attention to it. Paper is so familiar and invisible that, for example, it

really requires an effort to count all the encounters with paper one person has in a single day.

On the other hand, paper is a good example of the identity crisis a truly ubiquitous technology has to face. Paper is not considered cool and sexy high technology, unlike the latest information technology, and paper is overlooked as a technology platform because it is so common and boring. It is ironic that computing technology aims to be invisible and ubiquitous, just like paper, and the truly ubiquitous technology, paper, aims to be more like computers (*e.g.*, smart and intelligent paper).

As we have emphasized in this paper, we believe that paper and digital media should be seen as complementary platforms for media. Good examples of complementary uses are newspapers with websites or the photo books we discussed above. We argue that paper manufacturers should pay attention to more human-centric design paradigms to be able to create novel and complementary innovations. At least in the media business understanding the end-users and their context of use is critical for new products, services, and business partnerships.

Paper has the positive characteristics of an old and established technology: paper feels safe to use, it requires no learning or special skills to use, it requires no electricity or computing machine to consume, and unlike digital media, it can be torn into pieces. These qualities, and the ones we listed previously, are easily forgotten and overlooked in the middle of the hype for smart and intelligent technologies. The paper and pulp industry should take an active role in reminding and promoting these qualities both to designers of future technologies and the consumers who take technologies into use.

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