

# Designing the future e-newspaper - the da Vinci approach

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## Abstract

In this paper we propose an approach for gathering data to generate user requirements for an artifact under development, in this case the e-newspaper based on an e-paper solution. Inspired by future workshops, scenario- and mock-up techniques we suggest the da Vinci approach. In addition to describing the approach we also report types of requirements possible to derive. We conclude by discussing experiences from applying the approach in the DigiNews project.

## 1 Introduction

Suggesting design solutions based on user requirements for a technology under development could be problematic to accomplish. In our research we are focusing on a new type of media, the e-paper which is based on E-ink technology. The e-paper gives a visual impression very close to print on paper. One example of a product using this technology is the Sony Librié [7].

A potential content provider for this new technology is the newspaper industry, since producing a newspaper on e-paper, here referred to as the e-newspaper, would dramatically reduce production and distribution costs compared to the printed edition. The e-newspaper is predicted to be very thin and foldable, combining the readability and overview from the printed newspaper with the possibilities of digital media such as constant updates, interactivity and video. In the DigiNews project (ITEA 03015), aimed at proposing an end-to-end solution for the future e-newspaper, our -goal is to propose design solutions based on user requirements.

There are many different forms of data-gathering techniques with user involvement, to generate input for user requirements, presented within the Human-Computer Interaction (HCI) research field [14]. Examples of such are interviews, observations, questionnaires, workshops and scenarios. The use of day-in-the-life scenarios for envisioning future use and mock-ups of design are for example suggested by Go and Carrol [6]. However, in this case with the technology still in its infancy being developed at a very rapid speed, the technical specifications are constantly altered. But as Lyytinen and Yoo [10] point out it is important for researchers to be actively involved during the development of the technology and not just after it has reached the market. We therefore suggest what we call the da Vinci approach for gathering data for user requirements and design solutions. Like da Vinci described and sketched ideas for new inventions, users envision a future artifact by designing scenarios and mock-ups without paying attention to the technical limitations of today.

## 2 e-paper technology

Electronic ink (E Ink) consists of millions of microcapsules in the size of a hair, containing 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, the contrast is as good as on printed paper and no background light is needed, leading to high readability. An electronic display is created by printing the E Ink on thin, plasticized 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 [13].

The E Ink technology is illustrated in a Sony Librié in figure 1. 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 since power is only needed when updating since 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.



Figure 1: E Ink technology

### 3 The da Vinci Approach

In the HCI field scenarios are used for example to envision future use, mock-up and prototyping, and develop design rationales [6]. Our approach is a data gathering technique inspired by da Vinci’s visionary way of working, and builds on future workshops (mainly the critique and fantasy phase) [8], future scenarios [3] and mock-up techniques [5] used within the participatory design field. The main goal with the da Vinci approach is to achieve user generated visions including new services and user interface design suggestions. The approach is intended to support data gathering in a situation where the underlying technology is under development. Therefore it must support envisioning the technology and its possibilities as well as overcome conceptions of its limitations. Further the envisioning of use situations and contexts, modeling of the artifact, its interface and user interaction are important to support the design process. Consequently, our approach builds on three different phases; a visioning phase, a scenario building phase and a mock-up phase, with one phase giving input to the next like a three-stage rocket (figure 2).

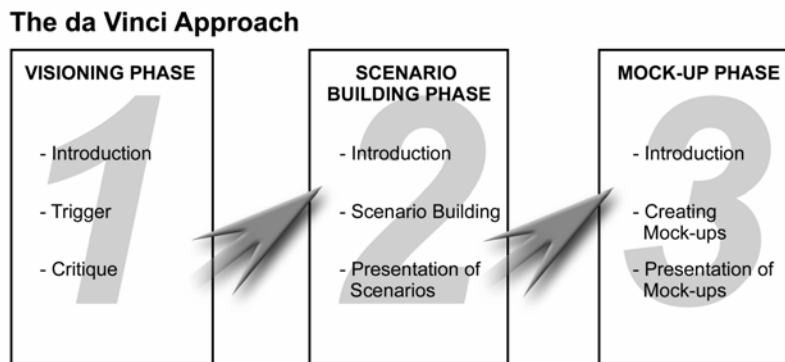


Figure 2: The da Vinci Approach

The visioning phase draws on future workshops techniques [8; 9]. The purpose of the trigger part is to increase the participants’ awareness of what is possible to achieve with a new technology [1]. The critique part is inspired by “The Critique Phase” from future workshops [8] and is basically a structured brain-storming that focuses on problems related to the question at hand. The problems are then grouped in collaboration with the workshop leaders [9].

Scenarios are “stories about people and their activities” [4] and focus on describing a stakeholder view of what, how and why a particular instance of use happens and can be presented in text, story-boards, video mock-ups, scripted prototypes etc. Scenarios allow discussions of contexts, needs and requirements and are often the first step in establishing stakeholder requirements [14]. Our scenario building phase use a similar building technique as CARD [12] regarding the use of cards, but whereas CARD is intended to explore workflow options, our scenario building phase focusing on future use of an artifact under development.

Mock-up techniques are ways to make effective use of the users’ experience and knowledge, as well as ways of experiencing the future, and can be very useful early in the design process [5]. Paper prototyping is an easy way to visualize the user interface design by using a sheet of paper or a card of the right size to represent the screen and for example hardware buttons [2]. To simulate dropdown menus and movable windows post-it notes can be used. Löwgren and Stolterman [11] describe interface sketches as simple drawings of what a system could look like. The

interface sketch can show functions, interaction techniques and spatial structuring. Mock-ups, paper prototypes or interface sketches can be useful aid when discussing and communicating ideas between different stakeholders [14].

The da Vinci approach is designed to be carried out during a three hours session, including a 15 minute break. This is a drastic reduction in time compared to the original idea of e.g. future workshops that were designed to take one or two full days [8]. In the DigiNews project it is essential not only to have the user requirements, but also to have the newspaper publisher view in mind to propose design suggestions for the future e-newspaper. Therefore, time was set to three hours considering the busy newspaper staff participating as well as the users being able to participate after working hours.

We have conducted ten different future workshops, five with users/readers of four different newspapers and five with newspaper staff (e.g. representatives from managers, designers, marketing and IT). The newspaper staff not only represented the publishers' view, but also acted as newspaper readers in the scenario building and mock-up phases. All activities were filmed and tape recorded. In the following we describe how we applied the da Vinci approach in the DigiNews project.

### 3.1 Visioning Phase

The visioning phase includes three parts, i.e. introduction (10 min), trigger (20 min) and critique (15 min). The *introduction part* started with a presentation of the workshop leaders and the participants, followed by a short introduction of the project. The roles of the workshop leaders and the participants were then explained. The workshop phases were briefly presented and the need for active participation during the workshop was stressed. The *trigger part* was essential since the underlying technology was not yet fully developed. Different triggers (e.g. video clips, pictures of prototypes, low-fi prototypes etc.) were used to envision the possibilities of the technology. The *critique part* related to the problems of realizing the future e-newspaper. All identified problems were written on large sheets of paper visible for everybody. The workshop leader ended this phase when the time limit was reached or when no more problems arose. The participants then ranked the most serious problems which helped to create a prioritized list. This part was concluded by the "removal" of all the problems, e.g. "solving" the problems for example by stating that "the infrastructure problem will be solved in 3 years". In this way the participants could enter the next phase with a "free mind" and be able to come up with creative scenarios without being constrained to limitations of today.

### 3.2 Scenario Building Phase

The second phase started with an introduction explaining the roles and activities in the scenario building. The scenario building group activity for retrieving suggestions of future use and services for the e-newspaper took about 60 minutes. This was lead by the workshop leader that made sure that the activity ran as planned and that every participant had input to the process. Six cards in different colors and numbers, pre-labeled with different questions; "Who?", "When?", "Where?", "What?", "How?" and "Idea"? were used to build scenarios (figure 3). The participant's own words were written on the cards in order to get their active participation. By placing the cards in sequential order on a big sheet of paper the scenarios were built by the participants. This activity helped the participants to envision future use, which was valuable input to the next phase. The phase was concluded with the participants explaining their scenarios, which also was video taped.



Figure 3: Scenario Building

### 3.3 Mock-up Phase

The last phase, the mock-up activity (figure 4), was introduced with a variety of material such as paper, overhead film, pencils, tape etc. The aim of the mock-up phase was to envision the physical interface and GUI of the services and functions discussed in the scenario building phase. The mock-ups created during this phase also visualized different types of interaction, such as



Figure 4: Mock-up activity

speech, touch- and point and click interaction. This activity enabled each individual to be creative by creating mock-ups of the future e-newspaper. This phase took approximately 60 minutes and ended with every participant showing their e-newspaper mock-up and explaining their thoughts behind the design to the other participants. These presentations were videotaped.

## **4 Analyzing the data**

We have analyzed the data gathered from all three phases. First, we summarized the problems from the visioning phase from all ten workshops resulting in general requirement patterns. Then we studied the video recordings from the scenario building phase resulting in a list of use situations, functions and possible services, to be considered for the

e-newspaper. Finally, we analyzed the mock-ups together with the video recorded explanations resulting in a detailed list of categorized requirements. We have also validated these results in collaboration with newspaper and interaction designers. Together these results will build a base for the initial user requirements within the DigiNews project to be used in designing and testing prototypes.

Categories of user requirements for the e-newspaper elicited from the da Vinci approach are requirements for the GUI, physical interface, interaction, functions and services. From the visioning phase we retrieved general requirements, e.g. ease of use, simplicity, robustness and newspaper specifics such as newspaper look and feel. This phase also enlightened us what concerns the users respectively the publishers had regarding the e-newspaper introduction. Examples of results derived from the scenario building phase are suggestions of functions (e.g. the ability to print out an article), new services (e.g. extended TV schedule) and use situations (e.g. “at home eating breakfast” or “on the bus to work”). The mock-up phase provided us with most informative data concerning physical interface and GUI requirements, e.g. suggestions of navigation (e.g. sequential- and section reading, menus), interaction techniques (e.g. point and click, buttons on the hardware), format and presentation (e.g. markers and size on text) etc.

## **5 Discussion and conclusions**

We have applied the da Vinci approach in the DigiNews project to meet the challenge of retrieving user requirements for an artifact under development, not having access to the technology. We find three main advantages using the approach. Firstly, it is time efficient and therefore cheap to use compared to the amount of data gathered. Secondly, it produces easily analyzed data generating different types of requirements. Finally, it gives a rich picture including use situations, user motives and problems to overcome.

From our experience we have learned that it is essential to carefully plan for the three hours to ensure fruitful results from all three phases. In some of the workshops the visioning and scenario building phases intruded somewhat on the mock-up phase. Due to the difficulty presenting and envisioning the technology we used many types of triggers. This was time consuming and some times lead to spaced-out scenarios, more related to high-tech possibilities rather than newspaper services, depending on the triggers used. Different triggers were used for shortening this phase. The scenario building phase were also shortened in the later workshops, to give more time for individuals to visualize their ideas in the mock-up phase, as these were more down to earth. Another lesson learned was that we might have influenced ideas for scenarios and mock-ups by presenting low-fi prototypes of e-newspapers as triggers.

The data gathered with this approach is extensive and rich, and was easy to analyze and reformulate as requirements. We were able to get more input to the requirements specification than we expected. The workshops conducted with the newspaper staff gave an overview of the publishing domain and resulted in several identified problems with the introduction of the e-newspaper, but also a range of possibilities not recognized before. The scenario building phase with readers generated suggestions of new services and identified new business possibilities. Further, the validation process resulted in several interesting design suggestions useful for further development of e-newspaper prototypes. However, these results initially only serve as grounds for designing and testing early prototypes. Requirements, design suggestions as well as new service proposals need to be revised and validated in an iterative design process.

In conclusion, we find the da Vinci approach to be a feasible approach to meet the challenge of retrieving user requirements for an artifact under development, not having access to the technology.

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