

FROM PRINT TO WEB TO E-PAPER – THE CHALLENGE OF DESIGNING THE E-NEWSPAPER

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This paper presents future scenarios of use and design of the e-newspaper, i.e. the newspaper on e-paper. These scenarios are based on experiences from prototyping e-newspaper interfaces and from a survey with newspaper designers and management. The findings show e.g. that the design from the printed edition and the functionality of the online newspaper were considered preferable attributes for the e-newspaper, and that mobility, interactivity, adjustment for special target groups and personalization were the most frequently suggested functionalities. Several issues regarding navigation, pagination, structure and overview were discussed during the prototyping, leading to layout suggestions for a one page 5.8 x 8.2 inches display with navigation both on the hardware and in the graphical user interface. Pagination was considered important as well as the ability to estimate the amount of content of the e-newspaper, and the possibility to return to the page from which an article was chosen to read. From the findings three future scenarios are proposed, for a) senior citizens in sparsely populated areas, b) business travelers, and c) young early adopters.

Keywords: e-paper, e-newspaper, design, GUI, future scenarios

INTRODUCTION

Newspapers have a long tradition and centuries of experience behind today's newspaper design. Pages, headlines, columns and fonts have been tuned in form and function to optimize content and context. They are all part of a user friendly and universally accepted product [1]. Newspapers have two internationally recognizable formats, i.e. broadsheet or tabloid, familiar to readers all over the world. The first online newspapers appeared only ten years ago in 1994 [2], and since then research has been done to gain knowledge about how to design user friendly news sites [3]. Today, we are facing the introduction of yet another media channel, the e-paper, which once again will require new design solutions for the graphical user interface (GUI).

E-paper is a wide and not defined term. For this paper we limit our research to the e-newspaper, i.e. a newspaper on e-paper, which will emerge on a new breed of e-Reader terminals based on E-Ink technology [4]. These future terminals will most likely be in the size of 5.8 x 8.2 inches, which has been used as a base for this paper.

There seems to be little doubt that e-paper has the potential to be an important development, widely adopted by newspaper publishers and readers. It combines many of

the qualities of printed paper with the advantages of electronic media - the ability to deliver new editions instantly and without the need to print copies and transport them over distances to thousands of retail outlets and millions of subscribers.

The change in the dimensions of printed broadsheet or tabloid newspapers into a smaller, digital e-paper format will radically change the user experience. Presumably, this e-newspaper solution will not replace the web but rather aims at replacing the printed newspaper in the future. When designing the e-newspaper, the best from both worlds, i.e. print and web, should be considered in combination with the unique advantages of this new media, since expectations based on previous experiences influence the acceptance of new artifacts [5].

Fidler [5] states that for digital print media “to function as a practical alternative to mechanical printing and pulp paper, digital print media [...] will need to be highly portable and simple enough for anyone to use without having to read a manual. As with traditional print media, digital forms must be comfortable and convenient to read while lying in bed, riding on a subway, dining in a restaurant, or sitting on a park bench. They will also need to integrate some of the more compelling elements of cybermedia, such as interactivity, hypertext, and audio/video clips, *without* sacrificing the readability and ease of using paper” [5, p.236].

Despite all advantages of the e-newspaper it will probably not be easy to replace the printed edition since users often stick to experienced ways and behaviors [6]. It will most likely take at least a decade, since acceptance of new artifacts in society may take longer than would be expected [7]. The five most important attributes that influence the diffusion of new ideas and innovations have been identified by Rogers [8], e.g. a) ‘relative advantage’, i.e. added value in relation to existing artifacts, b) perceived ‘compatibility’ to existing technology, c) ‘complexity’, i.e. the degree of recognition in relation to experiences from using existing artifacts, d) ‘trialability’ the degree to which an innovation may be experienced with on a limited basis, and e) ‘observability’, i.e. the degree other people use the new artifact. In addition to these attributes, Fidler [5] added ‘familiarity’ as a sixth attribute, i.e. the degree to which new forms of media are related to earlier forms. Further, he argues that it is not the technology that drives new forms of new media but the content, the usability, convenience and cost. With this in mind, it is essential for the publishers to find initial target groups when launching their e-newspaper, such as early adopters and readers in sparsely populated areas.

In this paper, we first present empirical results from two parallel studies. From these studies we a) report from experiences with prototyping e-newspaper interfaces, and b) discuss prerequisites for e-newspaper design from a publisher view. Based on the above we then propose a set of future scenarios for e-newspaper use and design.

In the next section, an introduction to e-paper technology is presented, followed by a discussion of newspaper design. The method used is then described followed by a description of the empirical results. We thereafter propose a set of scenarios for the e-newspaper. The paper is then concluded with a discussion of the findings.

E-PAPER TECHNOLOGY

Electronic ink consists of millions of microcapsules in the size of a hair. These microcapsules contain white positive and black negative magnetic particles floating in a

clear liquid. These white and black particles appear depending on electrical fields being positive or negative. This gives the look of black ink on paper.

An electronic display is created by printing the E-ink on thin, plasticised, paper-like sheets which thereafter is laminated with circuits. It is possible to apply E-ink on different materials such as glass, plastic and paper since the technology is not bound to a particular carrier. In figure 1 the E-ink technology is illustrated on a Philips device.

The human eye can not perceive any flicker on the display because of the fast updating frequency. This technology gives sharpness six times higher than an ordinary LCD display. The contrast is as good as on printed paper and no background light is needed, leading to high readability. The power consumption is very low due to that power is only needed when updating, the image on the display remains when the power is turned off. The e-paper technology is rapidly developed and a thin, flexible display has been developed by Philips (see figure 2).

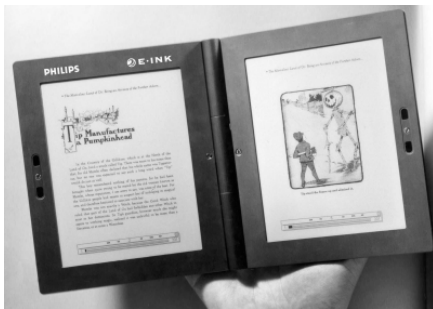


FIGURE 1. E-INK TECHNOLOGY ON A PHILIPS DEVICE [9]



FIGURE 2. PHILIPS FLEXIBLE DISPLAYS [9]

DESIGN OF NEWSPAPERS

Newspapers have a long experience of designing print media but the design of online newspapers is still in its infancy [10]. In Nielsen's [10] predictions for the future, he speculates that over the next ten years (from 2000), the traditional newspaper will be dead and news will be consumed interactively through digital media. He argues that media workers must modify their skills for the interactive age, since reading online is different from reading print. Therefore publishers need to change their styles and must learn to incorporate interactivity in publishing news.

There is a tradition of layout (visual pattern) for newspapers that seem to be taken for granted – the so called broadsheet layout. The broadsheet metaphor is described as “a newspaper layout of text and photographs [...] integrated into a coherent presentation” [11, p. 151]. The visual pattern for newspapers is strongly related to the front page according to Schmid-Isler [12]. She describes the visual pattern as a) the name of the newspaper – the brand, b) the number of columns, c) headings, d) photographs and e) table of contents (often to the left), an according to Toms and Campbell [13] a reader may recognize a digital document as a newspaper even before reading the content, through the appearance of columns and headlines.

Interestingly, the first web news providers adopted the web's single document window mode of presentation. Garcia [14] presented advice for publishers for redesign of printed news to the web in 1997, where the design of online news differs from printed news. Now, the dominant online newspaper genre appears to be evolving back to

something closer to its original genre in print [15; 16]. Cato [17] refers to the design of online newspapers as the newsprint style and has found that it seems to have gained predominance on the web.

Newspaper sections enable a reader easy access and make sense of information [14]. It does not take much effort to find a particular section e.g. the sport section or the business section, inside a newspaper. The newspaper indexing is the most effective “navigational” tool in newspapers and headlines are the main entry points to text. According to Garcia [14] all publications, printed or digital, should minimize the number of items that appear as navigational tools. In online newspapers, readers scroll the front page to get an overview of the contents of the news site, which could be compared to browsing and flipping through the printed newspaper [18].

Fidler [19] has among others envisioned the newspaper of 2020. He suggests the following layout for the portable digital newspaper in 2020:

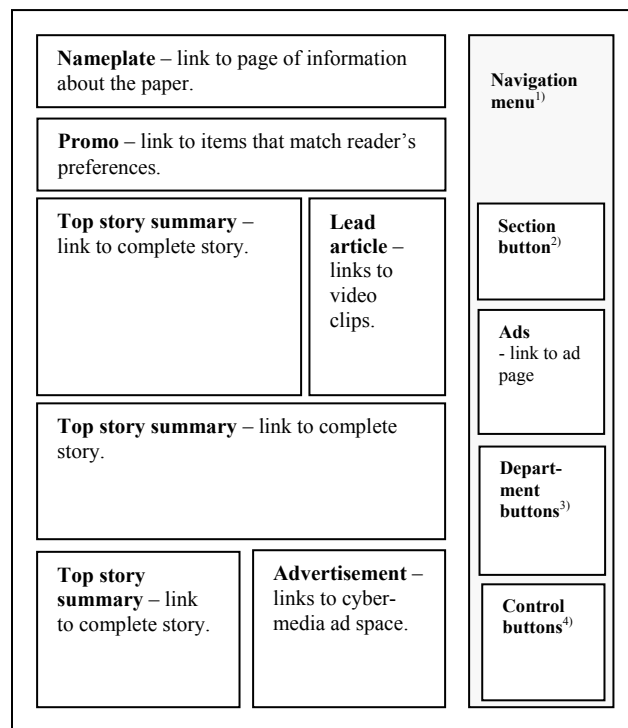


FIGURE 2. LAYOUT PROPOSAL [19]

¹⁾ constant element that present readers with their standard navigational and operational options

²⁾ links to available sections. Current open section is highlighted.

³⁾ links to available departments within open section

⁴⁾ used for turning pages, linking to dynamic indexes, searching, saving and printing, setting personal preferences, closing newspaper etc.

METHOD

This paper draws on empirical results from two parallel studies. In the first, e-newspaper prototypes were proposed and evaluated in collaboration with newspaper publishers, and in the second, questionnaires were sent to management and designers at newspapers with online editions.

Fourteen Swedish newspapers, interested in the progress of e-paper technology, have formed a group in which the future e-newspaper has been discussed and low fidelity

prototypes have been produced. During the project meetings, two different aspects of an e-paper were discussed, i.e. business models and design. A smaller working group interested in design of the print as well as the online edition produced prototypes after brainstorming sessions in an iterative process. In this paper we report from the experience of this work and present four layout prototypes.

In parallel, a questionnaire was sent via e-mail to five of the fourteen newspapers that recently have become dedicated to a project with the aim to develop a design for the e-newspaper. The questionnaire contained 16 open questions regarding a) possibilities and problems, b) design solutions from print and web that could be transferred to the e-paper media and c) prerequisites for design of the e-newspaper. The results were analyzed using a coding scheme to identify common as well as differing views, and the results form a base for a set of future scenarios.

EMPIRICAL RESULTS

E-newspaper prototypes

When creating the mock-ups and low-fidelity prototypes several issues were discussed regarding layout of the small display, for example: navigation, pagination, structure and overview.

Navigation issues concerned physical buttons or wheels on the hardware as well as providing navigation through menus and bars in the GUI. Concerns were expressed for users with little or no prior usage of digital devices. With this in mind, the group recommended buttons on the hardware in combination with providing navigation support on screen. The question about what functionality the navigation buttons should provide was also raised, a default sequential order was suggested, i.e. from top to bottom. In the beginning the group was working with two displays in 5.8 x 8.2 inches size folded as a book, as illustrated in figure 3 and 4.



FIGURE 3. MOCK-UP 1

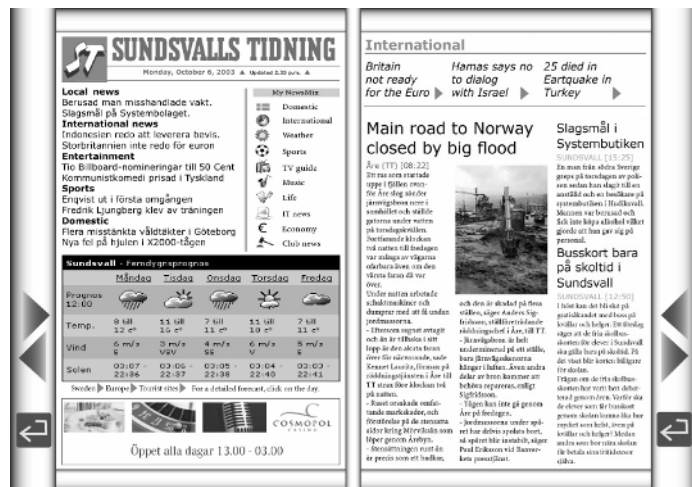


FIGURE 4. PROTOTYPE 1

But problems with navigation were experienced with this approach, i.e. when turning pages, questions like should a new spread be shown or should the left display be used for navigation etc arose. It was also a question of cost, and the group decided to abandon the double displays for a single display, as illustrated in figure 5 and 6.



FIGURE 5. PROTOTYPE 2



FIGURE 6. PROTOTYPE 3

Pagination in the GUI could facilitate navigation but could be problematic in parallel publishing if the whole content from the printed edition is not to be published in the e-newspaper in the introduction phase. However, it was considered important to provide the reader with page numbers for three reasons, i.e. for the user to know: a) how many pages that exist, b) which page that is viewed at the moment, and c) how many pages are left to read.

The structure and overview issues discussed regards that the reader easily should be able to estimate the amount of content of the e-newspaper, and the possibility to return to the page from which an article was chosen to read. The principle for the e-newspaper has to be simple, i.e. “open, turn pages, chose article, read and return”. Additional interactivity, moving images and sounds were considered a bonus for the more advanced reader.

Results from questionnaires

Possibilities and problems with an e-newspaper

The most frequently possibilities mentioned regarded technical aspects. For example, possibilities of providing: updates during the day, interactivity, added value, combining the e-newspaper with complementary subscriptions and services, and possibility of searching. Economic possibilities were also frequently mentioned, e.g. lower distribution costs, and new business model that benefits publishers, readers as well technical providers. Other mentioned possibilities were environmental advantages and reaching new target audiences. The e-newspaper is expected to replace the printed edition in the future.

The e-newspaper is expected to solve the problem with high distribution and printing costs as well as to reach sparsely populated areas. It is also considered more environmentally friendly and capable of personalization. On the negative side, the respondents had the most concerns about the journalistic and competence issues as well as the economical issues. The journalistic worries concerned changed reader habits, if the newspaper chose to publish less material than in the printed edition, that the impact of

pictures will not be the same and that the possibility to surprise the reader would be diminished. The respondents expect a need for educating those who are to work with editing and designing for this smaller newspaper format, due to problems with formatting and standards. The payment problems, the initial costs, the need for new business models, and increased competition on the local market are mentioned as economical concerns. Other problems raised were connected to the reader device, e.g. if it is: easy to break, liable to be stolen, the need for several devices in a household etc. A striking quote from one of the respondents concerned lost functionality:

“It is difficult to light a fire with e-paper. It is also difficult to cut out funny headlines and put them on the fridge.”

Design solutions from print and online

The respondents were asked which characteristics from the printed and the online newspaper that was important to transfer to the e-newspaper. These views are summarized below.

The preferred characteristics from the printed newspaper were:	The preferred characteristics from the online newspaper were:
<ul style="list-style-type: none"> - the clear overview of the content, including a beginning and an end, the ease of use, typography and design - the familiarity in design from the printed paper - that mainly the same editorial content should meet all readers, i.e. creating common topics to discuss in social settings - news valuation, e.g. positioning of lead story - mobility, i.e. to be able to read the newspaper everywhere 	<ul style="list-style-type: none"> - continuous updates - the possibility of searching - easy and intuitive navigation - hyperlinks - interactivity with the readers - possibility to add sound and video.

To illustrate the layout of a printed newspaper as well as an online newspaper, the front pages of Sundsvalls Tidning (also used as an example in the prototypes) and their online edition, ST Online (www.stonline.se) from April 23rd in 2004 are presented in figure 7 and 8.



FIGURE 7. ST APRIL 23, 2004



FIGURE 8. STONLINE APRIL 23, 2004

In conclusion, the design from the printed edition and the functionality of the online newspaper were considered preferable attributes for the e-newspaper.

Prerequisites for e-newspaper design

It seems that the 5.8 x 8.2 inches format is the smallest acceptable size, even though one respondent thought a smaller size could work if well designed. Most of the respondents prefer a combination of sequential presentation and hypertext for the e-newspaper. The sequential presentation was preferred to get an overview and to get a feel for the beginning and end and hypertext for quick and goal-oriented reading. A combination of navigation on the hardware and on the screen was suggested. In addition to this, an index, a list of page numbers and an indication of the current location in the e-newspaper was suggested. Providing news valuation was considered important, e.g. the leading story should be placed in a prominent position, and the reader should be able to be guided through the e-newspaper, if preferred.

Several aspects of functionality were suggested as essential for a successful e-newspaper. Mobility, interactivity, adjustment for special target groups and personalization were the most frequently suggested functionalities. All respondents liked the idea of contextual content provision, such as an enterprise edition, a vacation edition, a sports edition etc., but they considered it important to still have the traditional news as a base. Color is a necessity for the e-newspaper, due to more enjoyable reading and correct color adjustment in ads. A concluding remark from one of the respondents was:

“The e-newspaper has to be as easy to use as the printed newspaper. The goal has to be that the e-newspaper becomes a people’s product to the same extent as the printed newspaper and television.”

SCENARIOS FOR USE AND DESIGN OF THE E-NEWSPAPER

The respondents considered that it is important to reach as wide audience as possible including loyal readers, but the following target groups were initially suggested; early adopters, readers in sparsely populated areas, business travelers, senior citizens and young people.

From another study regarding e-newspapers similar target groups for the launch of the e-newspaper were suggested from interviews with newspaper management [21]: a) persons living abroad, b) people living in sparsely populated areas, difficult to reach with the existing distribution system for the printed edition of the newspaper, c) roaming readers, such as businessmen and other people who travel extensively, and d) people preferring to read an on-line edition of the newspaper, rather than the printed edition.

In this paper we have decided to build three scenarios by combining the suggested target groups, resulting in the following:

1. senior citizens in sparsely populated areas,
2. business travelers, and
3. young early adopters

We have also been inspired by the results from a study connected to this research, involving focus groups [20]. From their findings the following user preferences were identified; a) large format for better overview, b) upright page layout, c) two parallel displays to avoid turning pages (like a book), d) overview on the left and the chosen content on the right, e) importance of color, f) navigational buttons in the bottom or side of the page and not on the frame and g) storage capacity. Suggested additional features of the e-newspaper were; e.g. agenda, signals indicating updates, maps, cookbook, and dictionary.

Scenario 1 – senior citizens in sparsely populated areas

Mr and Mrs Andersson are having breakfast. Mrs Andersson comments on the e-newspaper being thick this morning, “It is 35 pages today” she says. They then discuss the top story on the new healthcare budget that they both are reading on their two e-newspapers. “Was there not another article on this topic, just a few days ago?” Mr Andersson asks his wife. “Well, search for it then, I’m moving on to the local news” she answers. She turns the page and presses ‘the enlargement button’. “My eyesight is getting worse” she says. “I will search for ads from opticians to see if there are any special offers. See, here is one good offer for new glasses. I think I will make an appointment.” Mrs Andersson then presses the ‘contact me button’ in the ad. Next time the e-Reader is connected to the modem the request will be sent to the newspaper, and the contact information will be sent to the optician from the subscriber database. A few minutes later an SMS with suggestions of appointment times arrives to her mobile which she immediately confirms.

Mrs Andersson has been thinking about dinner, but feels like she lacks the inspiration today. She looks in the fridge and then chooses the new cookbook that she has bought to her e-Reader. She fills in a few of the ingredients that were available and presses the ‘search button’. Immediately, she gets suggestions of six different recipes, and turns to her husband for advice.

Later in the day, after a nice dinner, Mr Andersson connects his e-Reader to the modem to check for updates on the healthcare budget discussion. He also checks for updates on information from the local pensioners’ association if there is a boule game

scheduled for the weekend. Mr Andersson looks out the window and remembers when he had to walk a mile to get the newspaper every morning, sun shine, rain or snow. It is really amazing, he thought, the e-newspaper. Really looks like a printed paper and yet delivered through the phone line and best of all it saves the beautiful forests of Sweden.

Scenario 2 – business travelers

At the airport in Stockholm, Mrs Nord is waiting for her flight to New York. Beep, beep! Her e-Reader is beeping since there are new updates on important business news that she has subscribed for. Mrs Nord picks the e-Reader up and reads the latest news on the Ericsson stocks. As she is a subscriber of the business edition of Dagens Nyheter she also gets an automatic offer of an analysis of the economic development of the Ericsson stocks, which she accepts. While waiting for the information, she reads the ads on new mobile phones, pressing the buttons in the GUI to shift ads, stops and looking at the new phone from Nokia, really liking the beautifully red color. After a few minutes the analysis is presented, including a summary of an article published in the Financial Times last week. She finds the article interesting and orders the full article. By her subscription the charge is made to her subscriber account on the Dagens Nyheter. As she is about to board the plane to New York she orders a single copy of today's New York Times and the latest novel by Clancy to read on the plane, from the ordering menu to the right on the display. When sitting on the plane reading the Clancy novel, she reflects on the convenience of the e-Reader having two connected displays, feeling like a book. She also likes the ability to use the buttons on the frame for turning pages.

Next morning in New York, she reads the new edition of Dagens Nyheter, and finds an article about several burglaries in her neighborhood in Stockholm. She phones her husband, asking him "Have you seen the article on page 7 about the burglaries? Maybe it is time to install that alarm that we have talked about. Could you please see to it today? Maybe you can phone the number on the ad to the right? It seems like a reasonable price to me." Later, when passing the hotspot in the hotel lobby, she gets ads on last minute tickets for a Broadway musical. She follows the impulse to order one, feels like she could allow herself that luxury before returning home to the husband and kids, and looks the theatre up in the interactive map in her e-Reader.

Scenario 3 – young early adopters

Ola, a young urban IT manager, is on his way to his favorite coffee shop. While passing a hot spot his recently upgraded 8.2 x 11.6 foldable e-Reader is updated with the latest news. Ola is a subscriber to a personalized e-newspaper with the sports from Sports Illustrated, IT news from Computer Sweden and the local news and ads from Sydsvenskan. By the user profile in the subscription database he mainly gets ads on new mobile phone offers, on stereos, sports cars and whiskey. He is currently looking for a used rare super sports car, a Koenisegg CC8S, with a top speed of 240 mph and is subscribing to the notification service from Aftonbladet. While sipping his coffee, reading the e-newspaper, a green light is indicating that there is a personal message for him. The newspaper service has located a car in Zürich and there will be an auction next Monday, attached to the message is a video clip of the car. Full of expectations, he clicks on the file and the sound of the engine roaring is heard in the whole coffee shop. Several heads are turned, he smiles and says: "There is nothing like the sound of a Koenisegg."

He checks his calendar, which is embedded in the e-Reader, found that he will be able to attend the auction and switches to the online mode, searching for air tickets to Zürich. He books the flight, and sends an e-mail to his fiancée and invites her to dinner this evening to celebrate. On his way to the restaurant, the e-Reader beeps and he receives an offer of “Midleton Very Rare” whiskey just as he passes the liquor store. He hesitates, but thinks that should I celebrate, I might as well do it properly, and walks into the store. Later that evening, sitting in front of the open fire, sipping his whiskey, the Persian cat happens to knock the glass over, and the whiskey pours out on the e-Reader, lying on the table. Ola sighs, a bit upset about the spilled expensive whiskey, and goes to rinse the e-Reader.

DISCUSSION AND CONCLUSIONS

For the e-newspaper to become widely adopted by newspaper readers and subscribers, it has to offer added value to existing newspaper media. Using Rogers attributes that influence diffusion of new ideas and innovations, we here discuss the potential of the e-newspaper in relation to the design challenge.

As we have shown in our scenarios, the e-newspaper holds the potential of combining the advantages of the printed newspaper (e.g. mobility, lightweight, newspaper layout, readability) with the advantages of the online newspaper (e.g. interactivity, digital distribution). This combination offers extended advantages in relation to the currently existing newspaper media. New ways of thinking about news publishing and the newspaper product, e.g. new services embedded in the newspaper product and interactive ads, are made possible by this new media,. The compatibility of the e-newspaper to existing newspaper publishing systems is important for the diffusion of the future e-newspaper. The challenge is to design newspaper resembled interaction models and navigation systems easy recognized by readers. The design challenge regarding the complexity attribute is related to usability issues, such as simplicity, ease of use, learnability etc. If a reader can relate to their experiences of reading newspapers, the adoption process will be made easier. To allow trialability of the product, we believe that the e-newspaper has to be very affordable in introduction phase. A strategy could be to place it for free at different locations, for the readers to get acquainted with it, which also increases the observability. Increased observability could also be gained by initially targeting early adopters of technology.

As regards to familiarity, it is strongly related to the design challenge, i.e. to translate the design from the printed edition and the functionality from the online edition into this new technology, making a synthesis based on usability. Using the broadsheet metaphor for layout and structure increases familiarity.

The suggested scenarios will serve as a basis for further prototype development, and the knowledge gained from the empirical result, together with Fidler’s layout suggestion for the portable digital newspaper (Figure 2), will be used in our future work.

In conclusion, we believe that there is a great potential of this new media to be successful for newspaper publishing. But, the newspaper designers now stand before the greatest design challenge since Gutenberg.

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