

# MixedNotes: A Digital Tool to Prepare Physical Notes for Affinity Diagramming

Tero Jokela<sup>1</sup>, Andrés Lucero<sup>1,2</sup>

<sup>1</sup> Nokia Research Center, P.O. Box 1000, FI-33721 Tampere, Finland

<sup>2</sup> University of Southern Denmark, Universitetsparken 1, DK-6000 Kolding, Denmark

tero.jokela@nokia.com, lucero@acm.org

## ABSTRACT

Affinity Diagramming is a technique to organize and make sense of qualitative data. It is commonly used in Contextual Design and HCI research. However, preparing notes for and building an Affinity Diagram remains a laborious process, with a wide variety of different approaches and practices. In this paper, we present MixedNotes, a novel technique to prepare physical paper notes for Affinity Diagramming, and a software tool to support this technique. The technique has been tested with large real-life Affinity Diagrams with overall positive results.

## Categories and Subject Descriptors

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

## General Terms

Human Factors

## Keywords

Affinity Diagram; KJ Method; Contextual Design

## 1. INTRODUCTION

Affinity Diagramming [1, 4] is a technique used to make sense of and organize large amounts of unstructured, far-ranging, and seemingly dissimilar qualitative data. Japanese anthropologist Jiro Kawakita introduced the method in the 1960s as one of the seven quality processes from Japan, often referred to as the KJ Method [8]. While originally developed to support brainstorming and planning, Affinity Diagramming is commonly used in Contextual Design [1, 4, 10] and HCI research as a method to analyze interview and observational data.

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Figure 1. Building an Affinity Diagram.

An Affinity Diagram (see Figure 1) is a wall-sized hierarchical representation of data that is built from the bottom up. The process of building an Affinity Diagram consists of first manually writing affinity notes, typically on sticky notes or paper cards, which record the main issues in relation to the data. Typical numbers of affinity notes can vary between 500 and 2,000, depending on the amount of data. The items are then iteratively arranged on a physical wall based on their affinity to each other, resulting in an increasingly hierarchical representation of the data. The method is well suited for collaborative data analysis, as it supports parallel work and creation of a shared interpretation of the data. However, preparing paper notes for and building an Affinity Diagram remains a laborious and highly manual process, with a wide variety of different approaches and practices. While many computer tools have been developed for Affinity Diagramming, experts and novices alike still prefer traditional paper methods [7, 3].

In this paper, we present MixedNotes, a novel method to prepare physical paper notes for Affinity Diagramming and a software tool to support this method. The method combines the convenience of digital text processing tools with the tangibility of paper notes. It introduces several practical improvements to the note printing process, including multiple note sizes and background sheets, and works with commonly available office equipment and standard sticky notes. The method has been tested with large real-life Affinity Diagrams with good results.

The rest of this paper is structured as follows. First, we provide a brief overview of known methods to prepare notes for Affinity Diagramming. We then give a detailed description of MixedNotes. Finally, we discuss our experiences of using

MixedNotes in real-life projects and compare it with other known methods.

## 2. RELATED WORK

There are several alternative methods to prepare paper notes for Affinity Diagramming. The simplest method is to write notes by hand on standard 3x3 or 3x5-inch sticky notes. While straightforward, the process of writing each note manually may be slow and tedious if the number of notes is large. Writing notes by hand also does not produce a digital copy that would allow storing and processing (for example, searching or counting) of the notes with computer tools.

A common alternative is to type the affinity notes digitally on a personal computer, print them on paper, and individually cut each note with scissors. Removable tape is then used to attach the notes and move them around on the wall. The extensive manual work needed to produce such notes can take several hours in the beginning of an Affinity Diagramming session.

CDTools<sup>1</sup> was a software package to support Contextual Design process offered by InContext Design. Among other features, it allowed writing notes and printing them on sheets of Post-it notes. Such special sheets, however, may not be as widely available and may be rather expensive compared to pads of ordinary sticky notes.

Several tools that support creation of Affinity Diagrams on a computer display have been developed. Examples of such tools include GUNGEN [12], PathMaker<sup>2</sup>, StickySorter<sup>3</sup>, and Affinity Visualization Tool<sup>4</sup>. As traditional desktop applications, they lack the benefits of paper notes in collaboration support, flexibility, tangibility, and physical interactions. Due to the limited display space, managing Affinity Diagrams with hundreds of notes may be challenging.

A number of more experimental systems to support Affinity Diagramming have also been built. Some of these systems use large wall or tabletop touch displays [2, 11]. Others are based on tracking the positions of paper notes with cameras and augmenting them with projector displays [9]. While innovative, these systems require special hardware setups and infrastructure support, which limits their practical applicability in everyday projects.

## 3. MIXEDNOTES

Based on our experiences in using the Affinity Diagramming technique to organize qualitative research data, we set out to develop an improved method to prepare notes for Affinity Diagramming. In particular, we were interested in techniques based on printing digitally-prepared notes on sticky notes as that would allow combining the benefits of digital text processing tools with the tangibility of physical paper notes. We initially experimented with various template-based approaches with common word processing applications, but eventually developed

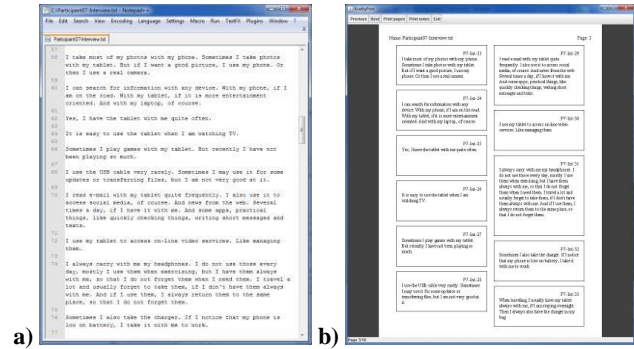


Figure 2. a) Typing notes in a text editor. b) MixedNotes application. Note the three different note sizes.

our own software tool to enable more fine-grained control over the note preparation process. The current version of the tool is implemented in Java and thus can be used on different software platforms.

The process of creating notes for Affinity Diagramming begins with typing the notes into digital format (see Figure 2.a). MixedNotes allows the researcher to use any text editor or transcription tool to write notes. Each note may consist of a single or several paragraphs. Leaving an empty paragraph after each note (that is, adding an extra line break) separates the notes.

The notes can then be imported to the MixedNotes tool (see Figure 2.b). The tool shows an on-screen preview of how the notes will be printed on paper. A unique identifier consisting of a prefix specified by the researcher followed by a running sequence number will be automatically added at the top right corner of every note (for example, “Interview7-23” where “Interview7-“ is the prefix and “23” is the sequence number). The researcher can control the paper size and margins as well as the font size. We have been using standard A4 paper with a 12-point Serif font, which produces text that can be conveniently read at typical distances used in Affinity Diagramming.

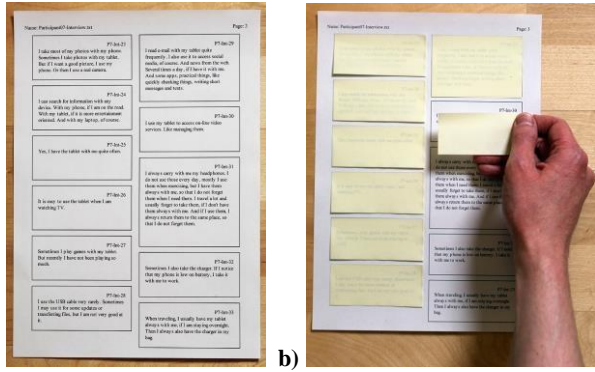
More importantly, the researcher can also control the sizes of the notes. All the notes must be of the same width, but it is possible to define several different note sizes with different heights. The note sizes can be standard sticky note sizes (such as 3x3 or 3x5 inches), but any custom size may also be used. The tool will then automatically select the closest matching size for each note. As the lengths of the notes can vary, using several different note sizes enables more efficient use of space than using a single note size. Moreover, limiting the number of different sizes to a few alternatives makes them still easy to manage. If there are very long notes which do not fit even on the largest note size, MixedNotes splits them onto several notes, which the researcher can then easily combine into a single note by attaching them together when building the Affinity Diagram. With A4 paper, we have been printing the notes with 85mm width, which produces two columns of notes with proper margins. We have been using three different custom note sizes: small (85x38mm) with up to four lines of text, medium (85x57mm) with up to seven lines of text, and large (85x76mm) with up to eleven lines of text. In our Affinity Diagrams, 75% of the notes typically use the small size, 20% use the medium size, and 5% use the large size.

<sup>1</sup> <http://incontextdesign.com/process/cdtools/>

<sup>2</sup> <http://www.skymark.com/pathmaker/tour/brain.asp>

<sup>3</sup> <http://youtu.be/Wg0WYcYlls0>

<sup>4</sup> <http://www.benjaminskoh.com/AffinityTool.html>

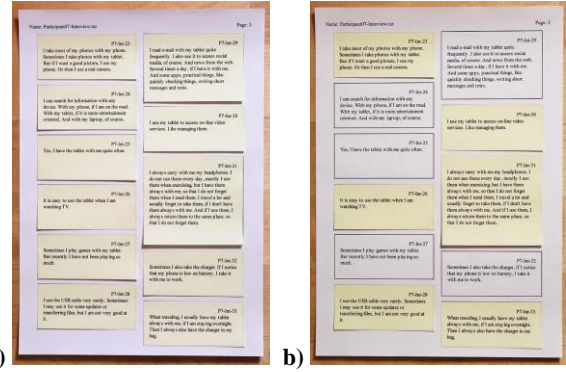


**Figure 3. a) Printed background sheet. b) Attaching sticky notes on a background sheet.**

Preparing the physical notes begins by printing the background sheets on normal paper (see Figure 3.a). This can be done by using the Print Background Sheets command of MixedNotes. The resulting sheets show the notes with outline borders around them. The sheets also have simple headers that indicate the source file and page order. After printing, the researcher manually attaches sticky notes on the paper (see Figure 3.b). The borders around the notes indicate the right size and position for each note. As the notes are manually placed, different colors of sticky notes can be freely used for different notes to implement color codings if needed. If custom-sized notes are used, it is relatively easy to prepare sticky notes of any size by cutting pads of standard 3x3 or 3x5-inch notes with a paper cutter. A pad of 50 or 100 custom-sized notes can be conveniently prepared with one or two cuts, meaning that preparing notes for, for example, a 1,000-note Affinity Diagram takes only a few minutes.

The researcher then feeds the same sheets with the attached sticky notes again in the printer using the manual feed slot. Care should be taken in this phase so that the sheets with attached notes do not get stuck in the printer. This time the printing is done using the Print Notes command. The command prints only the texts on the notes – the borders around the notes as well as the header information are not printed again. This results in sheets (see Figure 4.a) where the note texts are printed twice: on the sticky notes as well as on the underlying background sheets. As the sheets go through the printer, the sticky notes are firmly attached to the paper.

The notes are now ready for an Affinity Diagramming session. At the beginning of the session, the researcher arranges the printed sheets with sticky notes on a table or on a wall based on the header information printed on the sheets. As sticky notes are picked up from the sheets and moved to the Affinity Diagram, the printed notes on the background sheets below them are revealed (see Figure 4.b). This allows each note to be always viewed in context even if the preceding or the following notes have already been moved to the Affinity Diagram. It is also easy to check the context of a note that has already been moved to the Affinity Diagram, if needed, by using the unique identifier printed on the note to find its original position on the background sheets.



**Figure 4. a) Finished sheets. b) As notes are picked up and moved to the Affinity Diagram, note texts printed on the background sheets become visible.**

## 4. EVALUATION AND DISCUSSION

So far, we have used MixedNotes in three studies where Affinity Diagrams were used to support analysis of qualitative research data: a comparative evaluation of three ad-hoc group binding methods [5] (1,100 notes), another evaluation of group binding methods [6] (700 notes), and a diary study on practices in combining multiple smart devices in everyday tasks and activities (1,300 notes). In the first two studies, notes prepared with MixedNotes were combined with traditional hand-written notes, which allowed us to contrast the two approaches. In the third study, all notes were prepared with MixedNotes. The first two studies were done in English, while the third study was conducted in Finnish. A total of five different researchers participated in these Affinity Diagramming sessions. Next we will discuss the benefits and drawbacks of MixedNotes and compare it with conventional methods based on our experiences of using it in these three studies.

In MixedNotes, the notes are prepared in digital format. Compared to writing the notes by hand, this provides the obvious benefits of digital text processing, including easy editing, copying, archiving, sharing, counting, and searching of notes. Most experienced computer users also type text faster with a keyboard than write by hand. Printed notes provide consistent quality with very good legibility, while handwriting can greatly vary between persons and even individual notes. However, handwritten notes provide more expressive freedom, allowing drawing and more flexible use of different text styles.

Another common approach to prepare notes is to print them on ordinary paper and then cut them with scissors and attach a piece of tape. Compared to this approach, MixedNotes requires some additional work in the printing phase as the sheets need to be printed twice and sticky notes attached manually. However, this work is typically more than compensated later as there is no need to cut the notes and attach tape. Sticky notes with high-quality adhesive strips on the back also provide superior convenience compared to attaching paper notes with tape.

Some earlier tools have supported printing affinity notes on special sheets of Post-it notes. On such sheets, all notes are typically of the same size, which easily leads to notes being unnecessarily large. MixedNotes supports multiple note sizes and always uses the optimal size, which leads to more compact

Affinity Diagrams and more efficient use of space. Also, sheets of Post-it notes may not be as commonly available and may be rather expensive compared to pads of ordinary sticky notes used by MixedNotes.

Compared to digital tools, MixedNotes maintains the benefits of paper Affinity Diagrams: tangibility, flexibility, and common availability of paper, easy viewing of and interaction with large amounts of notes, and support for collaboration and creating a shared understanding. MixedNotes works with common office equipment and can be easily set up anywhere, requiring no special hardware or infrastructure support.

An important advantage of MixedNotes is that the background sheets always provide a complete list of all notes, even if some notes have already been moved to the Affinity Diagram. This provides an alternative sequential or chronological view to the data, which can be useful in several ways during the Affinity Diagram building process. Any note in the sheets can be viewed in context, as the preceding and following notes are always visible. The original context of any note in the Affinity Diagram can be easily checked by finding its original position on the background sheets using the unique code printed on each note. As the sheets are systematically ordered, they also provide a visual way to estimate the progress and balance of used notes during the Affinity Diagram building process.

The differences and benefits of MixedNotes may appear as minor compared to conventional techniques. However, as building an Affinity Diagram is an expensive and laborious process involving several people and a lot of manual work, even small improvements in smoothness and efficiency of the process can be significant. Therefore, we believe that sharing MixedNotes and our experiences in using it to prepare notes for Affinity Diagramming can be valuable to the HCI research and interaction design community.

## 5. CONCLUSION

We have presented MixedNotes, a novel method to prepare physical paper notes for Affinity Diagramming and a software tool to support this method. The method combines the convenience of digital text processing tools with the tangibility of paper notes. It introduces several practical improvements to the note printing process, including multiple note sizes and background sheets, and works with commonly available office equipment and standard sticky notes. The method has been tested with large real-life Affinity Diagrams with good results.

## 6. ACKNOWLEDGMENTS

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