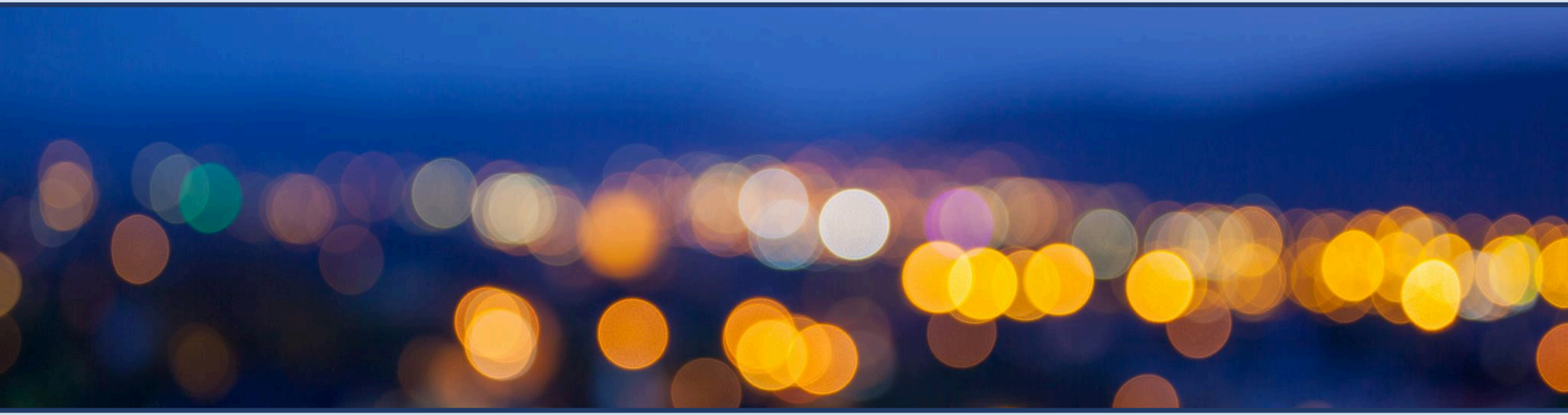
Round-Trip Sketches

Supporting the Lifecycle of Sketches from Analog to Digital and Back



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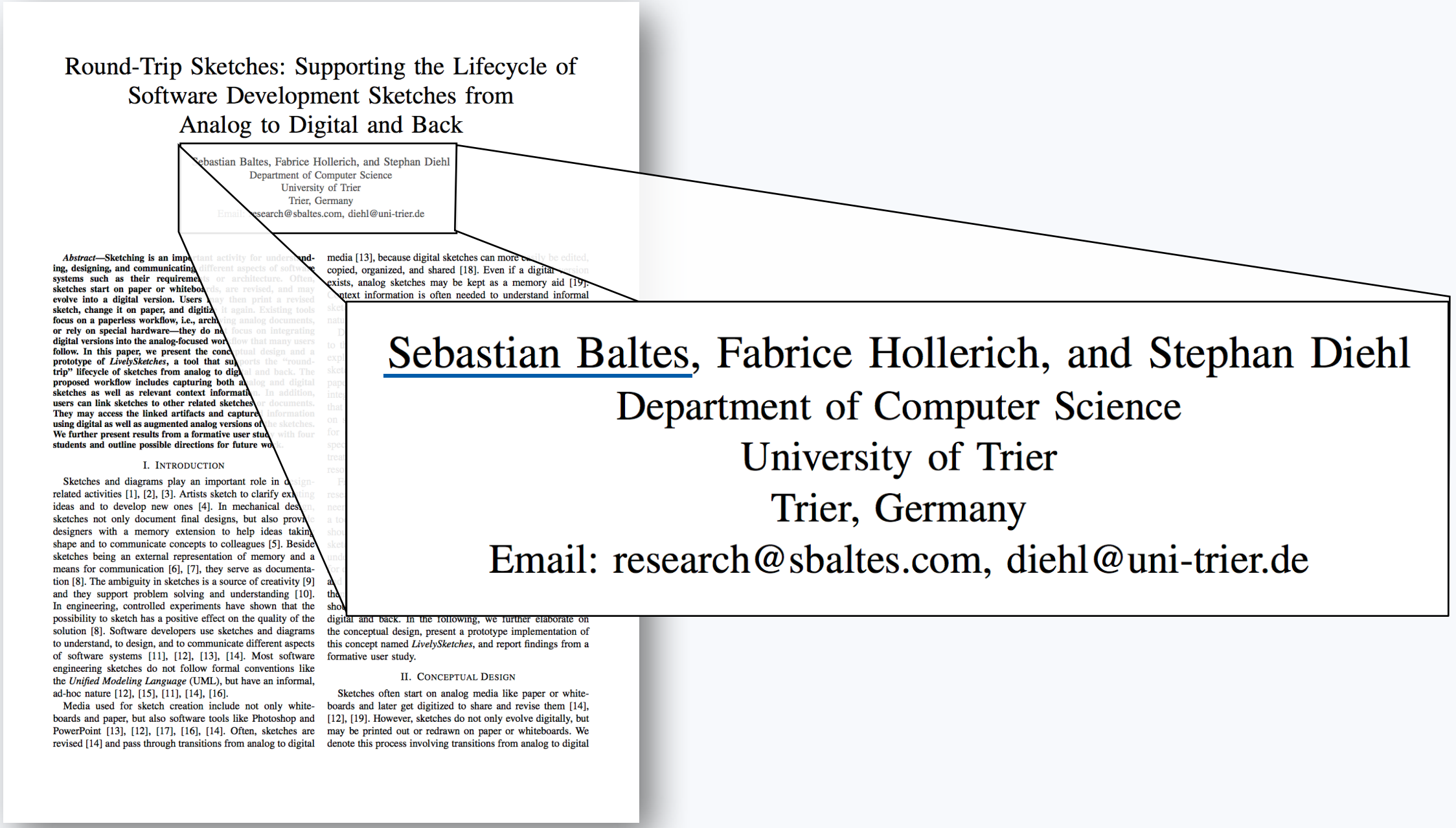
Universität Trier

VISSOFT 2017


Round-Trip Sketches: Supporting the Lifecycle of Software Development Sketches from Analog to Digital and Back
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Abstract—Sketching is an important activity for understanding, designing, and communicating different aspects of software systems such as their requirements or architecture. Often, sketches start on paper or whiteboards, are revised, and may evolve into a digital version. Users may then print a revised sketch, change it on paper, and digitize it again. Existing tools focus on a paperless workflow, i.e., archiving analog documents, or rely on special hardware—they do not focus on integrating digital versions into the analog-focused workflow that many users follow. In this paper, we present the conceptual design and a prototype of LivelySketches, a tool that supports the "round-trip" lifecycle of sketches from analog to digital and back. The proposed workflow includes capturing both analog and digital sketches as well as relevant context information. In addition, users can link sketches to other related sketches or documents. They may access the linked artifacts and captured information using digital as well as augmented analog versions of the sketches. We further present results from a formative user study with four students and outline possible directions for future work.
I. Introduction
Sketches and diagrams play an important role in design-related activities [1], [2], [3]. Artists sketch to clarify existing ideas and to develop new ones [4]. In mechanical design, sketches not only document final designs, but also provide designers with a memory extension to help ideas taking shape and to communicate concepts to colleagues [5]. Beside sketches being an external representation of memory and a means for communication [6], [7], they serve as documentation [8]. The ambiguity in sketches is a source of creativity [9] and they support problem solving and understanding [10]. In engineering, controlled experiments have shown that the possibility to sketch has a positive effect on the quality of the solution [8]. Software developers use sketches and diagrams to understand, to design, and to communicate different aspects of software systems [11], [12], [13], [14]. Most software engineering sketches do not follow formal conventions like the Unified Modeling Language (UML), but have an informal, ad-hoc nature [12], [15], [11], [14], [16].
Media used for sketch creation include not only whiteboards and paper, but also software tools like Photoshop and PowerPoint [13], [12], [17], [16], [14]. Often, sketches are revised [14] and pass through transitions from analog to digital media [13], because digital sketches can more easily be edited, copied, organized, and shared [18]. Even if a digital version exists, analog sketches may be kept as a memory aid [19]. Context information is often needed to understand informal
digital and back. In the following, we further elaborate on the conceptual design, present a prototype implementation of this concept named LivelySketches, and report findings from a formative user study.
II. Conceptual Design
Sketches often start on analog media like paper or whiteboards and later get digitized to share and revise them [14], [12], [19]. However, sketches do not only evolve digitally, but may be printed out or redrawn on paper or whiteboards. We denote this process involving transitions from analog to digital
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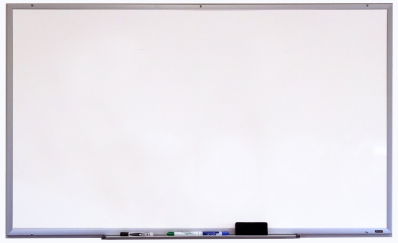
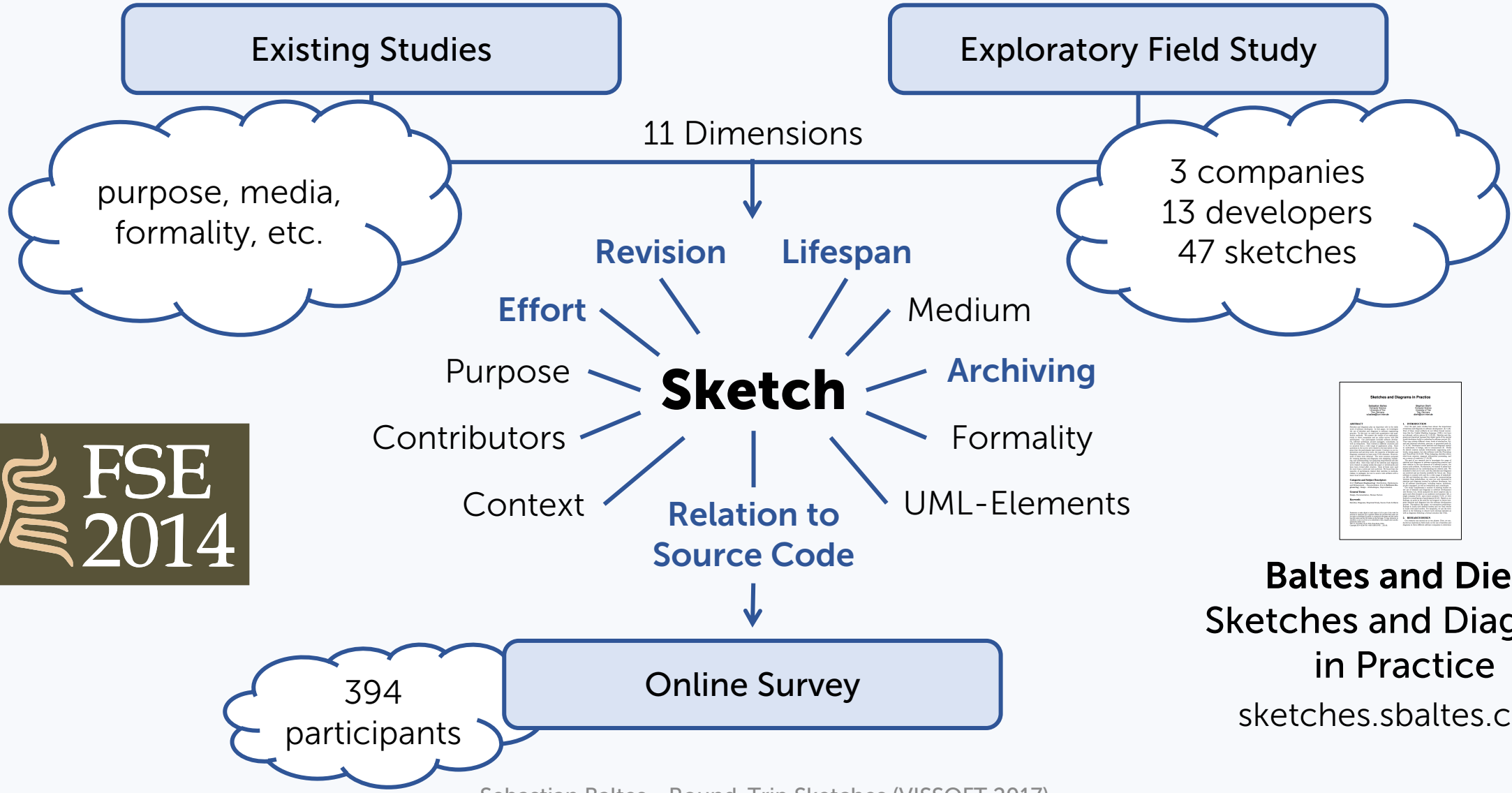
Medium



Application Area

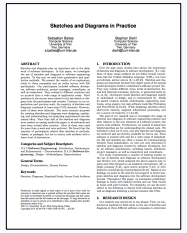
Sketches and Diagrams in SE Practice



FSE 2014

Baltes and Diehl
Sketches and Diagrams in Practice
sketches.sbaltes.com

Survey Results



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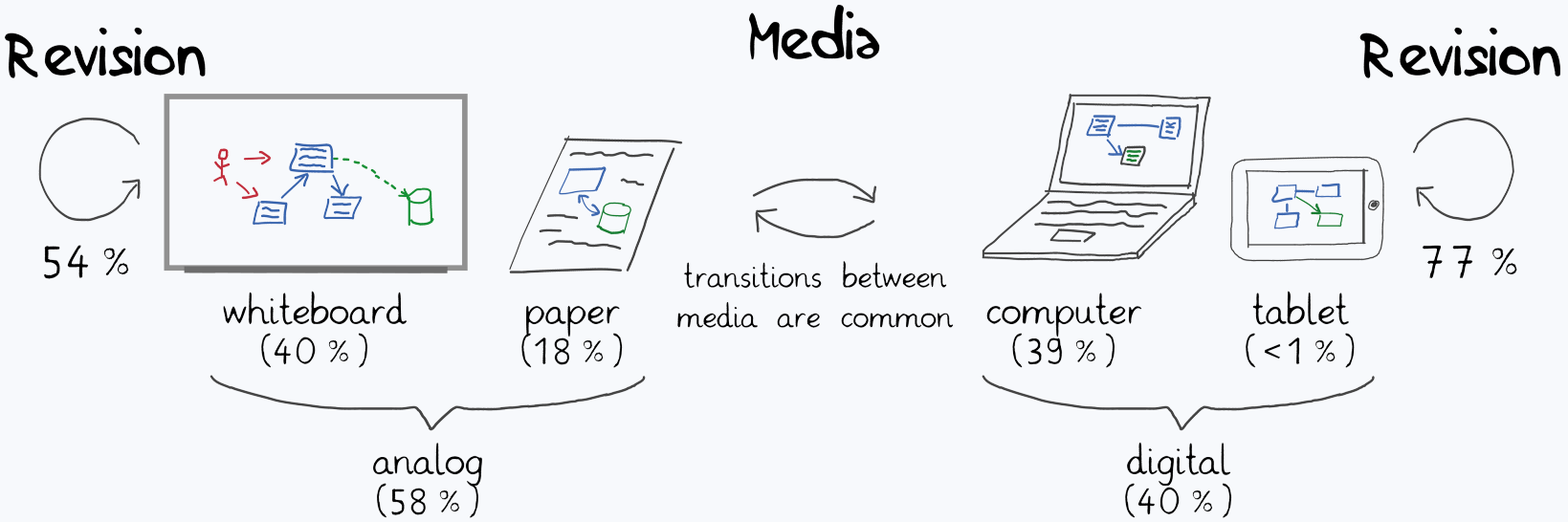
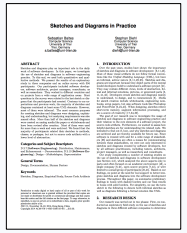


Survey Results



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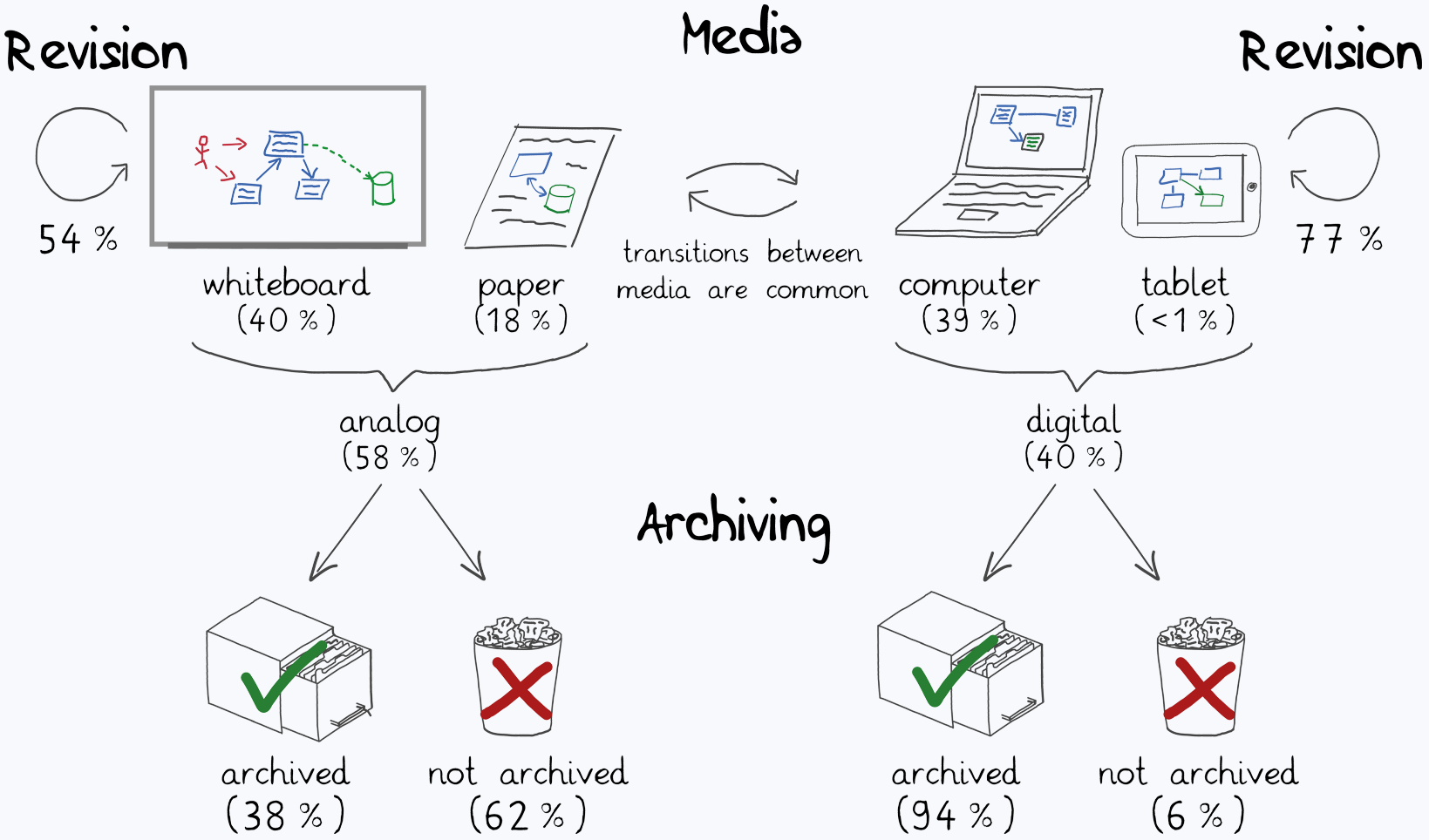
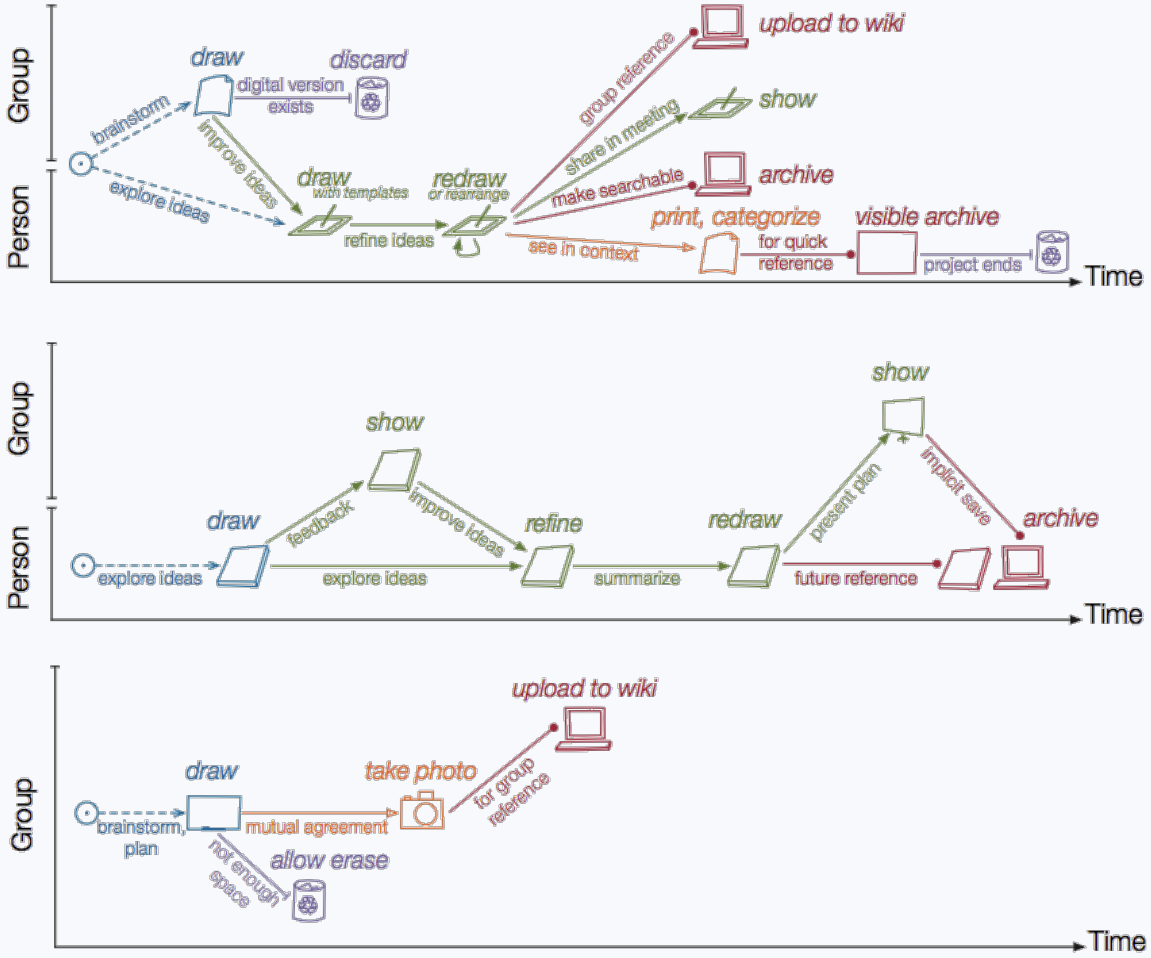


Related Work


Follow that Sketch: Lifecycles of Diagrams and Sketches in Software Development

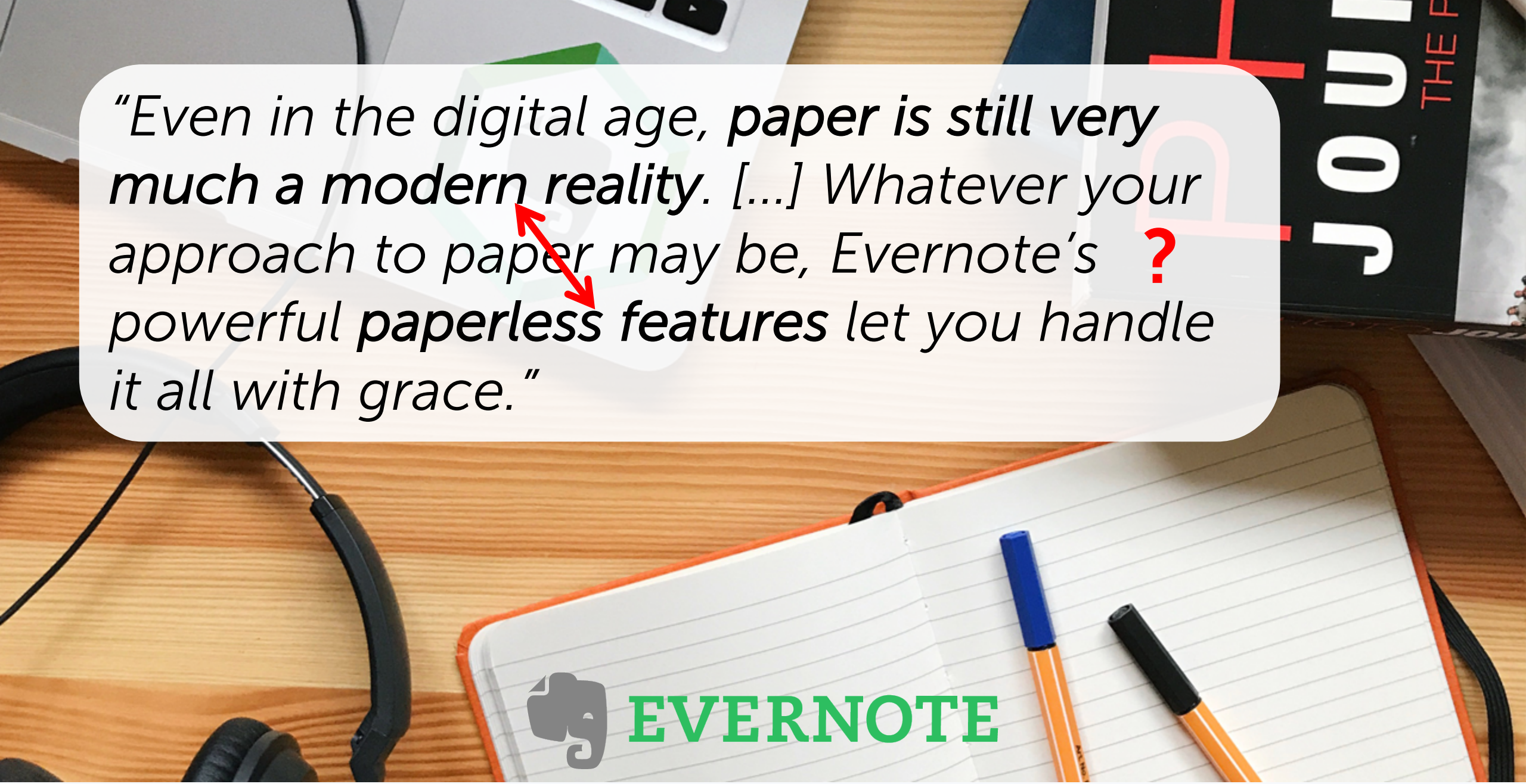
Walny et al.
Follow that sketch: Lifecycles of diagrams and sketches in software development

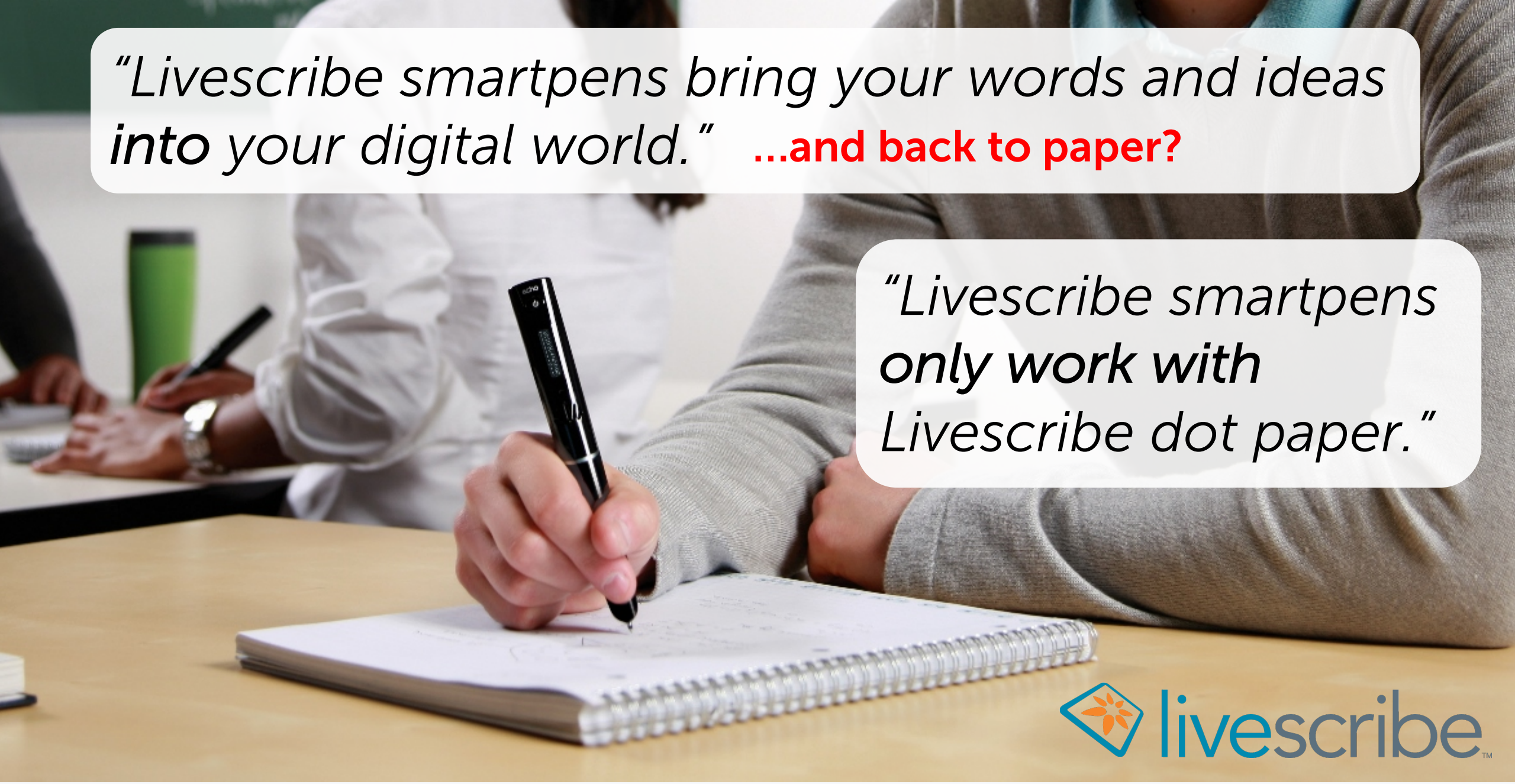
VISSOFT 2011



Tool support?


?
"Create your way"
OneNote


"Even in the digital age, **paper is still very much a modern reality**. [...] Whatever your approach to paper may be, Evernote's powerful **paperless features** let you handle it all with grace."
?
EVERNOTE

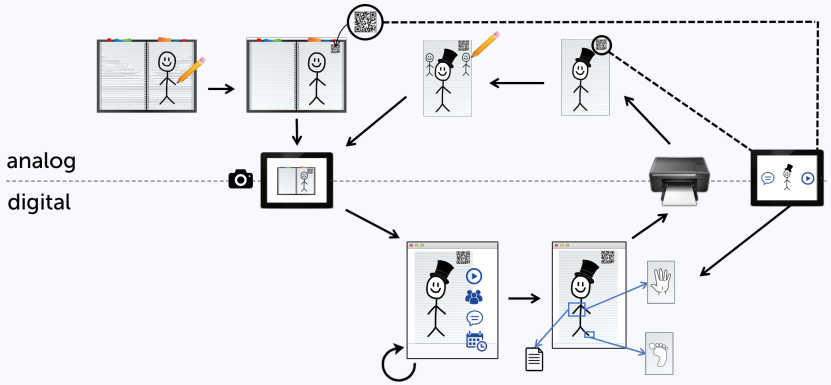

"Livescribe smartpens bring your words and ideas **into** your digital world." ...and back to paper?
"Livescribe smartpens **only work with** Livescribe dot paper."
livescribe™

Our Motivation

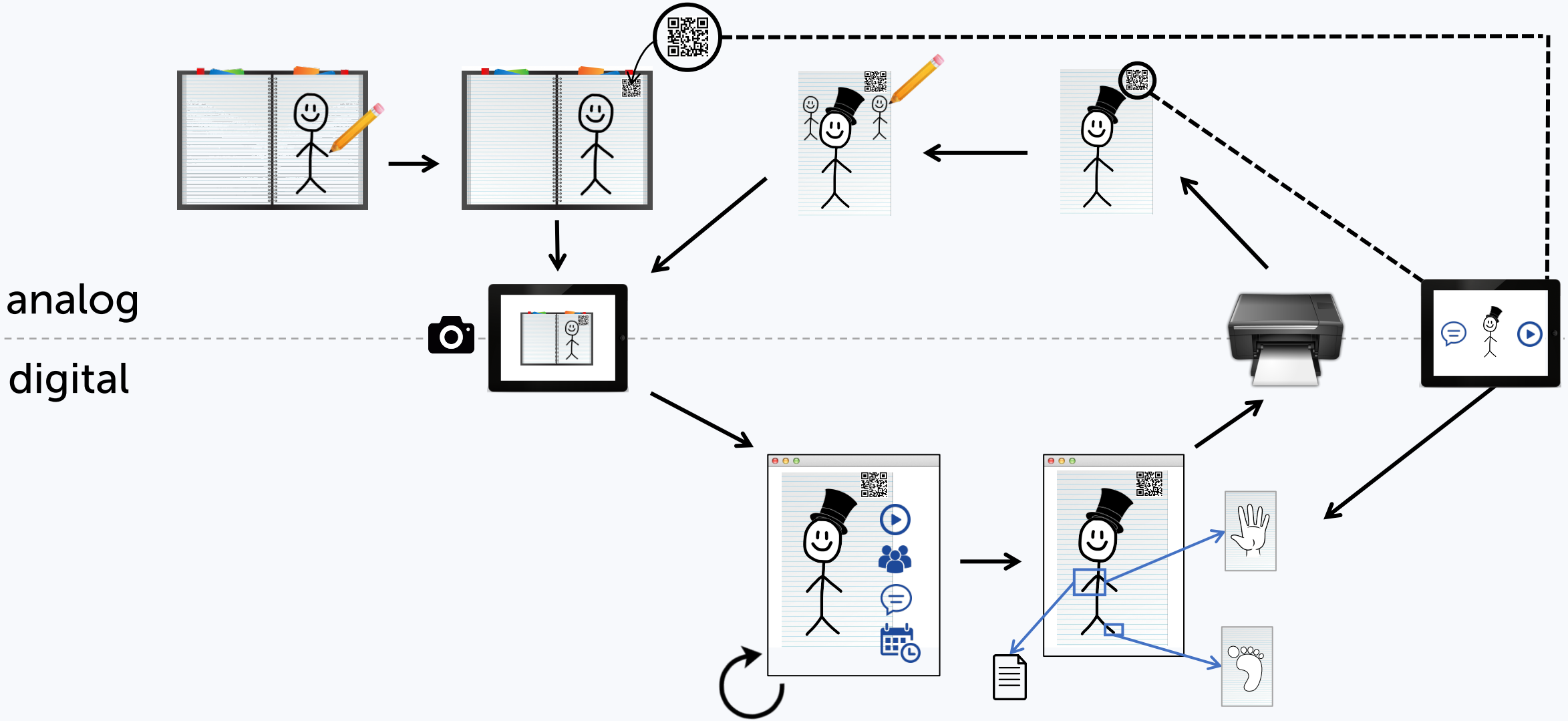
- Many people still use (and prefer?) analog media
- Why force them to use a different (paperless) workflow?

Our goal: Do not treat analog sketches as subordinate artifacts but support different analog-digital workflows

Round-Trip Sketching



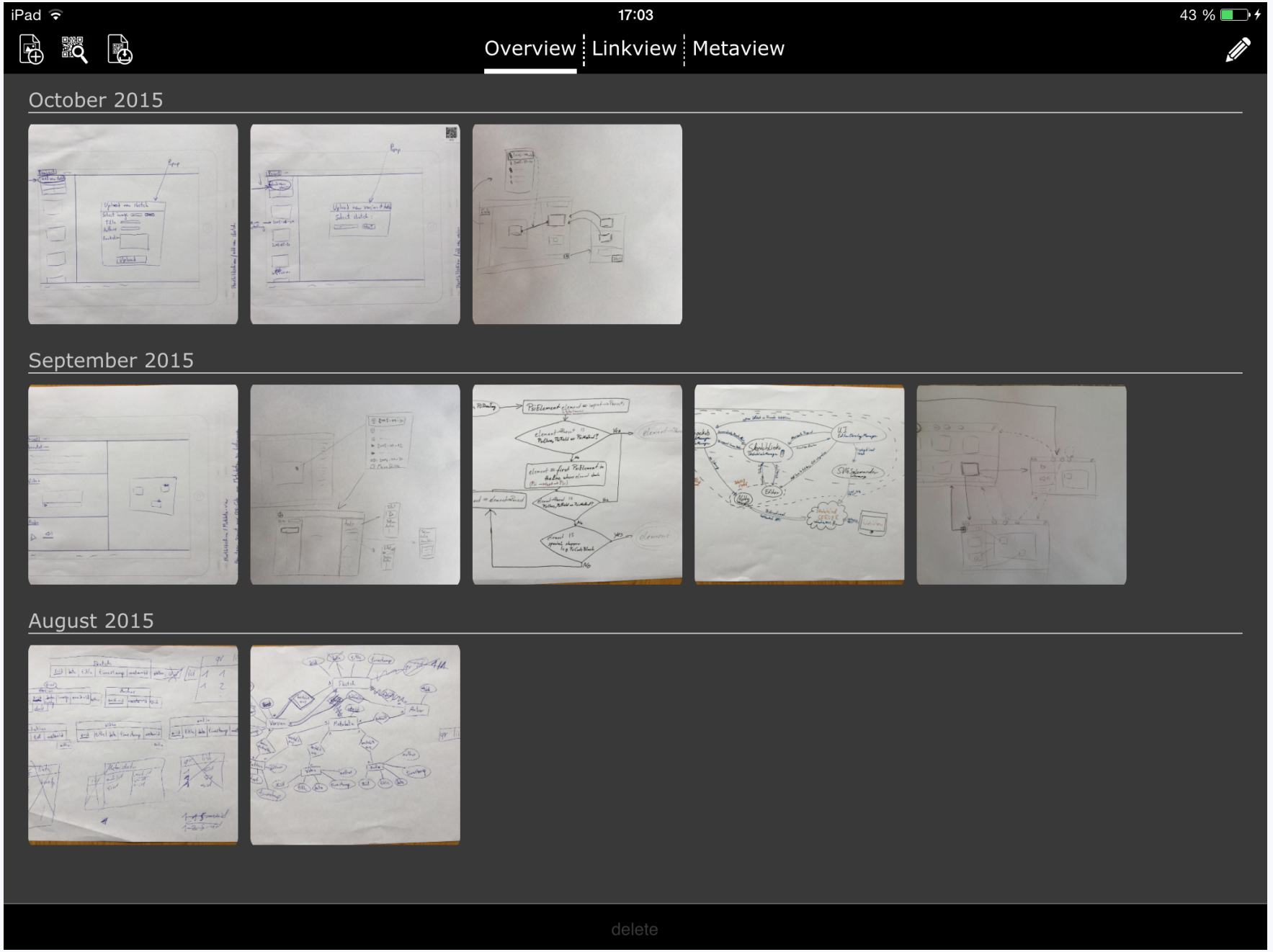
Concept




Overview
Linkview
Metaview
October 2015
September 2015
August 2015

Prototype

Overview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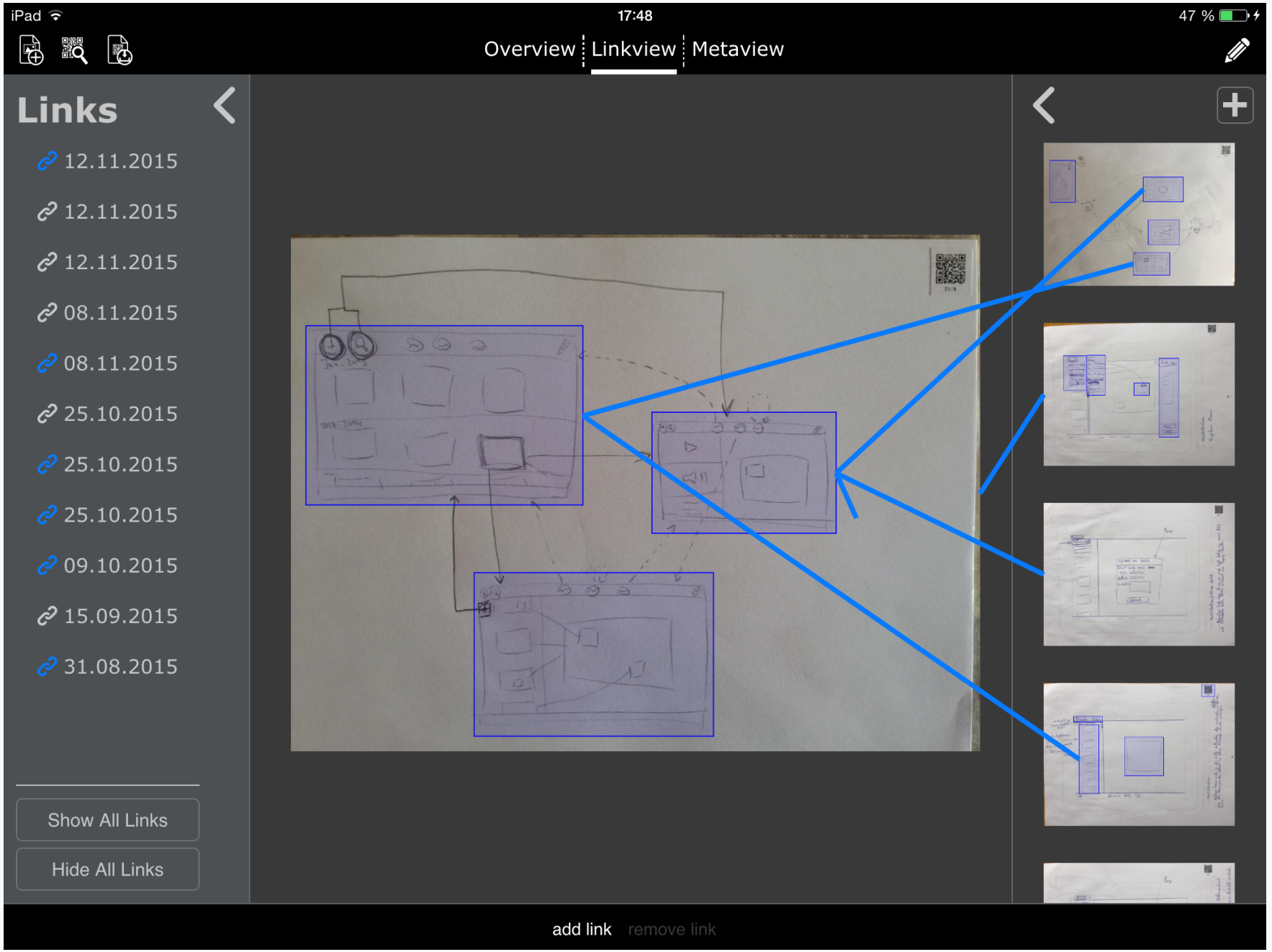
Overview
Linkview
Metaview
October 2015
September 2015
August 2015
delete

Linkview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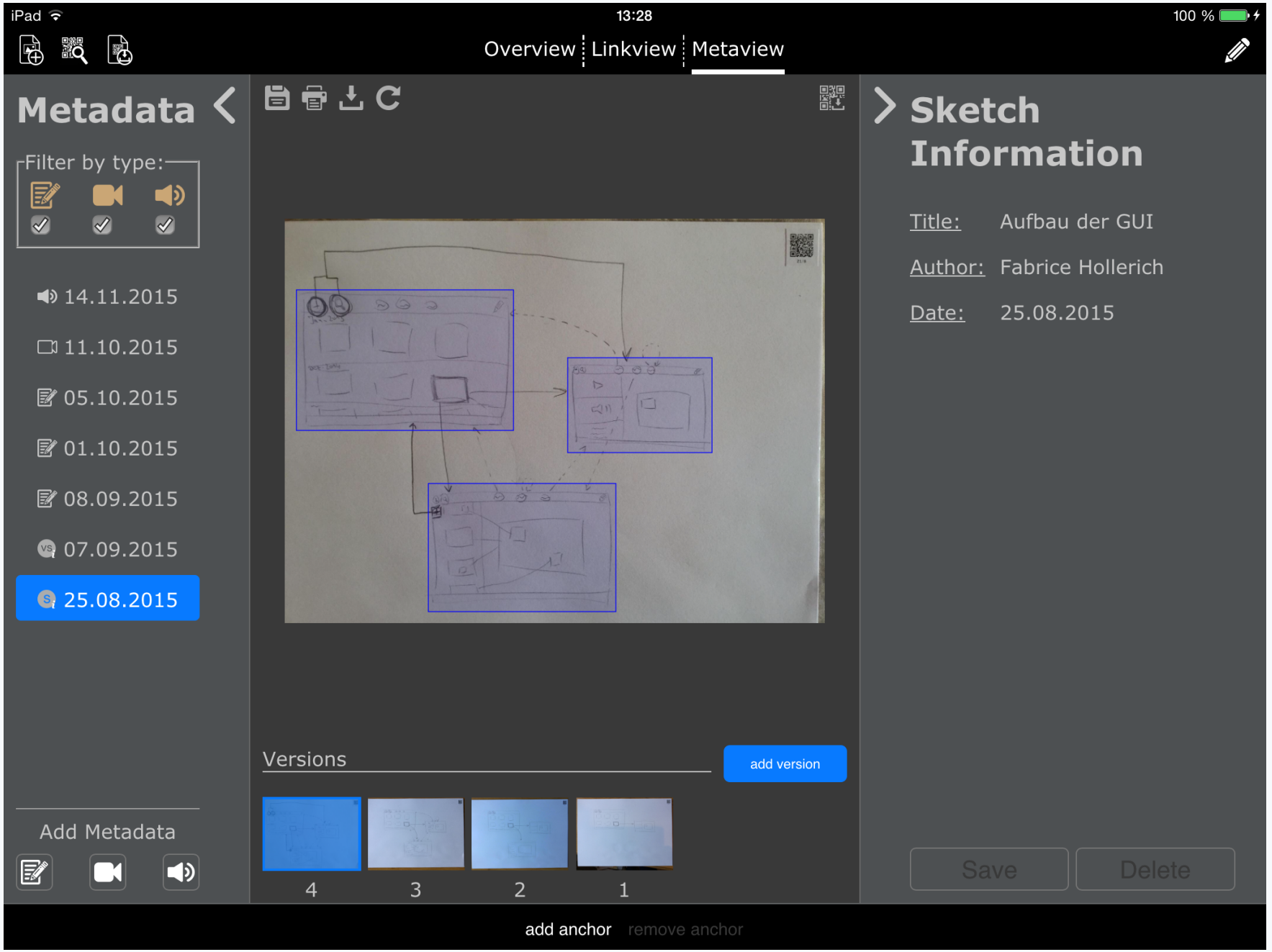
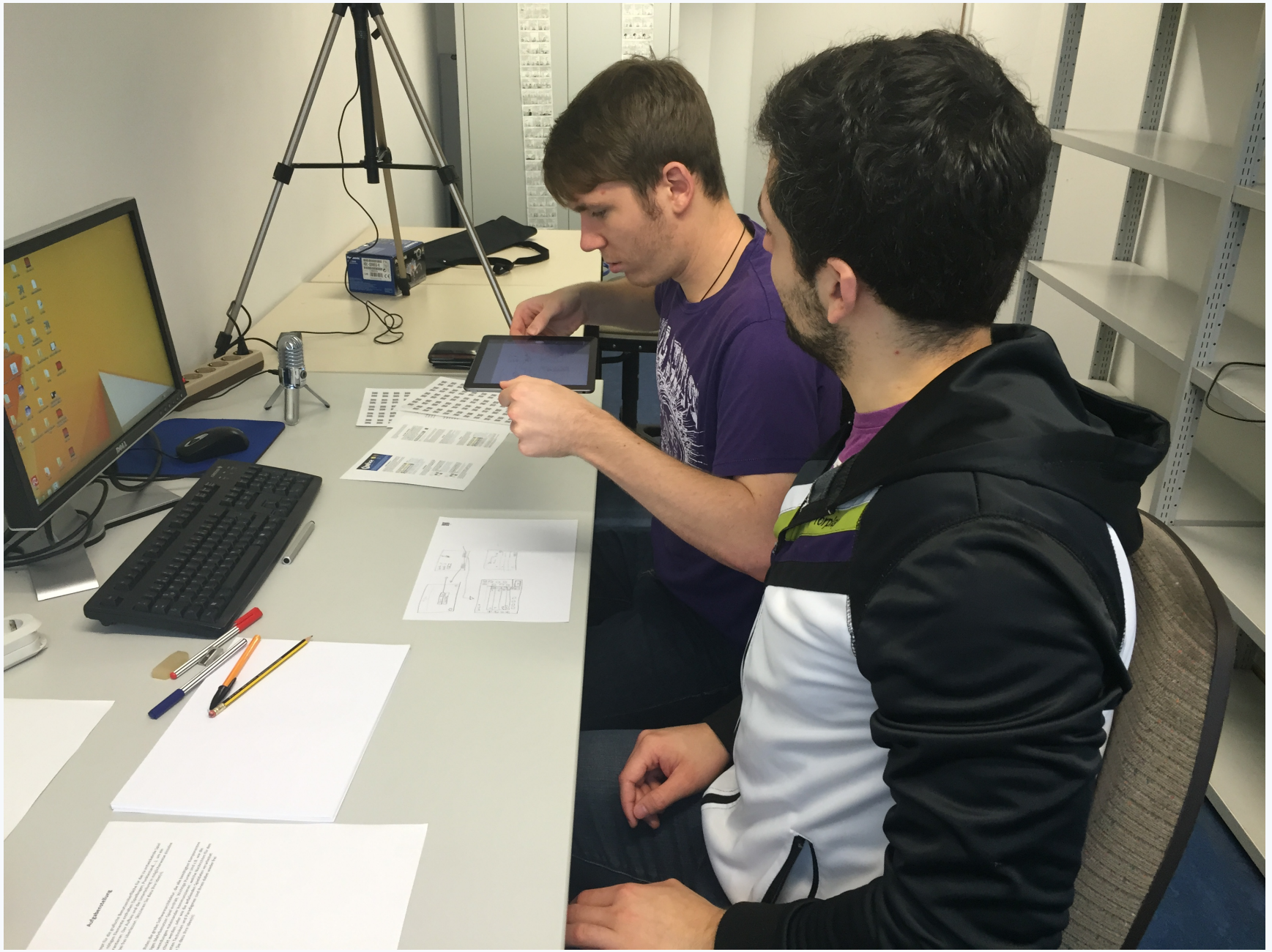
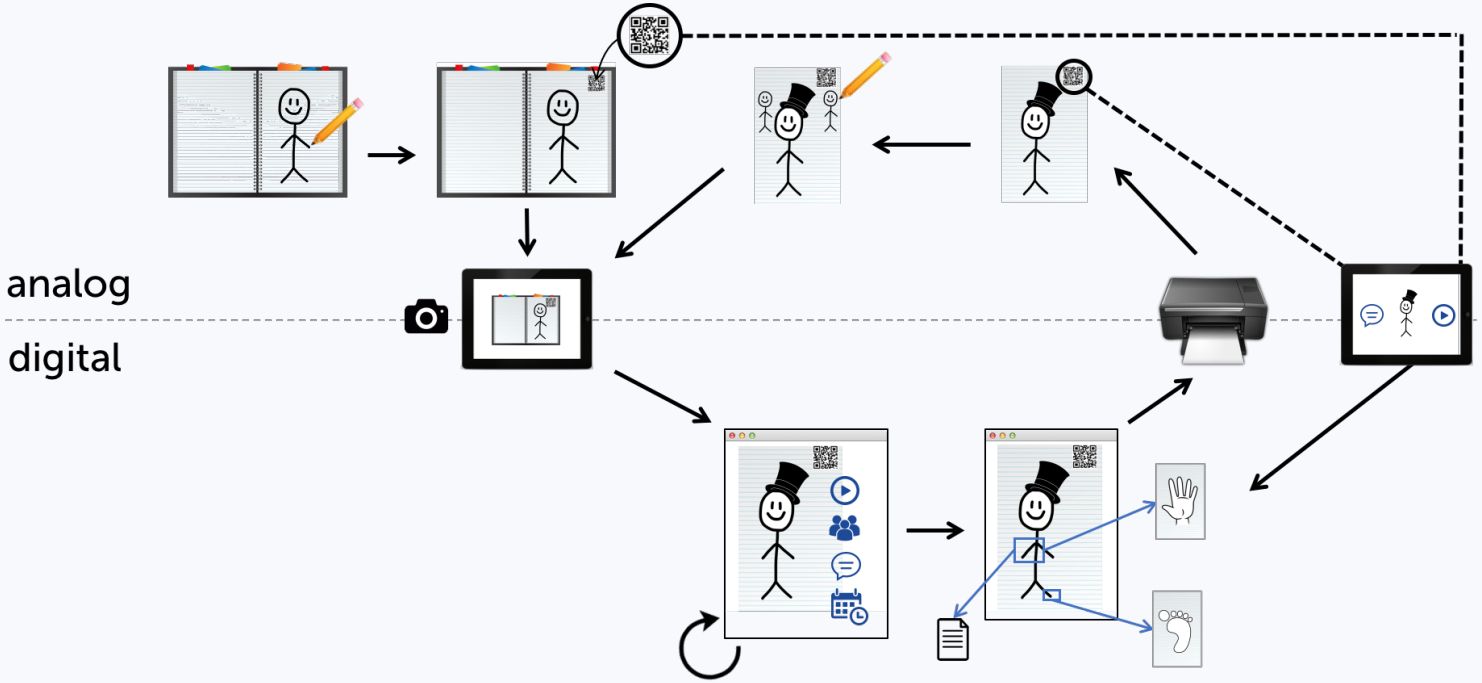
47 %
Overview
Linkview
Metaview
Links
12.11.2015
12.11.2015
12.11.2015
08.11.2015
08.11.2015
25.10.2015
25.10.2015
25.10.2015
09.10.2015
15.09.2015
31.08.2015
Show All Links
Hide All Links
add link
remove link

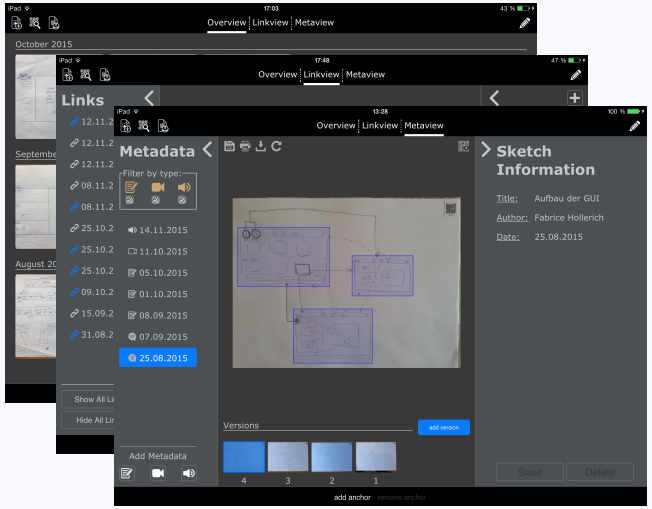
Metaview


iPad
13:28
100 %
Overview
Linkview
Metaview
Metadata
Filter by type:
14.11.2015
11.10.2015
05.10.2015
01.10.2015
08.09.2015
07.09.2015
25.08.2015
Add Metadata
Versions
add version
4
3
2
1
Sketch Information
Title: Aufbau der GUI
Author: Fabrice Hollerich
Date: 25.08.2015
Save
Delete
add anchor
remove anchor

User Study







Questions?

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