

Tick that Box: Interactive Paper Documents

Yomna Abdelrahman, Thomas Kubitza, Katrin Wolf, Norman Pohl, and Albrecht Schmidt

Interact 2015 | Bamberg | 16-9-2015

Paperless Environment



Source: <http://www.techtimes.com/articles/5018/20140331/sony-brings-back-the-paperless-office-with-its-1-100-digital-paper-tablet.htm>

Motivation

- Abigail J. Sellen and Richard H.R. Harper. *The Myth of the Paperless Office*. MIT Press.

ADJUSTING TO...

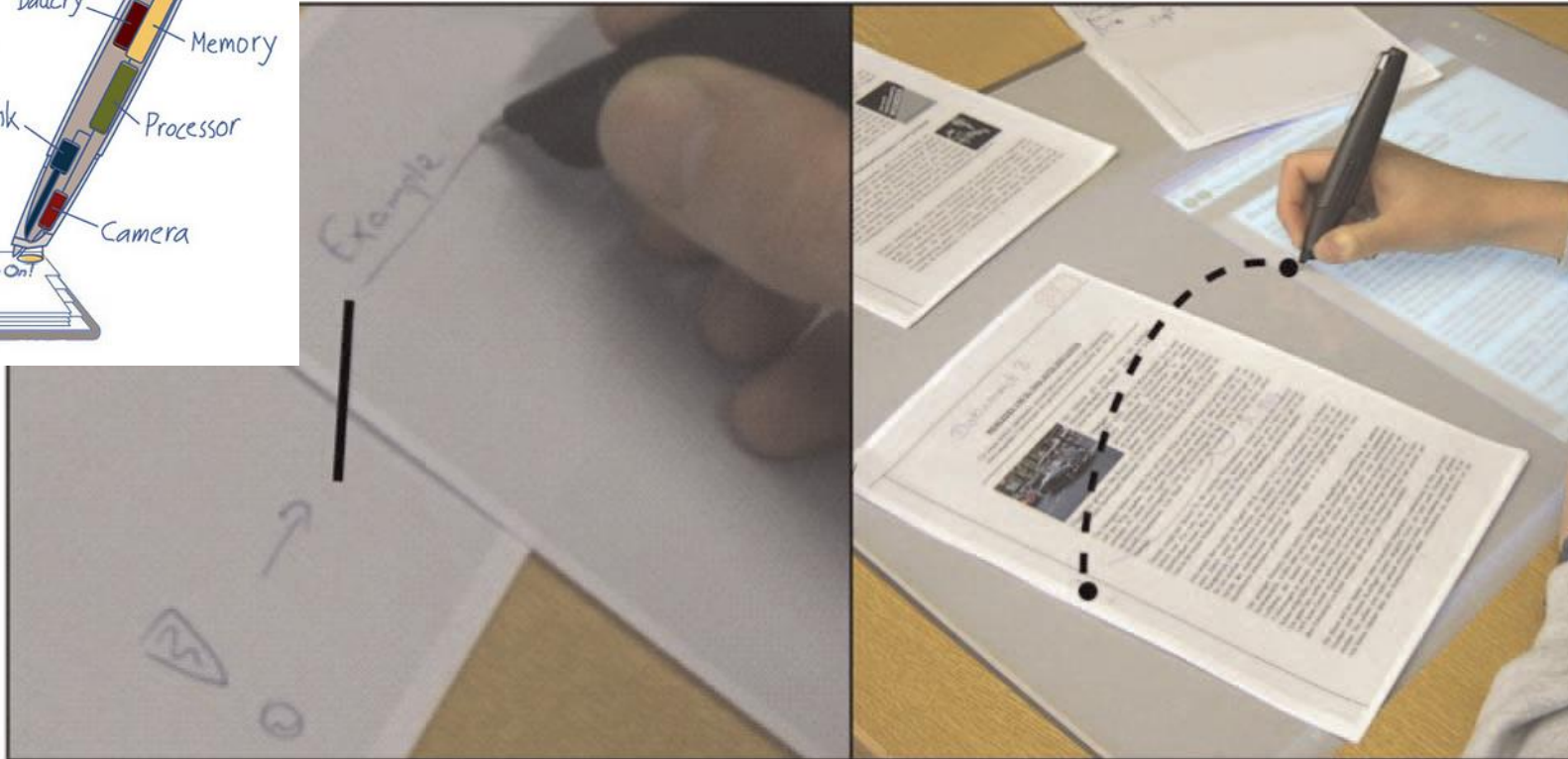
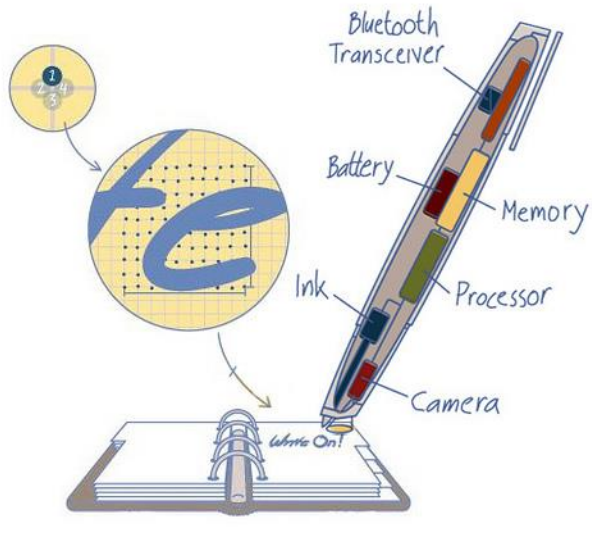


Life in a PAPERLESS SOCIETY.

Reprinted from The Funny Times / PO Box 18530 / Cleveland Heights, OH 44118
phone: (216) 371-8600 / e-mail: ft@funnytimes.com

Source: <http://www.vapartners.ca/how-to-write-a-white-paper/>

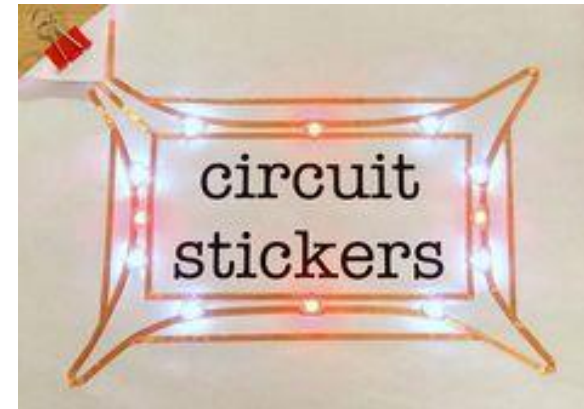
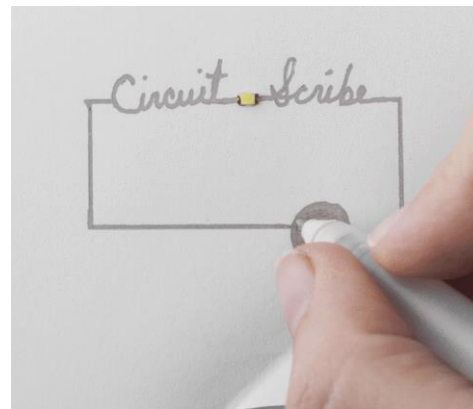
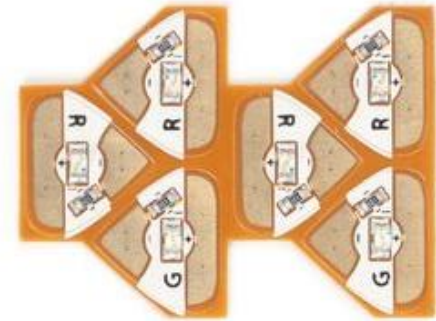
Related Work



Source: www.Anoto.com

Jürgen Steimle et. al. Coscribe: integrating paper & digital documents for collaborative knowledge work., IEEE 2009

Related Work



Source: www.designboom.com

Steve Hodges et. Al. Circuit stickers: peel-and-stick construction of interactive electronic prototypes. CHI14

Yoshihiro Kawahara et.al Instant inkjet circuits: lab-based inkjet printing to support rapid prototyping of ubicomp devices. Prev13

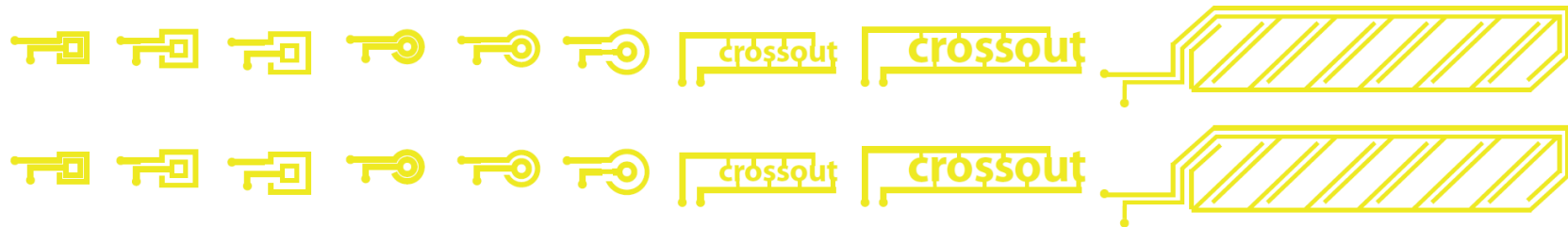
Printing Smart Documents

- Off-the-shelf Brother DCP-J125 printer
- Mitsubishi conductive ink (NBSIJ-MU01)
- Mitsubishi paper (NBWF- 3GF100).



Yoshihiro Kawahara et.al Instant inkjet circuits: lab-based inkjet printing to support rapid prototyping of ubicomp devices. Prev13

Smart Printed Paper Forms

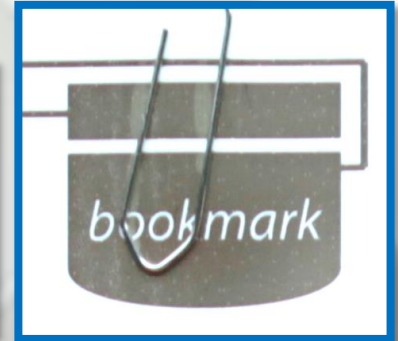
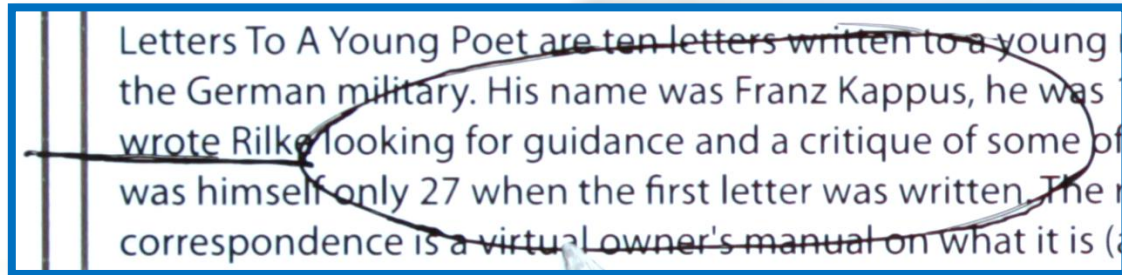


Adding conductive ink layer to:

- Transfer traditional forms elements to circuit layouts.
 - Checkboxes
 - Cross out items
 - Signature fields

Circuit Layout with basic 2 electrodes concept.

Smart Printed Paper Forms (1)



Supporting typical paper-based operations

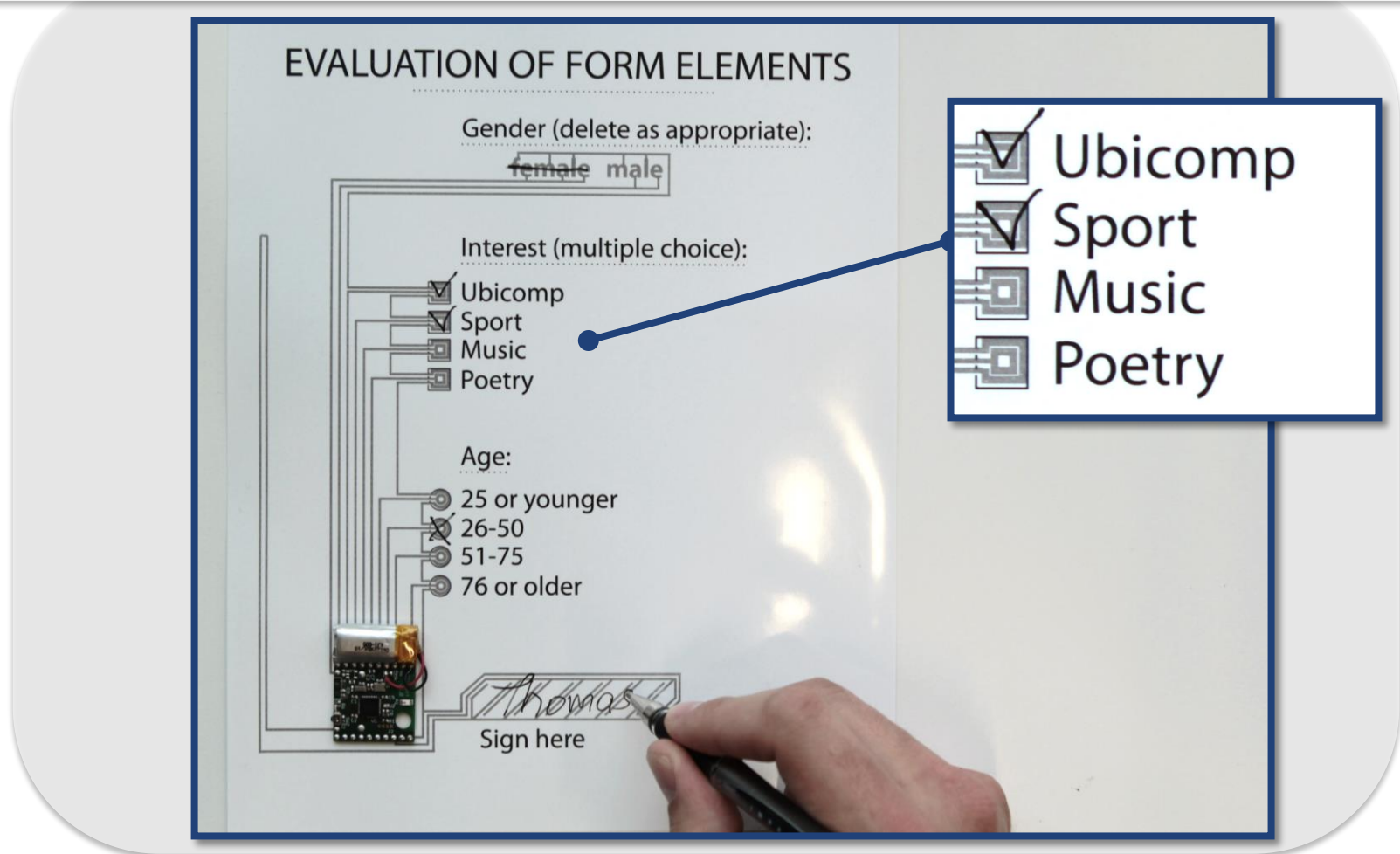
- Text Marking
- Book Marking
- Stabling Multiple pages

Interaction tools



Source: <http://www.fabercastell.com/>
www.uniball.co.uk

Traditional to Digital: Checkbox

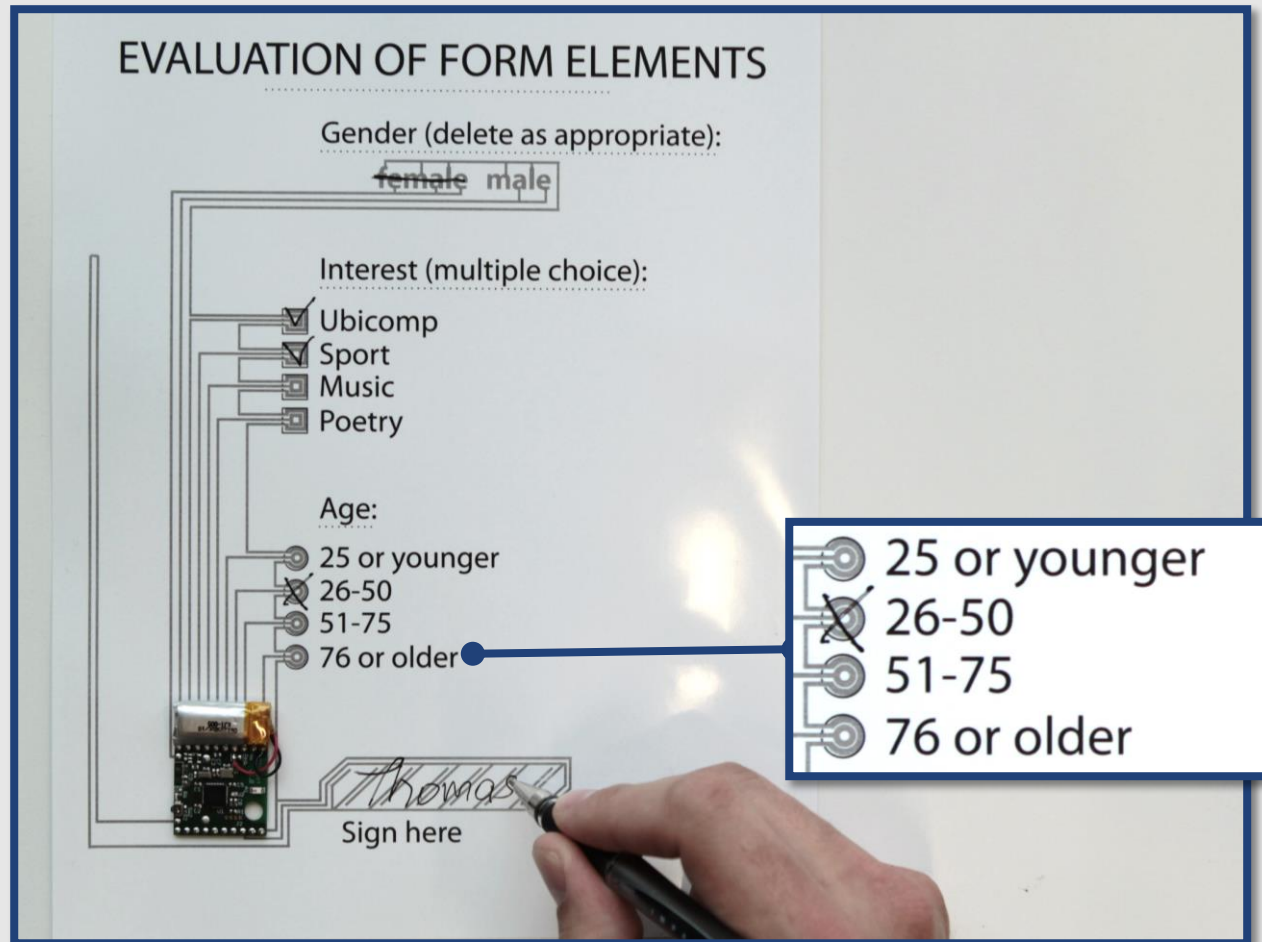


Selecting Multiple Items



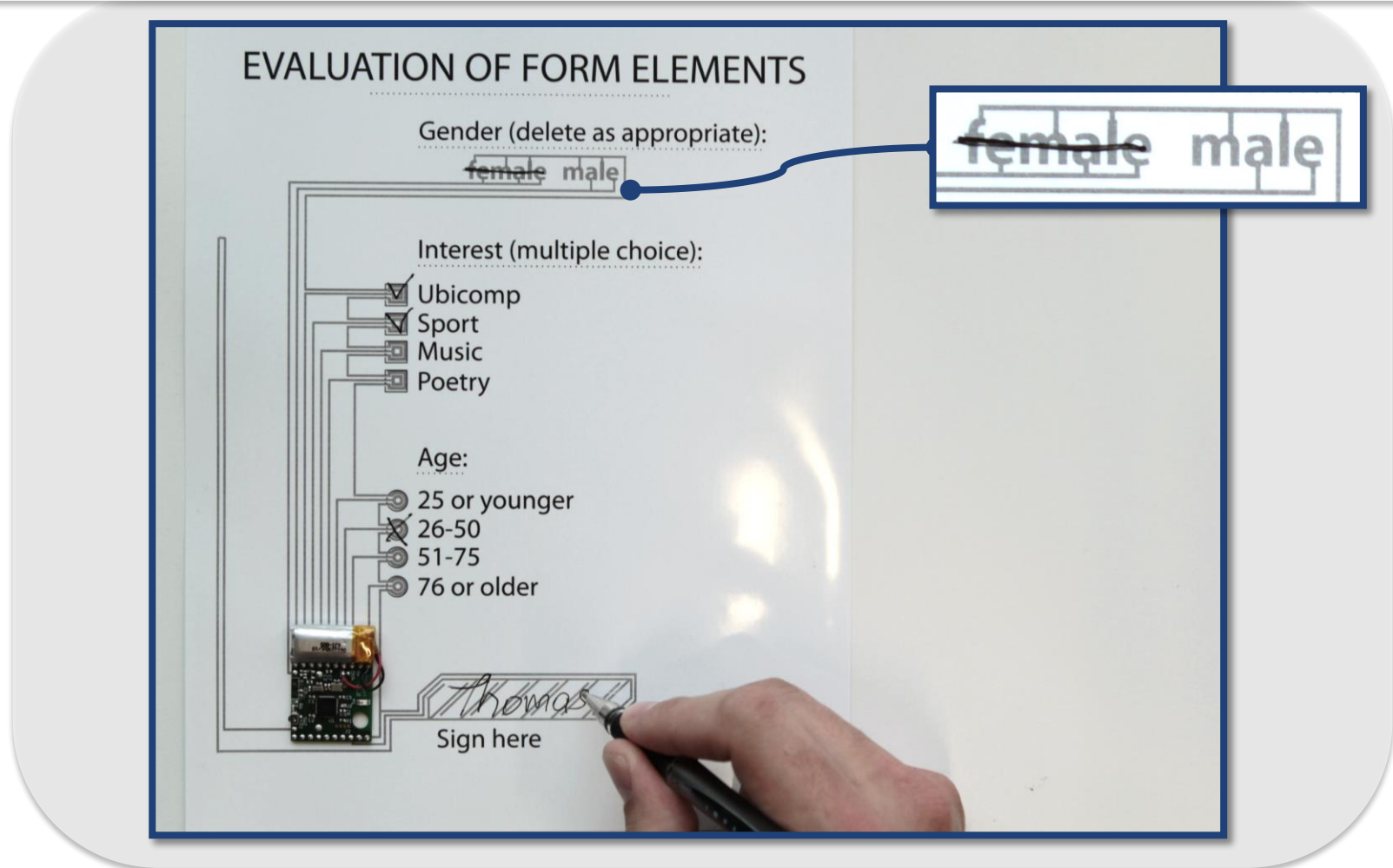
Digitally Synchronizing the selection

Traditional to Digital: Radio button



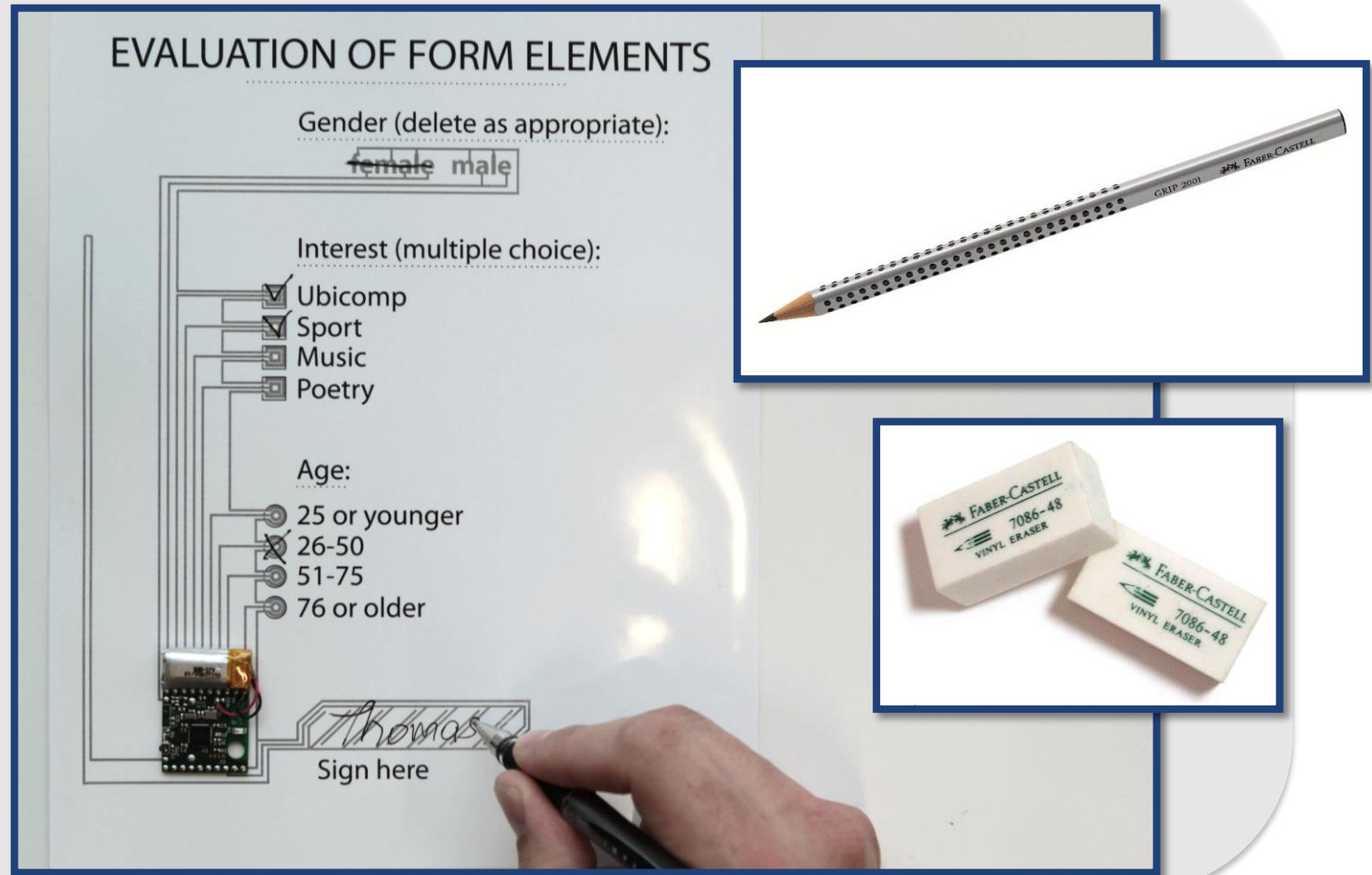
Selecting Single Item → Digitally Synchronizing single item selection

Traditional to Digital: Cross Out



Excluding the cross outs —————> Digitally Synchronizing the selection of uncrossed item

Traditional to Digital: Eraser

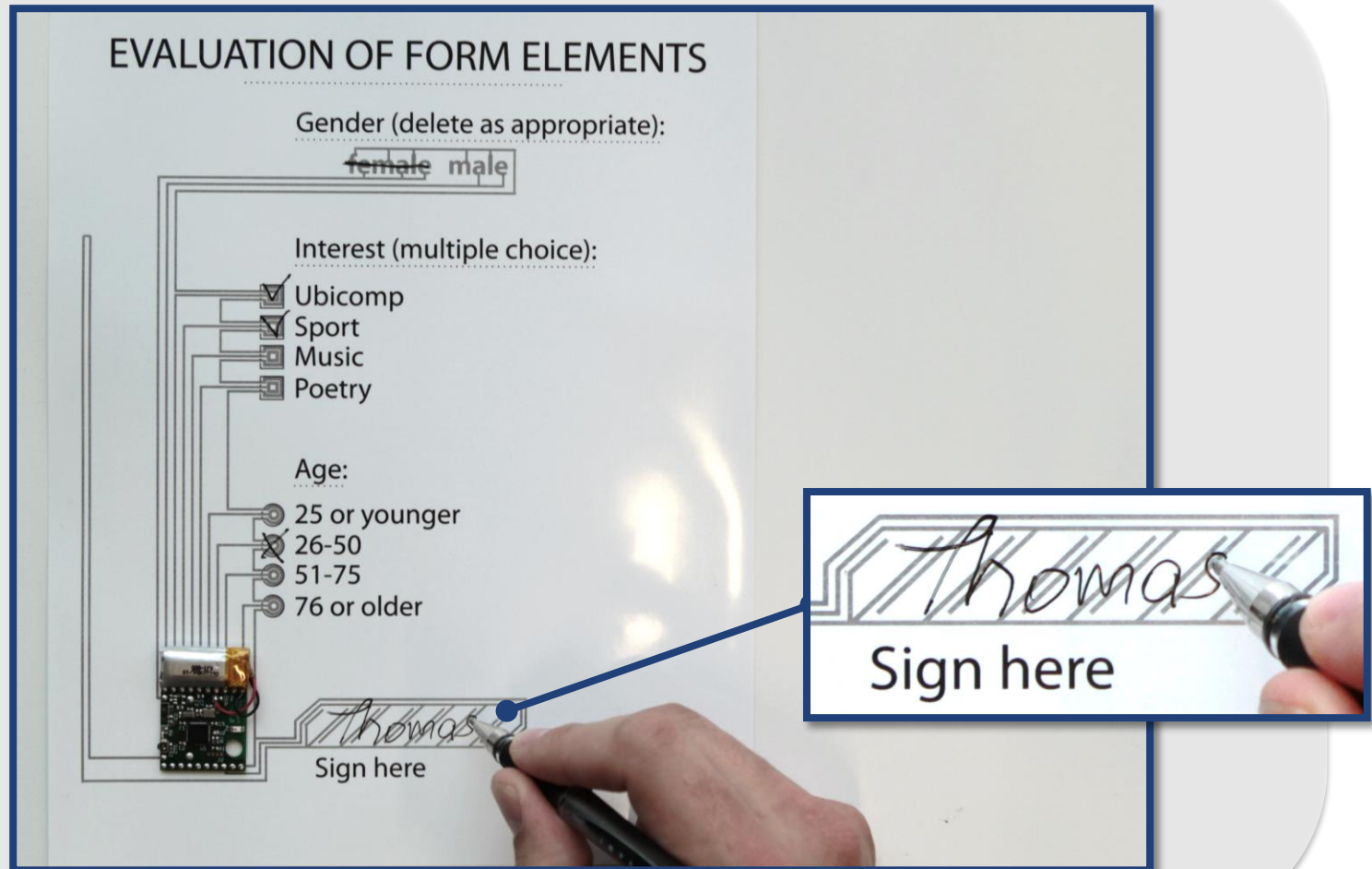


Erase Selection



Digitally remove the selection

Traditional to Digital: Signature

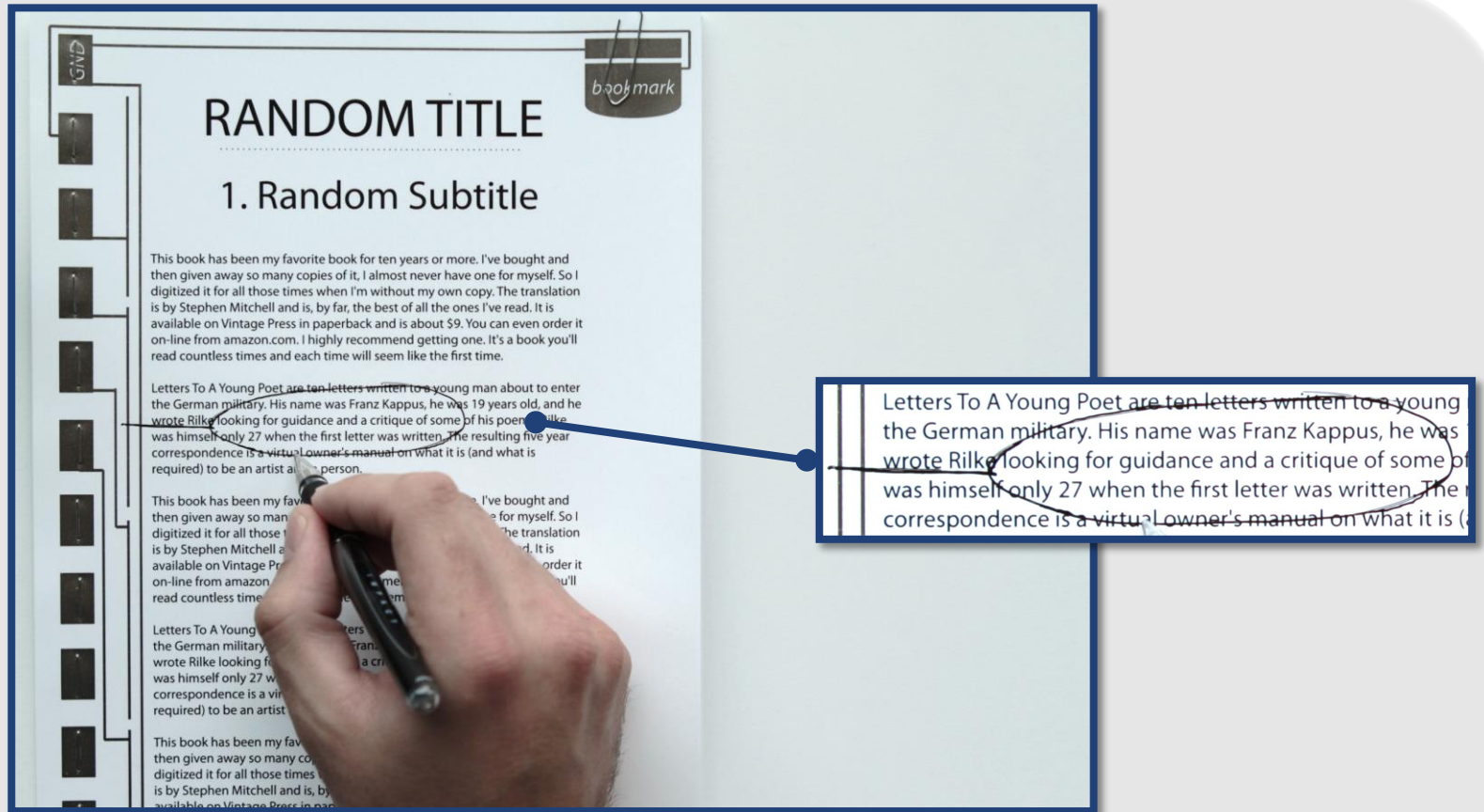


Assuring correctness



Assuring the existence of the signature

Traditional to Digital: Text Marking

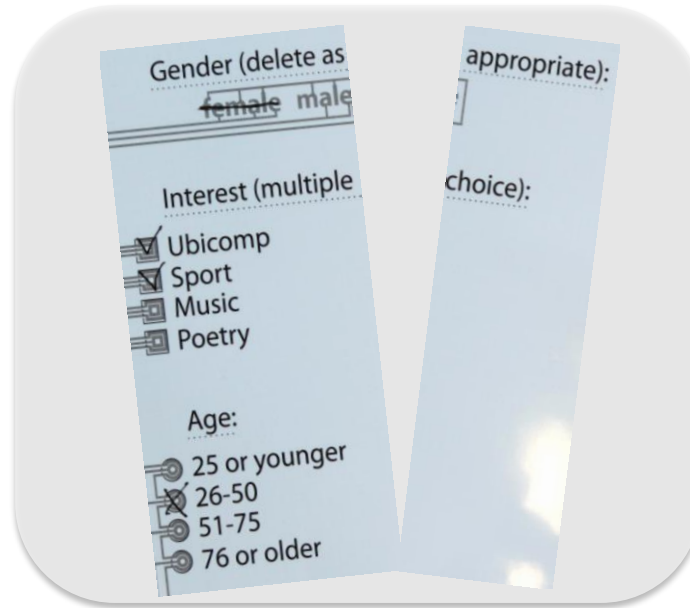


Highlight Paragraph



Digital Highlight of the Paragraph

Traditional to Digital: Ripping

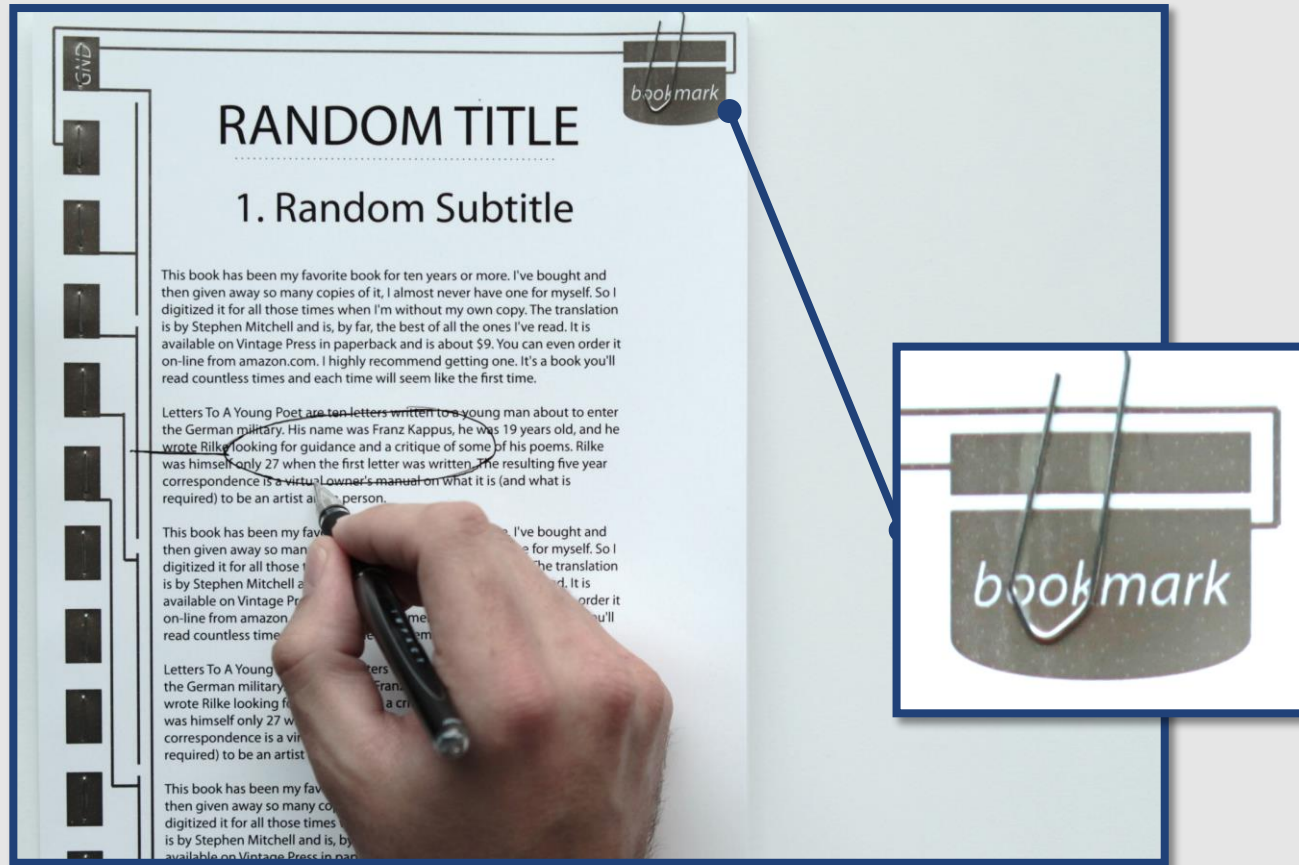


Destroying the document



Deleting the digital version

Traditional to Digital: Paper Clip

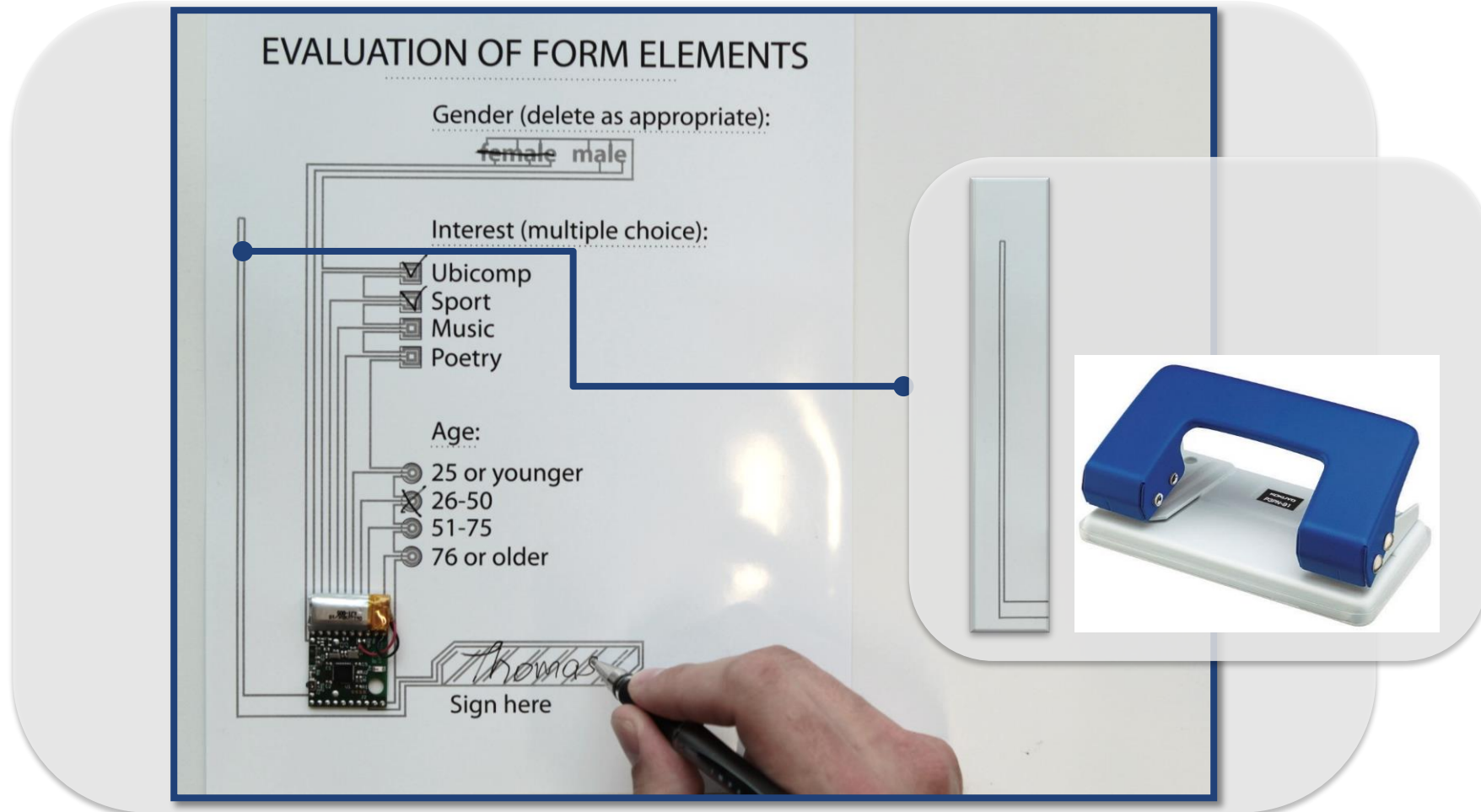


Temporary connecting
pages



Bookmarking the page

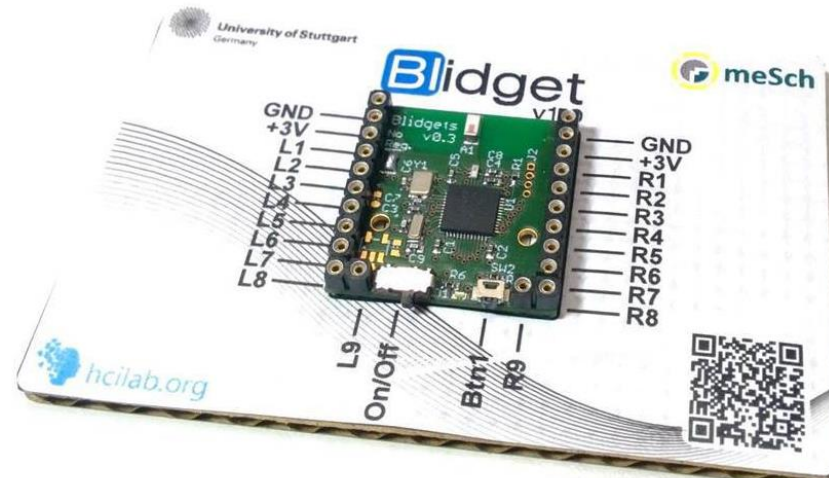
Traditional to Digital: Hole Puncher



Preparing document for archiving —————> Archiving the digital document

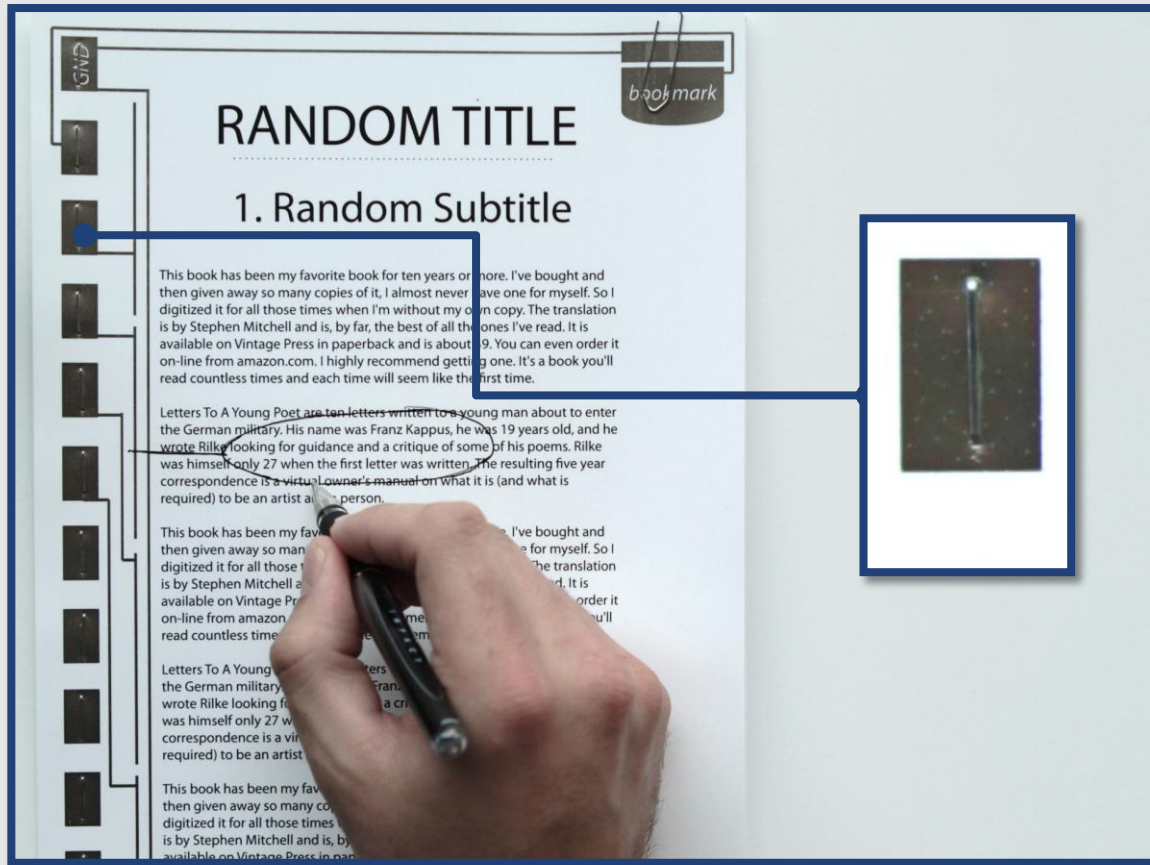
Computing Unit: Blidget

- Tiny always-on device
 - (25x25x6mm)
- connection via Bluetooth LE
- 18 GPIO ports
 - 1 for each form element
 - Common ground
- Web programmable
- Stack- and chainable



Source: <http://blidget.hcilab.org/>

Computing Unit for Multiple Pages



Connecting multiple pages



Connecting circuits

Study: Evaluation of Smart Forms

12 participants

4 female, 8 male

Tasks

- Fill the form using:
 - Pencil
 - Ball- pen
- Using different sizes for:
 - 3 Checkboxes
 - 3 Radio buttons
 - 2 Cross out words
- Sign the form

pencil

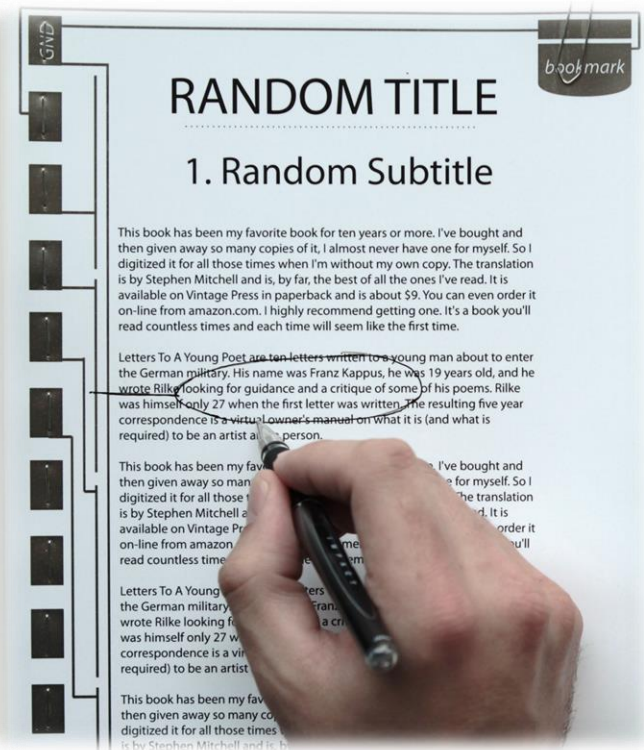
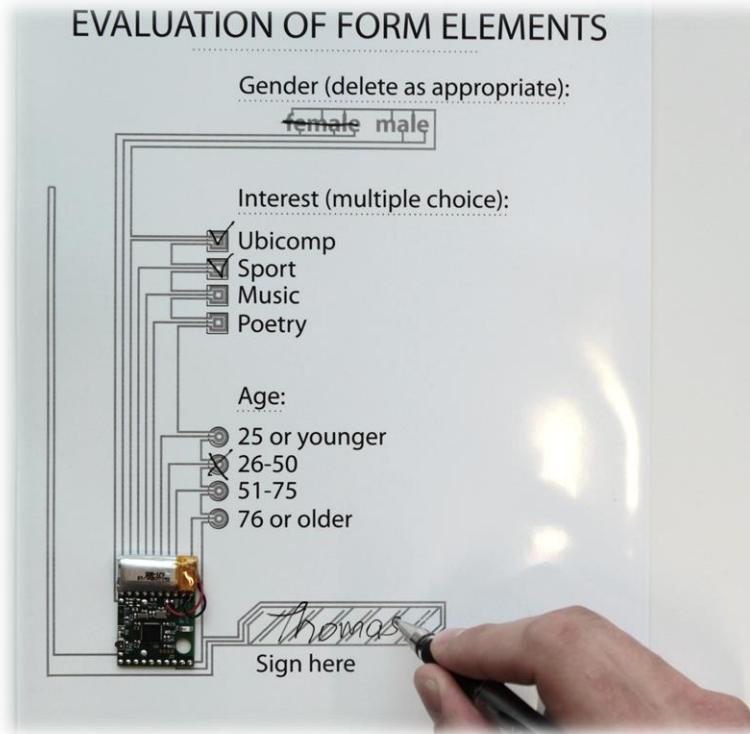


pen



Results

All mean resistances are in a range that can be sensed by a microcontroller.



Gender (delete as appropriate):

Conclusion

Interest (multiple choice):

- ☒ Ubicomp
- ☒ Sport
- ☐ Music
- ☐ Poetry

Age:

- ☒ 25 or younger
- ☒ 26-50
- ☐ 51-75
- ☐ 76 or older

- Conductive Ink to add interactivity to paper.
- Circuits Layout for form elements.
- Interaction mechanism with office tools.
- Evaluation of the proposed mechanism.
- Prototype that groups and shows the feasibility of our mechanism.



Sign here

Thomas

yomna.abdelrahman@vis.uni-stuttgart.de