

## Association for Information Systems AIS Electronic Library (AISeL)

ICIS 2010 Proceedings

International Conference on Information Systems  
(ICIS)

2010

# ENGAGED DESIGN SCIENCE: DEVELOPING DESIGN VISIONS FOR THE FUTURE E-NEWSPAPER

Marie Åkesson

*Halmstad University*, [maria.akesson@hh.se](mailto:maria.akesson@hh.se)

Karlheinz Kautz

*Denmark & Halmstad University*, [karlheinz.kautz@rmit.edu.au](mailto:karlheinz.kautz@rmit.edu.au)

Carina Ihlström Eriksson

*Halmstad University*, [Carina.Ihlstrom\\_Eriksson@hh.se](mailto:Carina.Ihlstrom_Eriksson@hh.se)

Follow this and additional works at: [http://aisel.aisnet.org/icis2010\\_submissions](http://aisel.aisnet.org/icis2010_submissions)

### Recommended Citation

Åkesson, Marie; Kautz, Karlheinz; and Eriksson, Carina Ihlström, "ENGAGED DESIGN SCIENCE: DEVELOPING DESIGN VISIONS FOR THE FUTURE E-NEWSPAPER" (2010). *ICIS 2010 Proceedings*. 111.

[http://aisel.aisnet.org/icis2010\\_submissions/111](http://aisel.aisnet.org/icis2010_submissions/111)

This material is brought to you by the International Conference on Information Systems (ICIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICIS 2010 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# ENGAGED DESIGN SCIENCE: DEVELOPING DESIGN VISIONS FOR THE FUTURE E-NEWSPAPER

**Marie Åkesson**  
Halmstad University  
P.O. Box 823, SE-301 18 Halmstad,  
Sweden  
Maria.Akesson@hh.se

**Karlheinz Kautz**  
Department of Informatics,  
Copenhagen Business School  
Howitzvej 60, DK-2000 Frederiksberg,  
Denmark & Halmstad University, Sweden  
Karl.Kautz@cbs.dk

**Carina Ihlström Eriksson**  
Halmstad University  
P.O. Box 823, SE-301 18 Halmstad, Sweden  
Carina.Ihlstrom\_Eriksson@hh.se

## Abstract

*This paper reports the development of design visions for the future electronic (e-) newspaper. The ambition is to bring together the features of printed newspapers with the possibilities of online media. In an engaged design science research project we together with representatives of the newspaper industry and newspaper readers identified the three design challenges genre awareness, stress and lack of control, and obstruction. We also developed the guiding design metaphor of a calm e-reading experience and three design principles provision of media recognition support, support for user control, and support for focus on content. The design principles were evaluated through e-newspaper prototypes and on this basis we revised the design principles which led to a design theory for e-reading solutions on and for digital media.*

**Keywords:** Engaged scholarship, design science, e-newspaper, digital media

## Introduction

This paper reports the development of design visions of the future e-newspaper. The newspaper industry has undergone several changes due to digitalization and the widespread use of the Internet. As early as in 1993, newspaper executives started to assess the consequences of the Internet. Some viewed its diffusion as a threat to their industry, while others primarily saw the opportunities associated with this new technology (Beamish 1998). The first fully web based newspaper, The Palo Alto Weekly, appeared already in 1994 and today, almost all newspapers have an online counterpart. Now, a second wave of digitalization, namely the emerging concept of the electronic (e-) newspaper offers new opportunities for the newspaper industry. The ambition of the e-newspaper is to bring together the readability and overview from the traditional newspaper with the possibilities of online media such as constant updates, interactivity and video (Ihlström et al. 2004).

To push the aspiration of the e-newspaper forward and to develop design visions of this emergent medium based on an emergent technology the Swedish Newspaper Publishers' Association in co-operation with a device producer initiated a design science research project. The project aimed at combining the accessibility, simplicity and mobility

of printed newspapers, with the advantages of digital media, communication technologies and portable consumer electronics. Over a period of 27 months a university research team, consisting of the two of the authors as facilitators and analysts and two technical designers and software developers, engaged with representatives of different stakeholder groups in this design project to explore research and development issues for the future e-newspaper. The three main stakeholder groups in the project were Swedish newspaper publishers, including their management, their editors-in chiefs, their newspaper layout designers and their web designers, as well as newspaper readers and newspaper advertisers. Two of the newspapers, one from a metropolitan area and one from a rural area, were regional newspapers, the Göteborg Posten (abbreviated GP), and the Sundvalls Tidning (ST) respectively, and one was a nationwide evening press, the Aftonbladet (AB).

In the following sections we provide more background on the emerging concept of the e-newspaper. Following we describe our research approach, and then the development and evaluation of the design visions based on three design principles and realized in the form of three prototypes of actual e-newspapers. We then discuss and theorize our findings towards a theory of e-reading solutions for digital media based on the artifact appraisal and finish with some conclusions including future research.

## **The emerging concept of the e-newspaper**

The emerging of e-newspaper relates to printed as well as to online newspapers. Printed newspapers are characterized by a traditional layout in black and white or color, presented on paper which makes the news considered most important available on the front page, other news is organized in sections; printed newspapers contain yesterday's news and have no interactivity, they are portable and mobile and contain many advertisements. Online newspapers are presented on a device, e.g. computer, personal digital assistant (PDA), or mobile phone that is connected to the Internet and thus depends on an Internet connection and a device. Online newspapers present news in color and have a layout that makes most content available on the front page, they present frequently updated news, allow for search as well as audio and video possibilities, are interactive by e. g. allowing for comments or polls and contain advertisements.

The reader's use patterns of online newspapers differ substantively from the printed edition. The online version is often used for actively skimming through headlines and short stories, while the printed edition is used for more thorough reading in a relaxed manner (Ihlström Eriksson and Svensson 2009). These differences in use patterns are reflected in the design of online newspapers where almost all content are available on the front page through headings, links and ingresses. The emergence of online newspapers, which allows for constant updates as well as audio and video material, has influenced journalistic work and created new positions at newspapers accompanied by a shift from newspaper to media houses (Ihlström and Henfridsson 2005).

Beyond the presentation of news, the Internet has also influenced the newspaper business in another way. In addition to the loss of advertisements intake, the advertising share that for many years has been exclusive for the printed newspapers has partly shifted towards the internet as well, but spread to more actors. The newspapers are suffering from decreasing subscriptions and are now trying to find new arenas and business models. One new opportunity that has emerged is electronic paper (e-paper) technology.

E-paper is the common term for several different technologies that can be used to produce screens with a number of specific characteristics, of which many have properties that can be compared with print on paper, making it especially interesting for newspapers. Compared to transmissive displays such as liquid crystal display (LCD) and thin film transistor (TFT) displays, e-paper is a reflective display technology, i.e. it has no back light; it gives the same reading experience as paper such as high contrast and the possibility to read in sunlight. Around 2004, the first eReaders approached the market. An eReader is a reading device based on electronic paper; examples are the Sony Reader, Amazon Kindle and iRex iLiad (Figure 1). As shown in Figure 1 newspaper content is available on these devices, but the available eReaders are all in grayscale and not bendable. Both bendable e-paper (Figure 2) and color e-paper exist in the laboratories and are expected to reach the market soon (the figures are all retrieved from the web sites of the producers). Current e-newspapers are presented on an eReader where content is downloadable online, they are portable and mobile; they can be updated in regular intervals as editions, their format reminds of a book format with around A5 page size and very few pictures presented on a grayscale; they provide no interactivity, but contain search and audio possibilities, and only very few advertisements. Several newspapers publish on Amazon Kindle or on iRex iLiad, but their e-newspapers are in the format of a book rather than a newspaper.



**Figure 1. iRex iLiad**



**Figure 2. Plastic Logic**

A newspaper published with e-paper technology i.e. an e-newspaper will enable reduced printing and distribution costs for the newspapers, thereby offering a new interesting arena for publishing businesses. It will be bendable, flexible, in color and with a proper newspaper layout. Before presenting the development of our e-newspaper prototypes we now introduce our overall approach to develop design visions for the future en-newspaper.

### The research approach

The research follows the approach of engaged scholarship (Van de Ven 2007), which is a participative form of research for seeking advice and perspectives of key stakeholders to understand and theorize about a complex problem. Engaged scholarship goes beyond participatory design (Bjerknes and Bratteteig 1995) which is an approach to design which attempts to actively involve all stakeholder groups, but which does not primarily aim at theory building which is an explicit aim of engaged scholarship. It accepts the challenge that scholars need to develop and exploit new forms of knowledge production, which facilitate and leverage interactions between practice and theory to develop scientific as well as practical knowledge (Mathiassen and Nielsen 2008). Among others Van de Ven (2007) defines design and evaluation research as a form of engaged scholarship that focuses on normative knowledge related to design and evaluation of policies, programs, and models for solving practical problems within a profession. A similar form of engaged scholarship within IS research has been defined by (Mathiassen 2002) as design research which focuses on designing various forms of artifacts with the purpose of supporting stakeholders engaged in IS practices. Design science research has developed into a distinct research approach that is gaining a growing recognition (Hovorka 2010). Design science research is well suited for engaged scholarship, the engagement is focused on the design and evaluation of an IS/IT artifact; learning is achieved through building. We will follow Mathiassen and Nielsen's (2008) call and explicitly state here what type of engaged scholarship we pursue in particular and how this approach translated into a detailed research design that facilitated subsequent evaluation of research contributions.

There are several approaches to design science among others described by Hevner et al. (2004), Peffers et al. (2007), Hardless et al. (2007), Kuechler and Vaishnavi (2008), Pries-Heje and Baskerville (2008) to name just a few, which all have the general structure 'problem identification-design/build-evaluate-theorize' (Winter 2008; Hovoraka 2010) where kernel theories or justificatory knowledge (Gregor and Jones 2007) build the basis for some design principles. So inspired, the approach used in our project had 5 steps. In the first step we, similar to a problem identification, analysis or diagnosis step, explored the design challenge; in the second step we derived the design principles combining our analysis results with a kernel theory or better a leading metaphor, in the third step we applied the principles and built IT artifacts in the form of prototypes, which were evaluated in a fourth step. In a final step we reflected over our evaluation results and revised our design theory to class of solutions. In general our data collection involved multiple data sources (Germonprez and Mathiassen 2004) including focus group and workshop sessions, prototype testing, qualitative interviews and quantitative questionnaires. The workshops and interviews were documented and were all audio-taped; some were also video-taped. Overall the project was monitored by a steering group of about 10 people who represented the Swedish Newspaper Publishers' Association, the newspaper management of seven newspapers, and the university researchers. The steering group met at least once in the two early stages of the project and 2-3 times in the two latter ones.

The *exploration phase* took about seven months and included a number of future workshop and focus group meetings which were all facilitated by the university researchers. Future workshop (Jungk and Müllert 1996) is a

technique that enables a group of people to develop new ideas and future designs. The future workshops were carried out as three hour sessions, including a visioning phase, a scenario building phase and a mock-up phase. A focus group (e.g., Krueger and Casey 2000) is an interactive group session where the participants talk about their perceptions, opinions, beliefs and attitudes towards an idea, product, service, or concept. We used two different focus groups, i.e. a reader focus group and a design focus group. These activities were supplemented with additional individual interviews with newspaper publishers. Furthermore, two online reader questionnaires published at two newspapers' web sites provided further input. The first questionnaires focused on the preferences of a future e-newspaper, while the other focused on the apprehension of the printed and online newspaper versions as a comparison to the future e-newspaper. Another questionnaire which focused on design solutions from print and web that could be transferred to the design of the e-newspaper was send to designers at the participating newspapers. Finally, a joint design focus group meeting took place to summarize the results of this phase in the form of design challenges and goals (for more details see Ihlström Eriksson and Svensson 2009; Åkesson and Ihlström 2006).

In the *derivation* phase which lasted about three months several future workshops were conducted. These future workshops were dedicated to a particular theme such as advertising and business aspects which were discussed to inform the design process. Furthermore, additional individual interviews with newspaper publishers were performed. A design focus group meeting took place and a workshop with newspaper designers and an interaction designer finalized the work on the design principles.

<b>Table 1. Overview of engagement with stakeholders</b>		
Phase	Stakeholder	Type of engagement
The exploration phase 7 months	Newspaper publishers	2 future workshops with about 10 participants each 6 semi-structured individual interviews lasting 90 minutes 1 design focus group meeting with 4 newspaper designers 1 questionnaire to newspaper designers with 5 respondents
	Readers	2 focus group meetings with 6 reader participants 2 future workshops with 6 readers each 2 surveys with a total of 1822 individual answers
The derivation phase 3 months	Newspaper publishers	2 future workshops with about 10 participants each 1 workshop with 7 participants 1 design focus group meeting 7 individual interviews
	Readers	1 future workshop with 6 readers
	Advertisers	1 workshop with 6 participants
The building phase 7 months	Newspaper publishers	Developing three prototypes in cooperation between researchers and newspaper designers 4 meetings with design focus group 1 workshop with focus on design 2 workshops with newspaper employees
	Readers	2 focus group meetings with 6 readers each 1 questionnaire with 192 respondents
	Advertisers	2 workshops with 4 and 6 participants respectively 2 interviews
The evaluating phase 10 months	Newspaper publishers	7 workshops with newspaper employees 16 interviews
	Readers	1 questionnaire with 4239 respondents 1 hour prototype tests with 36 readers followed by a 45 minutes in-depth interview

The *building phase* lasted about seven months. For the three newspapers explicitly mentioned above, e-newspaper prototypes were developed in cooperation between newspaper designers, who provided the newspaper layout and proposed functionality and the university research team, which produced the technical design and coded the layout and functionality of prototypes to assess the design principles. All design decisions were taken jointly in the design focus group by the newspaper designers and the researchers. Though no formal evaluation of the prototypes took place in the building phase further input and feedback for the design of the prototypes was provided through workshops and focus group meetings with designers, newspaper employees and readers. As the prototypes developed an increased focus on advertising arose, which led to workshops and interviews with advertisers. Finally, a third readers' questionnaire concerning media behavior and reading habits and satisfaction of the printed newspaper was included in the building phase to study if the e-newspaper could replace the printed edition and still support the reading habits.

The *evaluating phase* lasted 10 months. The evaluation phase started with a design focus group meeting to prepare all evaluation indicators. Next, it included workshops and interviews with newspaper publishers to get their assessment of the three prototypes. The main emphasis then lay on the readers. A readers' questionnaire was presented at the web sites of the three newspapers where the readers could review limited versions of the prototypes. The prototypes proper were assessed by 12 readers for each newspaper. These assessments are the focus of the evaluations described later in this paper. The reader evaluation was performed by each individual in a two hours session. The readers who participated in evaluations were selected by the researchers depending on gender, age, occupation, subscribers and nonsubscribers, online readers and non online readers to get a representative sample. After a short introduction of the e-newspaper concept and technology, the tests were carried out and analyzed. The evaluations included a test session followed by an in-depth evaluation interview. The phase ended with a design focus group meeting where all collected and analyzed data were assessed jointly by the researchers and newspaper publisher representatives with regard to both research and practice. A final focus group meeting with readers was also held. The engagement activities are summarized in Table 1 above.

The *theorizing phase* took place after the project proper and had no particular time limit.

## Developing the e-newspaper

The development of the design visions for the future e-newspaper followed the five phases described above. The first four of these phases are presented in more detail in this section.

### *Phase one: Exploring the challenge*

The project was started by investigating the possibilities and limitations of the e-newspaper. In an initial session of the newspaper designer focus group, advantages and shortcomings of the currently used publishing channels were identified and initial thoughts concerning the advantages of an e-newspaper as a digital publishing media were explored. The readability of the display, its mobility, as well as the possibilities for interaction and actuality were recognized as advantages of the e-newspaper, which in turn created some general design challenges.

The initial workshops identified the core overarching challenge of bringing the best of print and digital media together. In the following all stakeholder engagement in the exploration phase pointed towards merging design features from print and online newspapers. As illustrated in the following statements from newspaper publishers this could be something new:

*I think we need to bring the soul and the look and feel of the printed newspaper into the digital world, for the first time we have the chance to do that...The newspaper soul is visually embedded in typefaces, colors etc. It is the small things that make it – not the big things.*

*It needs to be similar to the printed newspaper so people get a familiar feeling, at least in the beginning. Then we can start a journey together with our readers and develop the e-newspaper to something new. But this is a huge challenge in A5 format.*

The newspaper designers in particular recognized the challenges related to navigation and orientation by providing structure and overview on this flat and small media, which initially was in between an A5 size up to an A4 size. Some newspaper publishers regarded this to be the greatest challenge with the e-newspaper:

*The by far greatest challenge with designing the e-newspaper is the smaller format. It is very information dense. How do we communicate the drama and the twinkle of our newspaper? How do we create feelings and get a grip on the reader?*

The overall challenge was confirmed by the results of the newspaper designers' questionnaire. Reader questionnaire results expressed an interest in the e-newspaper and further highlighted the importance of combining design features from both print and online newspapers. In the interviews with newspaper publishers the challenges of designing the e-newspaper were further illuminated. In particular 3 challenges were identified which we termed: 1) genre awareness, 2) stress and lack of control, and 3) obstruction (table 2).

Table 2: Design Challenges and Goals	
Challenges	Goals
Genre awareness	Familiarity in reading experience
Stress & Lack of Control	Stress less and controlled reading experience
Obstruction	Effortless reading experience

### The first design challenge

The first design challenge concerns the readers' awareness of the newspaper genre as presented by the digital news media. The two predecessors, printed and online newspapers, make this challenging because readers have different relationships to these media as illustrated by these reader quotes:

*In the printed newspaper the structure is very familiar and it provides a good overview. It easy to skim read and you can easily go back and forth. You also find things you were not actively looking for, that you did not plan to read. I like this surprising effect without actively having to click.*

*I want fast updates of news like the online newspaper. If I could get that in a device that I can bring with me wherever I go it would be great.*

Familiarity as an aspect of genre awareness was identified in all engagement activities. This led to formulating the design goal of providing familiarity in the reading experience. Providing familiarity is not a trivial design goal. What features of the design provide familiarity is not obvious. These features are embedded in visual design of a newspaper and depend on people's habits. The following quote illustrates how a newspaper publisher discusses what familiarity is:

*Familiarity is not only a challenge of design. It is also a challenge of providing a service that fits with people's habits. The printed newspapers strength is that it fits with people's breakfast habit. The evening newspaper fits with commuting. The online newspaper fits with a quick break. What does the e-newspaper fit with? The interesting thing is that if we design it well it can fit with all.*

This publisher view of familiarity was confirmed in reader activities. Most readers refer to their habits when discussing preferences of print versus online newspapers. This reader gives a representative example:

*A printed newspaper is very much about a familiar feeling. I often read news online but I would not want to be without the moment with a real newspaper and a cup of coffee in the morning.*

### The second design challenge

The second design challenge of stress and lack of control relates to the reading experience and differs with regard to the two foregoing newspaper media. This is very challenging because people do not get stressed by the same things. This newspaper publisher recognizes this:

*Everybody is not stressed by the same. Some want the quick facts and some want the in-depth story.*

This was confirmed in reader activities as shown by the following contrasting statements:

*I want to read in the sofa or at the kitchen table when I have decided to and not because there is an update pushed on me.*

*The online newspaper is available whenever I want. I do not have the stressed feeling that an unread newspaper gives me.*

There was consensus among newspaper publishers that the printed newspaper creates less stress than the online newspaper. However, as illustrated by the following quote from a newspaper designer, it is not evident that this difference is related to the media as such or rather to the design:

*And I do not think it is the paper that gives this relaxing feeling, I think it is the design. I think we can do this even better on e-paper but the size is a problem. I think that coming generations will prefer a well designed e-newspaper to a stressful online newspaper.*

Another part of this challenge concerns control which can be problematic in digital online media. In reader related activities the need of control for a relaxed reading experience was often stressed as this reader confirms:

*I want to be in control of the situation and read when and where I want to.*

The newspaper publishers back up this position and one of them said:

*There is a problem in digital media to provide the overview and navigation required for a controlled reading experience. Online people get lost and they wander away from the newspaper. Just one click and suddenly they are somewhere else. Things get updated and suddenly you don't know where to find things. That is not a reading experience - that is something else. Of course an e-newspaper should be updated, readers will expect that, but I strongly believe that we must give the reader this control and not push everything on them.*

In summary the second design challenge led to the second design goal as providing a stressless and controlled reading experience.

### **The third design challenge**

The third design challenge of obstruction concerns a reading experience without unintended interruptions. Readers as well as newspaper designers were in agreement about the online newspaper reading experience being more obstructive than the printed newspaper. They were also in agreement about the importance of updates adding value to digital news media. Thus this challenge regards balancing the possibilities offered by digital media with the relaxed and controlled reading experience provided by print media. This is illustrated by an assertion from a design focus group meeting:

*Updates can be very interruptive. How do we handle updates in the e-newspaper? We can probably not just change the screen in real time. What if somebody is reading something and it changes while reading? Maybe we can put in an icon that there are updates but that would also be a bit interruptive. We probably need to experiment with different strategies for updates. Some sorts of news are probably acceptable to update in real-time and some are not. What is and what is not probably differs between readers too. How do we crack this nut?*

Other instances of this challenging balance are how to incorporate advertising and multimedia features as recognized by newspaper designers:

*Web advertising is hell, blinking and blipping, it is horrible. It is really disturbing and interruptive. The printed newspaper has the strength of letting people make the choice. It is easier to ignore advertising in the printed newspaper.*

*The e-newspaper can be a multimedia newspaper with video and sound. The challenge here is to make sure we do not interrupt the reading and how do we know when we do or don't?*

The third design challenge led to deducing the design goal of providing an effortless reading experience. The three design challenges and the three design goals that were identified and defined (see table 2) in the exploration phase formed the basis for deriving design principles for the e-newspaper.



### ***Phase two: Deriving the design principles***

The identified design challenges directed the design team, which consisted of newspaper designers and the university research team, to the field of interaction design. Interaction design refers to the shaping of interactive products and services (Sharp et al. 2007). The overall goal of good interaction design is to support people in their everyday lives (Winograd 1997). Although there are some overarching principles for good interaction concerning usability and the quality of user experience (Sharp et al. 2007) they are difficult to operationalize for specific situations such as the design of an e-newspaper as what constitutes good design in one specific situation might be very different from another one. For situated interaction design Löwgren and Stolterman (2004) propose the use of guiding metaphors to represent an overall design vision.

The characteristics of reading a printed newspaper so aptly described as leaning back by several workshop participants in contrast to the bending forward to read an online newspaper on a digital device as well as the demands for ease of use and readability to allow for genre awareness and to avoid stress, lack of control and obstruction through the medium directed our attention to the metaphor of calm technology as a guiding metaphor to addressing the design challenges.

The metaphor of calm technology was introduced by Weiser and Brown (1997) to describe how people interact with technology in a way where the technology does not require any unnecessary effort or attention from the user. The metaphor of calm technology is closely related to prior work by Winograd and Flores, who – relating to Heidegger (1962) – put forward the general design principle that technology should disappear into the background. This idea has lately been supported by e.g. Dourish (2006) and Germonprez et al. (2007) in their research concerning user interface design in general and the design of tailorable technology, respectively.

Calm technology allows the user to direct efforts and attention to the actual task that the user intends to accomplish, such as to read, write or search for information. Calm technology is characterized by that it is taken for granted by its user. It is embedded in everyday life in such a way that that the user does not consciously think about the underlying technology. This is what typifies artifacts with ingrained patterns and behaviors embedded in everyday use such as writing with a pen on a piece of paper or reading the printed daily newspaper (Weiser, 1991). As Weiser and Brown (1997, p.77) describe "... some technology does lead to true calm and comfort. There is no less technology involved in a comfortable pair of shoes, in a fine writing pen, or in the delivery of The New York Times on a Sunday morning than in a home PC." Artifacts like newspapers, books, letters and signs are all used universally and allow focusing on what the text means and not on the technology by which the meaning is communicated. Calmness is accomplished as technology moves into the periphery of attention (Weiser and Brown 1997). The user's centre of attention is on the task performed and has control of the technology. Calmness implies that technology does not require unnecessary efforts, it does not distract users from their actual task and it does not create stress, i.e. the technology disappears into the background.

In the context of developing design visions for the future e-newspaper, the guiding metaphor became that of a calm – user experience of an – e-newspaper, and understanding the e-newspaper as an instance of future readings provided on digital media, the metaphor of a calm e-reading experience. On this basis three design principles each addressing one of the design challenges and goals were derived through continuous reflection in an iterative process of interpretation, comparison and interlacing of the different stakeholders' input in the various engagement activities. The design principles for a calm e-reading experience of digital media are:

(1) *The principle of providing media recognition support:* The e-newspaper should be designed to provide a familiar news reading experience. This means that patterns of interaction, layout, structure, order and aesthetic characteristic of news media, feasible for the e-newspaper, should be used. This principle addresses the problem of genre awareness expressed in the exploration phase.

(2) *The principle of supporting user command:* The e-newspaper experience should be relaxed and without stress. This means that interaction with the content should be user controlled, and not forced on the reader by actions taken by the system, e.g. by blinking or entering advertisements. The problem of stress and lack of control identified in the exploration phase is addressed in this principle.

(3) *The principle of supporting focus on content:* The e-newspaper should provide a reading experience as opposed to computer use experience. This means that the e-newspaper content should be directly accessible without unnecessary hindrance by system or interface components. This addresses the problem of obstruction identified in the exploration phase.

### Phase three: Building the prototypes

The three design principles were applied when three prototypes of the e-newspapers were built. The three prototypes of the e-newspapers were created in an iterative process by the researchers and the newspaper designer focus group. The newspaper designers provided the news content, layout and structure and the researchers provided the code to implement the interactive elements and touch sensitive spaces. The three different e-newspapers were designed in different formats ranging from A5 to A4, and with some differences in structure and interaction techniques, still within the range of the design principles. In the following we give a short description of some significant design decisions and design examples.

*The principle of providing media recognition support* is exemplified in Figure 3, which shows the front page of GP. Regular readers of the publication can easily recognize the resemblance of the e-newspaper to the printed edition of the newspaper with entrances to the different sections through headlines and ingresses. This addresses genre awareness. It is also illustrated in Figure 4 with the index page for local news of the ST. Here all content of this section is shown, all clickable, i.e. directly linked to the corresponding page as in an online newspaper. All sections are available on one click.



Figure 3. Recognition Support



Figure 4. Recognition Support

*The principle of supporting user command* addresses user-controlled interaction with the e-newspaper. Unless there is user action nothing will happen. If a user is reading an article, there is nothing that will disturb the reading, e.g. a changing image, a flying banner, or a news update. All video clips, sound files, multi-slide presentations, advertiser catalogues and such are only presented on user action, and users can stop at any time, returning to the page they were reading before. The basis for the interaction model is the page-by-page reading from the printed newspaper; therefore paging is integrated, hyperlinks are built in to support direct navigation, such as on the web. No scrolling or dropdown menus were implemented; everything on a page is visible for the reader. Clearly marked buttons and icons are used in the graphical user interface to indicate user action. To be in control, the user can for example choose to click on an icon in a picture to start a video clip.

*The principle of supporting focus on content* can be illustrated by an index for the sport section of AB. The reader can choose one of the pages by touching it and can come directly to that page. Buttons can be used to go back and forth indicated by arrows as well as to show an index of all content pages represented by a 'content' button. The content focus is exemplified by the navigation tool "the thumb". It emerges wherever one puts one's thumb on the screen, and allows navigating back, forward and directly to the index page.

### Phase four: Evaluating the principles

Evaluation was a continuous activity in building the prototypes. In this section we describe the formal evaluation that was done with readers after the design of the prototypes was stabilized. In the evaluation phase the incorporated

design principles were evaluated by testing and the e-newspaper prototypes and evaluation interviews with readers. All in all, 36 readers were engaged in the evaluation of the design principles. Drawing on the guiding metaphor of the calm e-reading experience derived from the kernel theory and formulated as three design principles we used the design goals and their indicators in the evaluations. The indicators which operationalized the goals were used in the tests and evaluation interviews. They had emerged in the course of the project during all phases but were finally consolidated in the evaluation phase. Table 3 presents a summary of the design goals and indicators related to each design principle.

<b>Table 3. Design principles, design goals and indicators</b>		
<b>Design principle</b>	<b>Design goal</b>	<b>Indicator</b>
Providing media recognition support	Familiarity in reading experience	Recognition of layout Recognition of content
Supporting user command	Stress less and controlled reading experience	Perceived control Perception of interruption
Supporting focus on content	Effortless reading experience	Perception of hindrance Perceived transparency

In the following we focus on the readers' evaluation and describe results from their appraisal of the e-newspaper prototypes with regards to the three principles.

### **The first design principle**

The first design principle, providing media recognition support, had a positive impact on the calm e-reading experience. The design of the prototypes was intended to provide a very familiar and well-known feeling of interaction with the newspaper; thereby supporting the type of reading conduct afforded by printed newspapers as well as in online newspapers. The readers confirmed that this goal had been achieved as the following citations from the evaluation interviews illustrate.

*This really feels like a printed newspaper, not that there is a lot missing like on the web. You actually get even more, video and sound and a whole catalogue. Here you get the best from both, the smoothness and the readability.*

*At first it was a bit unaccustomed with the smaller format but after just a little while it felt pretty familiar. I got used to it surprisingly fast. I really didn't think I would like a newspaper like this, but it is not at all bad.*

In general, readers regarded the recognition of layout to be supported in the e-newspaper prototype design. The layout was tested by for example giving users assignments to find content such as the sports section. Readers had few problems navigating the newspaper, the paging, index and menus proved to be good support.

*It feels like the printed newspaper when you turn page by page and go through the newspaper. You get a good overview from the index pages and you know what you have and have not read....This is even easier than the printed newspaper.*

The second important indicator of providing media recognition support tested in the evaluation was recognition of content. In assessing this recognition the readers' perception of newspaper content credibility was included as readers' associate newspaper content and newspaper brands with credibility. The readers had no problems to recognize the newspaper brands and did associate the e-newspaper content with the printed newspaper content rather than online content of the respective newspaper. The tests gave witness that there were very strong feelings related to printed newspaper content.

*This feels very trustworthy, same style and layout as the printed newspaper, same brand. The trustworthiness is really in the brand. And the calmness, you have succeeded to bring that. I just miss the two page spread that is part of the newspaper feeling.*

*I love my newspaper, I do not want to exchange it! But when I travel it might be good, and then I can have my newspaper every day anyway.*

Nevertheless, not only expected responses to the reading experience regarding media recognition were observed. One unanticipated feedback was the frustration that there was not enough direct linking. In attempting to follow the second principle, user command, the design team had decided to limit hypertext linking to avoid the risk of web-style interaction pattern. It turned out that readers, especially those with experiences from online newspapers, were annoyed when for example headlines in an index were not linked as this quote illustrates.

*I miss links to the news in the index, I want more links and maximum two clicks to get where I want.*

These readers related their recognition more to an online reading experience than a print reading experience. One example is that the design team expected the traditional newspaper sections to be a very familiar structure, but it proved that for some readers it was not as this quote shows.

*I don't think in sections, it is something I have to learn.*

### **The second design principle**

The second principle supporting user command had a great significance for the readers' calm e-reading experience. Incorporating this design principle in the prototypes aimed at providing a controlled and stress less reading experience. Many readers emphasized how important controlling the reading experience was for them as exemplified by this quote.

*Here, you can turn page by page. I always have the feeling that I have missed something on the web, feels bad. Here you know when you have read everything. And you don't get surprised when you have to search for the information.*

In testing for the indicator perception of control readers confirmed that disturbing objects or sounds had a negative impact on their calm reading experience. The chosen mode of user controlled multimedia embedded in the e-newspaper prototypes was appreciated and was not considered to be disturbing by the readers as this quote illustrates.

*I think it is very good with video, the football goal for example. If you don't want to see it you can choose not to, and read on. That feels good, you are not forced upon it but it is there for you if you want it, video and such.*

There was also a consensus among readers that user controlled updated news is a very important feature of the e-newspaper. Nevertheless, there is a tension between updates and stress.

*I would feel stressed if the newspaper was updated several times a day. In that case you would never be finished reading the newspaper.*

In the reader interviews we discussed the indicator perception of interruption by for example relating it to their experience of advertising in the e-newspaper prototypes. As described in reporting the exploration of challenges, incorporating advertising in newspapers is challenging with regards to advertising being perceived as interruptive. Readers made a number of comments about the online newspapers' approach to advertising being interruptive. The design closer to the printed newspaper advertising model, as implemented in the e-newspaper prototypes, was more in line with their preferences for a calm e-reading experience as this reader confirms.

*This feels more like ads in a newspaper, that's good. On the web it's not ads, its commercials – like on TV and that's stressful, you get interrupted.*

### **The third design principle**

The third design principle supporting focus on content, aimed at providing an effortless reading experience. This principle was more challenging to evaluate in the sense that it is more difficult to relate to specific design features in the e-newspaper prototypes to the experience. If the design allowed focusing on reading without unnecessary effort readers did not comment very much on it. In the evaluation interviews the indicator perception of hindrance was traced by asking whether there were any obstructions to the reading experience (i.e. the operation of the device or navigation). Even so, some comments indicated that the interaction model that was implemented allowed readers to concentrate on the content rather than the device carrying the content.

*You really don't think about the thing, I mean the screen – how it works.*

*It was a relief not having to think about the computer, to get rid of the computer feeling.*

Further, the evaluation of the third design principle was addressed by the indicator perception of transparency. In the tests and evaluation interviews showed that the e-newspaper content was in the centre of readers' attention and was appreciated as a transparent media. In describing this, the readers related to for example the touch model for interaction that played out to be very intuitive for readers. During the tests all readers understood instinctively how to turn pages as illustrated by these quotes.

*This touch makes you forget that you are using a computer, no mouse or keyboard and so on, there is nothing in the way of reading the newspaper.*

*It was a faster to find your way around than in the printed newspaper and better overview than the web newspaper...It feels natural to use touch.*

One example of a design solutions drawing on the principle of supporting focus on content that led to contradictory reader reactions was the navigation support implemented to as a virtual “thumb” aiding users to interact as if they were reading a printed newspaper rather than clicking and scrolling as an online interaction model. The design intention was to provide an interaction closer to the content which would not require shifting focus from the content to graphical or physical navigational features. However, the “thumb” was perceived as very helpful to keep focus on content by some readers but as hindering by others.

## **Theorizing - discussion**

The work presented here is based on engaged scholarship and design science research to develop designs and design visions for a mass market consumer product in co-operation with representatives of an entire industry sector, not for the support of work tasks in an organizational context. It has been performed in line with a Scandinavian participatory design tradition, which embraces a cooperative design approach (Bjerknes and Bratteteig 1995), but with the explicit objective to contribute to theory building. Based on design visions for the e-newspaper as an instance of broader class of design challenges, the aim was to build a design theory for e-reading innovations provided on digital media. This goes beyond the original objective of the participatory design approach, namely to contribute to workplace democracy.

The engagement of multiple stakeholder groups first identified three design challenges for the development of the future e-newspaper. Then a design team consisting of newspaper designers and university researchers derived the leading design metaphor, the calm e-reading experience, and three design principles and design goals to take up the challenges. In terms of stakeholder engagement the project caught different perspectives from the different stakeholder groups and thus chose different approaches and different degrees of engagement in the different phases of the design science research project. By engaging multiple stakeholder groups and interacting with these groups with several different engagement types, this process resulted in rich and in depth understanding of different stakeholder views. This approach was well worth while since this rich understanding strongly influenced the mutual learning between newspaper publishers and researchers and in turn the design of the e-newspaper. However, while all stakeholder groups were directly involved in the project (Mumford 1983), the potential readers of the e-newspaper as the ultimate target group were mostly engaged in informative and consultative roles, whereas the newspaper designers also held a participative role, which gave them more decision power (Damodaran 1996). This had a number of consequences when implementing and evaluating the three design principles, which aimed at accomplishing a calm e-reading experience.

*The principle of providing media recognition support* aimed at providing a familiar reading experience by making use of interaction, layout, structure, order and aesthetics that readers are accustomed to. This principle was developed to address the challenge of genre awareness, i.e. meeting reader expectations, support use patterns as well as being associated with the credibility of today's newspaper products. The evaluation showed that the implementation of this principle supported the calm e-reading experience. The readers perceived the e-newspaper to have the look and feel of a printed newspaper and to be as easy, comfortable and credible as the printed newspaper. However, it was also noted in the evaluation that readers' expectations on order, structure and linking vary more than expected, due to variations in reading habits and use patterns. In the prototypes, with support for e.g. turning page by page, direct navigation to sections, using the thumb or not, some users had expected more alternatives.

From this experience we learned that providing different types of recognition support is important for a calm e-reading experience.

*The principle of supporting user command* aimed at addressing the challenge of stress and lack of control by designing a user controlled interaction model not forced by system actions. The intention was to provide a stress less and controlled reading experience of an e-newspaper still including updates, multimedia features and advertisement. As the evaluation illustrated, this principle had a strong impact on readers' perception of the e-newspaper reading experience. Many readers expressed a strong aversion of the online model of multimedia, advertising and updates which made them feel interrupted and out of control. The restrained implementations of these features were appreciated as these features were regarded as attractive if they were not disturbing. Nonetheless, in the evaluation we also learned that the preferences for how to provide for example updates and the individual stress tolerance levels differed. Those who preferred constant updates were stressed if the updates were not constant and those who preferred constrained models were stressed by constant updates. From these reactions we learned that providing different models for activating system actions (such as animations, updates, sound etc) is important for a calm e-reading experience.

*The principle of supporting focus on content* aimed at allowing a reading experience perceived as close to the e-newspaper content as possible so that readers do not have to reflect on how to interact with the medium. The intention of this principle was to make it possible for the e-newspaper to be as taken for granted and as effort less to read as the printed newspaper. The evaluation showed that the interaction model in the prototypes was perceived as transparent and not hindered by unnecessary efforts. The readers confirmed that they were not occupied with thinking about how to read or turn pages, neither were they occupied with thinking about how the device worked. However, in the evaluation we learned that there are differences in what is perceived as a hindrance and not. For example, a few readers felt the "thumb" navigational aid as a support for touch interaction was hindering. The lesson learned from this implies that individual differences require alternative models of interacting.

In our engaged scholarship and design science research approach we created new knowledge through the interrelated activities of exploring design challenges, deriving design principles and goals, building artefacts, and evaluating principles. In this process the development of the evaluation indicators and partial evaluation took place through all activities similar to the Action Design research process described by Sein et al. (2011, forthcoming).

<b>Design challenge addressed</b>	<b>Design goal achieved</b>	<b>Design principle Revised</b>
Genre awareness	Familiarity in reading experience	Provide media recognition support for differentiated media-use patterns
Stress and lack of control	Stressless and controlled reading experience	Support user command for varying individual stress level
Obstruction	Effortless reading experience	Support focus on content for varying intrusion levels

We now theorize the results of our particular project towards a design theory. Following Sein et al. (2011, forthcoming), we argue that developing design visions for the future e-newspaper in the particular context of the project is an instance of a class of challenges concerning a class of solutions for the design of future e-reading applications provided on and for digital media. The evaluation of the initial design principles through some evaluation indicators applied to the developed prototypes showed that the principles are interrelated and led to some lessons learned and the revision of the design principles. Only together provisions of media recognition support, support of user command, and support for focus on content foster a calm e-reading experience. The revised design principles, which were shaped both by a concurrent and a distinctive feedback and evaluation process capture the knowledge gained through the process of building the particular prototypes, but they also comprise insights about creating other instances that belong to this class. This process followed an inductive approach which connects the generalized outcomes, in form of the design principles to a class of solution proposals and a class of challenges.

Thus, the three interlinked principles in their entirety, present a new approach and new knowledge for the design of the class of e-reading solutions on digital media and thus a design theory. Table 4 summarizes this theory.

Some limitations of our approach have to be discussed however. The initial strong focus on the newspaper publishers led to a strong reader engagement first in the evaluation phase. While important limitations of the chosen operationalization of the three design principles were uncovered and valuable lessons were learned there, more and earlier engagement of readers in the building phase might have been helpful. The evaluation phase might also be extended by assessing the proposed designs in more mundane environments on a daily basis for example in the reader homes. On the other hand side, a more formal engagement of non-reader stakeholder groups in the formal evaluation might have provided additional input for the further design visions.

A further limitation of the project was the circumstance that the design visions could not be implemented on real e-paper technology and the evaluations of the design principles were not conducted in real-life settings. The prototypes were realized on tablet PCs with touch capabilities and evaluated at the newspaper locations and a university site. Our results however indicate that despite these limitations the engaged stakeholder groups provided valuable feedback for the development of the future e-newspaper. Still, it remains to be investigated if there are implications for the design metaphor and principles based on the qualities of e-paper and reading in real-life situations. Overall however, the presented design science project has shown that the metaphor of calm e-reading experience and the revised three design principles provide a viable theory for the design of future e-reading solutions.

## **Conclusion**

In this paper, we have addressed the challenge of developing design visions for the future e-newspaper and future e-reading solutions on digital media. This kind of design science research is challenging as the daily newspaper is a common artifact interwoven in people's every-day lives. Based on three design principles our research empirically demonstrates that an everyday artifact entwined in the fabric of our lives can be transformed into a digital information environment, which is perceived as familiar, stress-free controllable, convenient, unobtrusive, in other words as a calm artifact providing a calm e-reading experience.

The work presented in this paper makes two contributions. First, we provide an engaged design science research approach for mass market consumer products, which engages both developers and users in the design science activities. This goes beyond a mere proof of the technological concepts, which is so common in design science research projects and only shows that the technology works. Second, we present a design science theory, which consists of a guiding metaphor – the calm e-reading experience – and three design principles for mass market consumer products, the e-newspaper and e-reading solutions that combines features of printed and digital media.

The presented design principles contribute to the development of calm e-reading experience. However, designing for anyone, anywhere, anyhow, anytime is a challenging venture, as only a few assumptions can be made about the emerging technology, its context of use and its potential users. The user experience will gain from a design and interaction which is adaptable to a number of uncertainties. This is a demanding research challenge for prospective design science research into the future e-reading solution. The lessons learned in our project and the resulting design theory should thus serve as the starting point for further design science research project in this area of concern.

## **References**

- Beamish, R. "The local newspaper in the age of multimedia", in *Making Local News: Local Journalism in context*, Franklin B. and Murphy D. (Eds.), Routledge, London, 1998, pp. 140-53.
- Bjerknes, G., and Bratteteig, T. "User Participation and Democracy: A Discussion of Scandinavian Research on System Development," *Scandinavian Journal of Information Systems*, 7(1), 1995, pp. 73-98.
- Damodaran, L. "User involvement in the systems design process – a practical guide for users," *Behaviour and Information Technology*, 15(6), 1996, pp. 363-377.
- Dourish, P. "Implication for Design," in *Proceedings of the ACM Conference on Human Factors in Computing Systems CHI*, Montreal, Canada, 2006, pp. 541 – 550.
- Germonprez, M. and Mathiassen, L. "The Role of Conventional Research Methods in Information Systems Action Research", in *Proceedings of the IFIP WG 8.2 Conference*, Manchester, UK, 2004.

- Germonprez, M., Hovorka, D., and Callopy, F. "A Theory of Tailorable Technology Design," *Journal of the Association of Information Systems*, 8(6), 2007, pp 351-367.
- Gregor, S. and Jones, D., "The Anatomy of a Design Theory", *Journal of the Association of Information Systems*, 8(5), 2007, pp. 312-335.
- Hardless, C., Lindgren, R. and Schultze, U. "Technology-Mediated Learning Systems for Project Work - A Design Theory", *Scandinavian Journal of Information Systems*, 19(2), 2007, pp. 3-36.
- Heidegger, M. *Being and Time*, Basil Blackwell, Oxford, UK, 1962.
- Hevner, A.R., March, S.T., Park, J., and Ram, S. "Design Science in Information Systems Research", *MIS Quarterly*, (28:1), 2004, pp. 75-105.
- Hovorka, D.S. "Incommensurability and Multi-paradigm Grounding in Design Science Research: Implications for creating Knowledge", in Pries-Heje et al. *Proceedings of the IFIP TC8 WG 8.6 Working Conference on Human Benefit through the Diffusion of Information Systems Design*, pp 12-27, Perth, WA, Australia, 2010.
- Ihlström, C., and Henfridsson, O. "Online Newspapers in Scandinavia: A Longitudinal Study of Genre Change and Interdependency", *IT & People*, (18:2), 2005, pp. 172-192.
- Ihlström, C., Åkesson, M. and Nordqvist, S., "From Print to Web to e-paper - the challenge of designing the e-newspaper", in *Proceedings of ICCO 8th International Conference on Electronic Publishing*, ELPUB 2004, Brasilia, pp. 249-260.
- Ihlström Eriksson, C., and Svensson, J. "A User Centered Innovation Approach Identifying Key User Values for the E-newspaper", *International Journal of E-Services and Mobile Applications*, (1:3), 2009, pp. 38-78.
- Jungk, R., and Müllert, N. *Future Workshops - How to Create Desirable Futures*. Institute for Social Inventions, London, 1996.
- Krueger, R.A., and Casey, M.A. *Focus groups: A practical guide for applied research*. Sage Publications, Newbury Park, CA, 2000.
- Kuechler, B. and Vaishnavi, V. "Theory Development in Design Science Research: Anatomy of a Research Project", In Vaishnavi, V. and R. Baskerville, R. (Eds.) *Proceedings of the Third International Conference on Design Science Research in Information Systems and Technology*. 2008.
- Löwgren, J., and Stolterman, E. *Thoughtful interaction design: A design perspective on information technology*. Cambridge, Mass.: MIT Press. (2004).
- Mathiassen, L. "Collaborative practice research," *IT & People*, 15(4), 2002, pp. 321-345.
- Mathiassen, L. and Nielsen, P.A. "Engaged Scholarship in IS Research - The Scandinavian Case," *Scandinavian Journal of Information Systems*, 20 (2), 2008, pp. 3-20.
- Mumford, E. *Designing Human Systems for New Technology - The ETHICS Method*, Manchester Business School, UK, 1983.
- Peffer, K., Tuunanen, T., Rothenberger, M., and Chatterje, S. "A Design Science Research Methodology for Information Systems Research," *Journal of Management Information Systems*, 24(3), 2007, pp. 45-77.
- Pries-Heje, J., and Baskerville, R. "The Design Theory Nexus", *MIS Quarterly*, 32(4), 2008, pp. 731-755.
- Sein, M. K., Henfridsson, O., Purao, S., Rossi, M., Lindgren, R. "Action Design Research", *MIS Quarterly*, (35:2), 2011 (forthcoming).
- Sharp, H., Preece, J. and Rogers, Y. *Interaction Design - Beyond Human-Computer Interaction* (2nd ed.), John Wiley & Sons Ltd, 2007.
- Van de Ven, H.A. *Engaged Scholarship A Guide for organizational and social Research*. Oxford University Press, New York, USA, 2007.
- Weiser, M. "The computer for the 21st century", *Scientific American*, (265:3), 1991, pp. 94-104.
- Weiser, M. and Brown, S.J. "The coming age of calm technology", In *Beyond Calculation: The next fifty years of computing*, Denning, P.J. and Metcalfe, R.M. (Eds.), pp. 77-85, Copernicus, 1997.
- Winograd, T., and Flores, F. *Understanding Computers and Cognition: A New Foundation for Design*, Ablex Publishing Corporation, Norwood, NJ, USA, 1986.
- Winograd, T. "From computing machinery to interaction design". In *Beyond calculation: The next fifty years of computing*, Denning, P., and Metcalfe, R. (Eds.), Springer-Verlag, 1997, pp. 149-162.
- Winter, R. "Design science research in Europe," *European Journal of Information Systems*, 17, 2008, pp.470-475.
- Åkesson, M. and Ihlström, C. "Designing and evaluating the calm e-newspaper," in *Proceedings of ECIS 2006*, Göteborg, 2006.