Sketches and Diagrams in Practice

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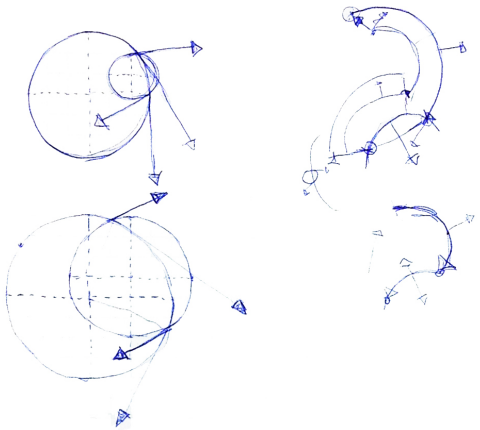
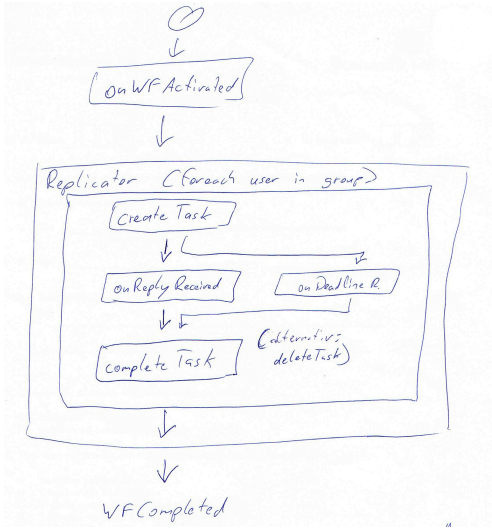
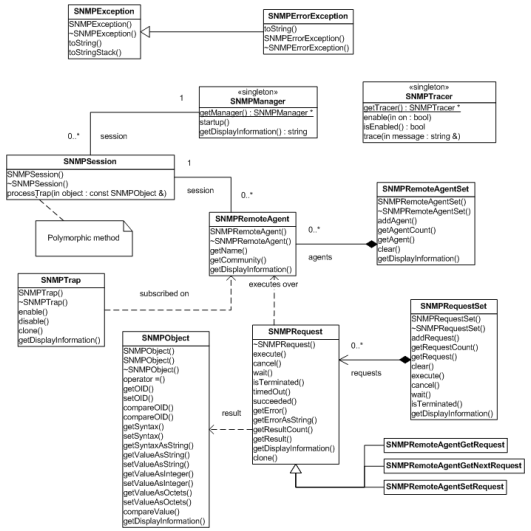
Sketches and Diagrams







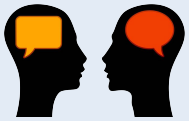
informal — **formal**

Sketch

Diagram

Introduction

Past studies:
Sketches and diagrams important in daily work of software developers

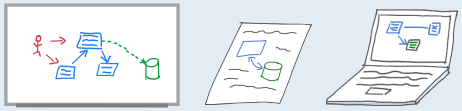


Purpose: Understanding, designing, communicating

[Cherubini07]

Depict **mental model** of software

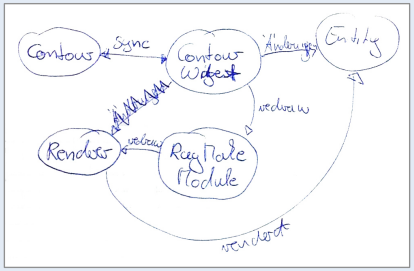
[LaToza06]

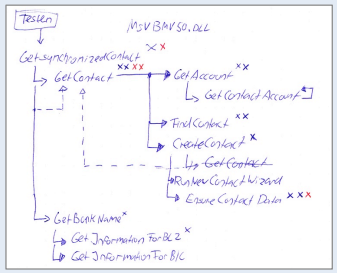


Medium: Whiteboard, paper, computer [Cherubini07, Walny11]

Psychology: Sketching augments **information processing**, sketches are sources of **creativity**

[Goldschmidt03, Tversky03]





Teams **improvise** representations, sketches/diagrams often **informal**

[Dekel07, Petre13]

Our Goal

Existing studies:

- Concentrated on certain aspects
- Single companies
- Academic environment
- Some had small number of participants

Our goal: Thorough description of how sketches and diagrams are used in software engineering practice

Better tool support for integrating sketches and diagrams into software development process

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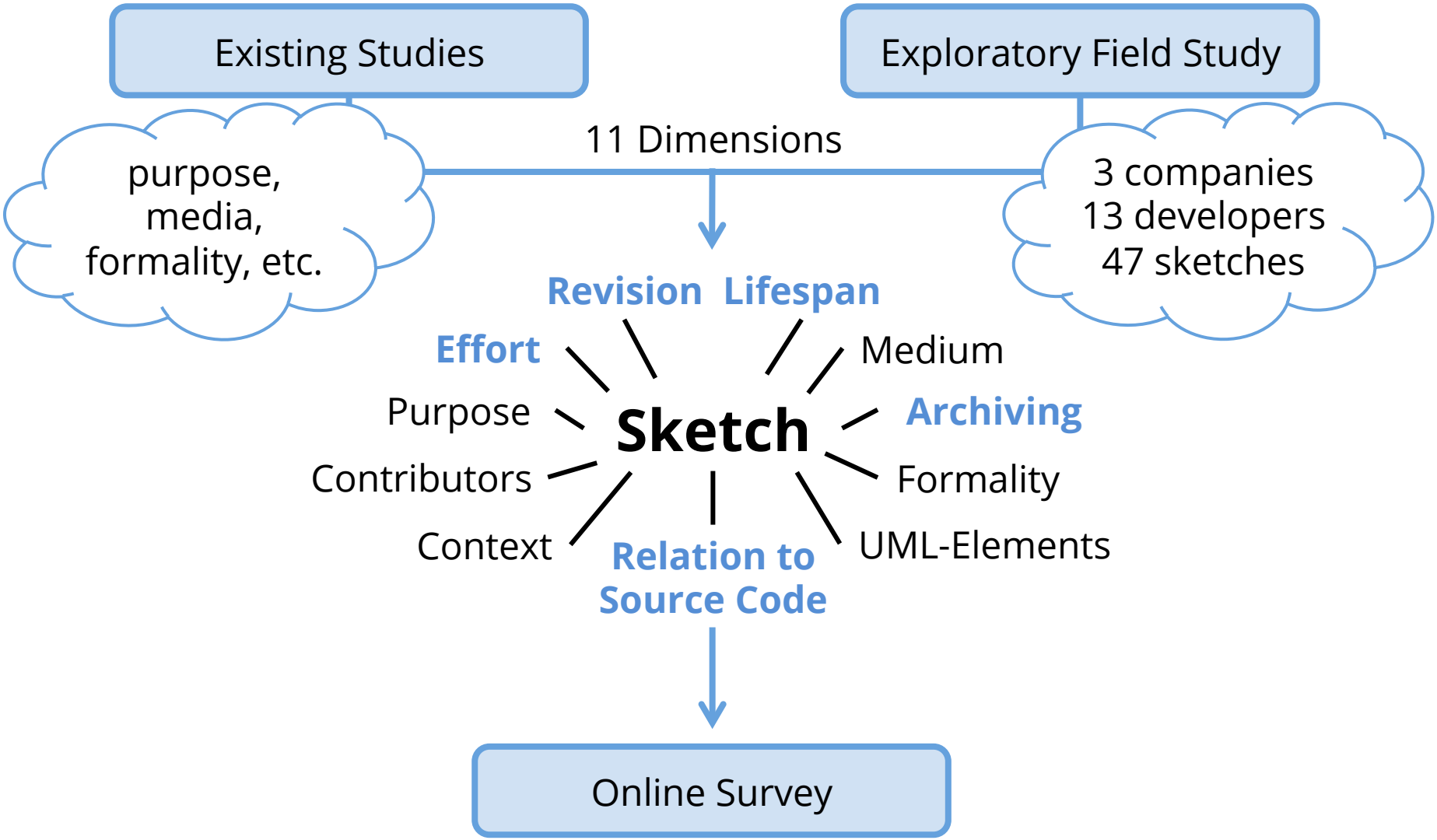
Research Design

How to describe sketches and diagrams in SE practice?

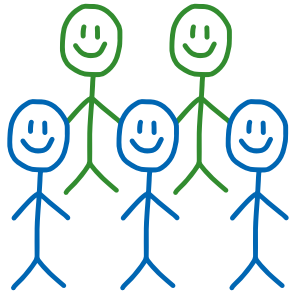
Research Design



Online Survey

- **Target population:** "software practitioners"
- **Concise:**
  - ~10 minutes to complete
  - 28 questions, 15 about last sketch
- **Recruiting:**
  - Network of colleagues and contacts 
  - Social networks
  - IRC channels and online communities
  - Directly contacted software companies
  - Article on major German IT news website

Participants



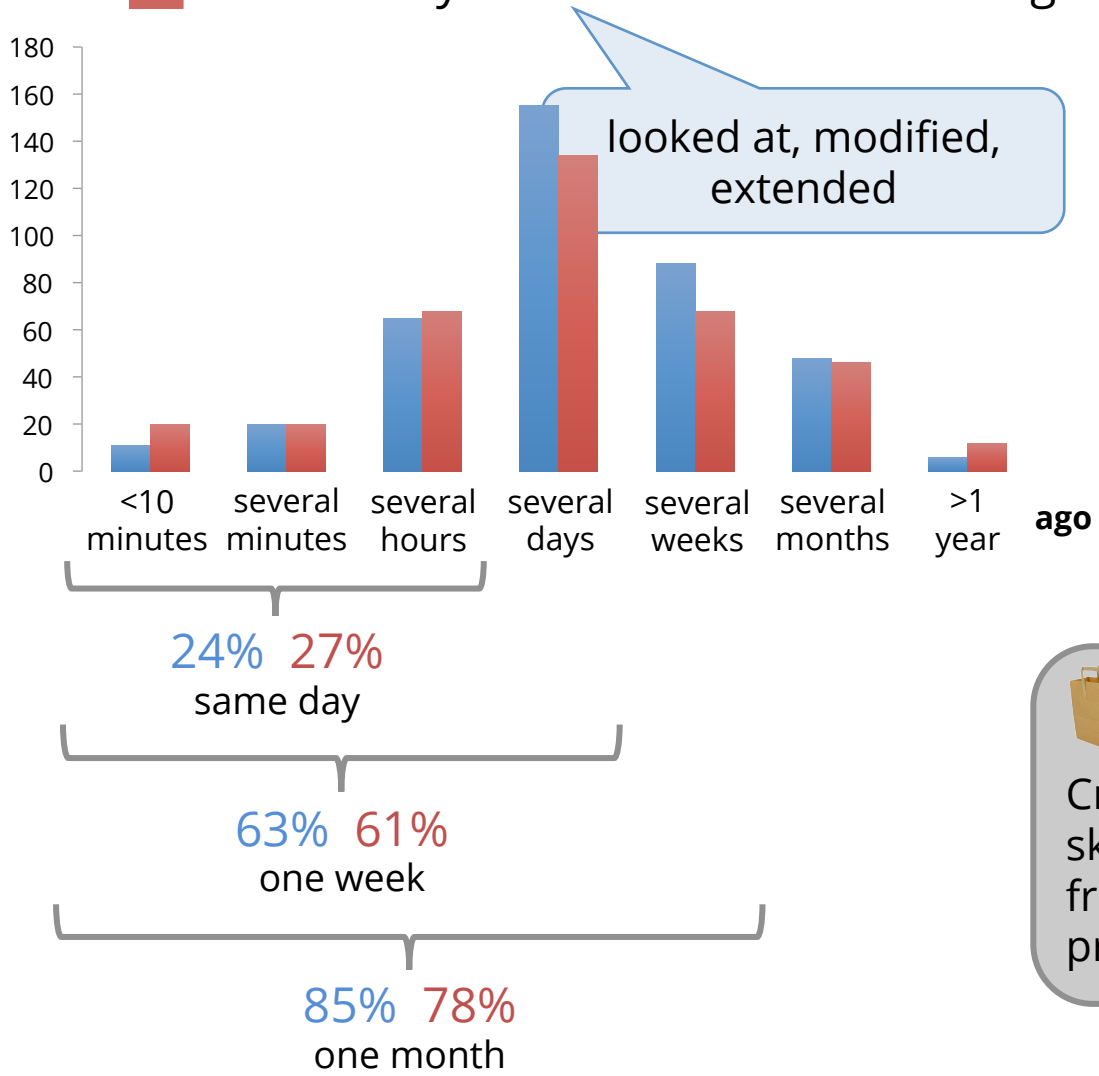
- **n=394**
- **32 countries**
  - 54% Germany 15% North America
- 52% software developers, 22% software architects
- Time spent developing software: **80%** (median)
- Professional work experience: **10 years** (median)
- Software projects from various **application areas**

Results

Creation and Usage

When did you create your last sketch/diagram?

When did you use the last sketch/diagram created by some else?

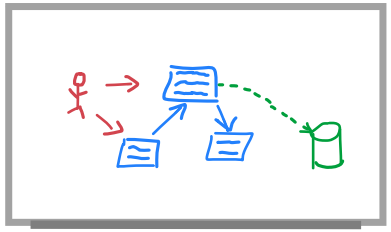


Takeaway 1:

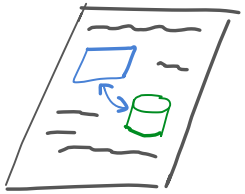
Creating own sketches **and using** sketches created by others are frequent tasks among software practitioners.

Media

What medium did you use to create the sketch/diagram?

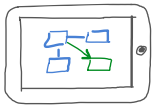


Whiteboard (40%)

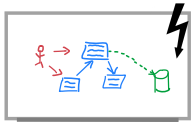


Paper (18%)

Computer (39%)



Tablet (0.8%)



E-Whiteboard (1.5%)

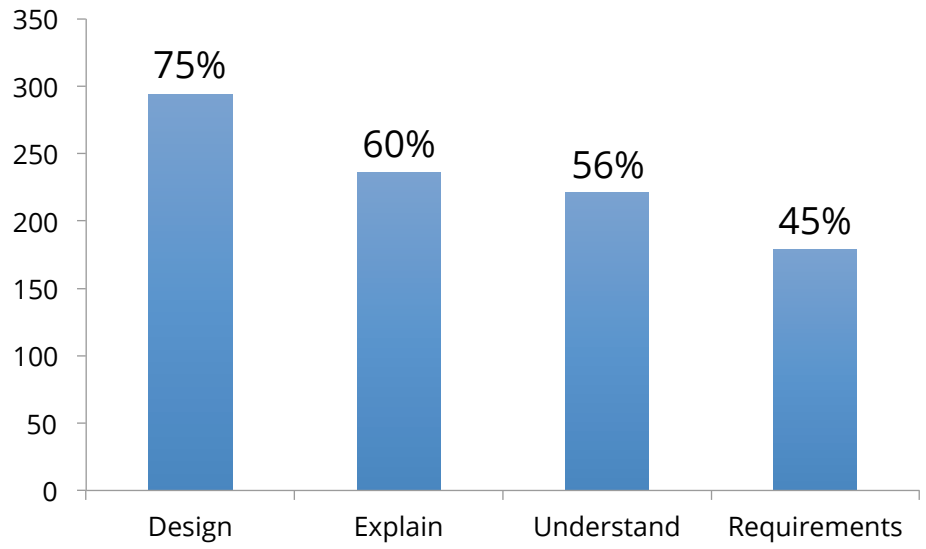
Analog (58%)

Digital (42%)

Purpose

The sketch/diagram helped me to…
(multiple answers possible)

…design a new architecture (52%)
…design new features (48%)
…explain an issue to someone else (46%)
…analyze requirements (45%)
…understand an issue (44%)



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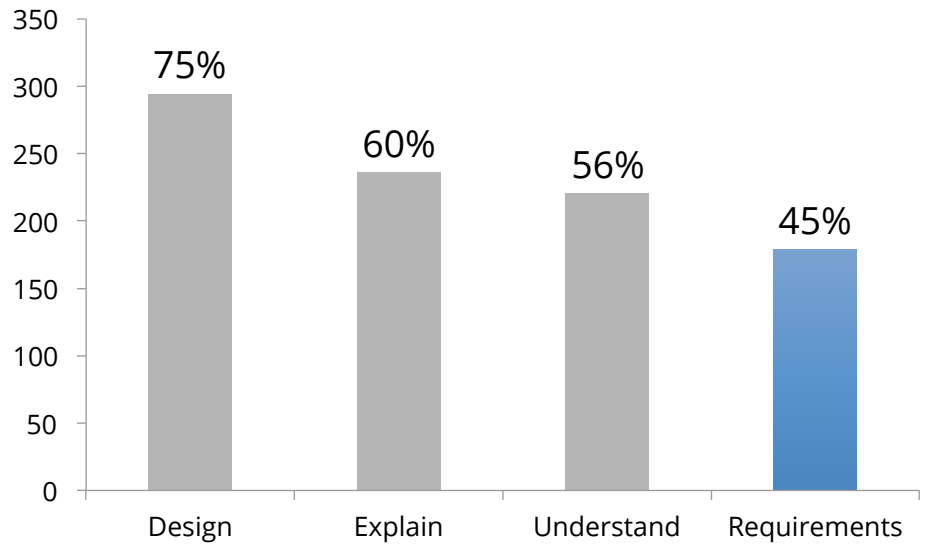
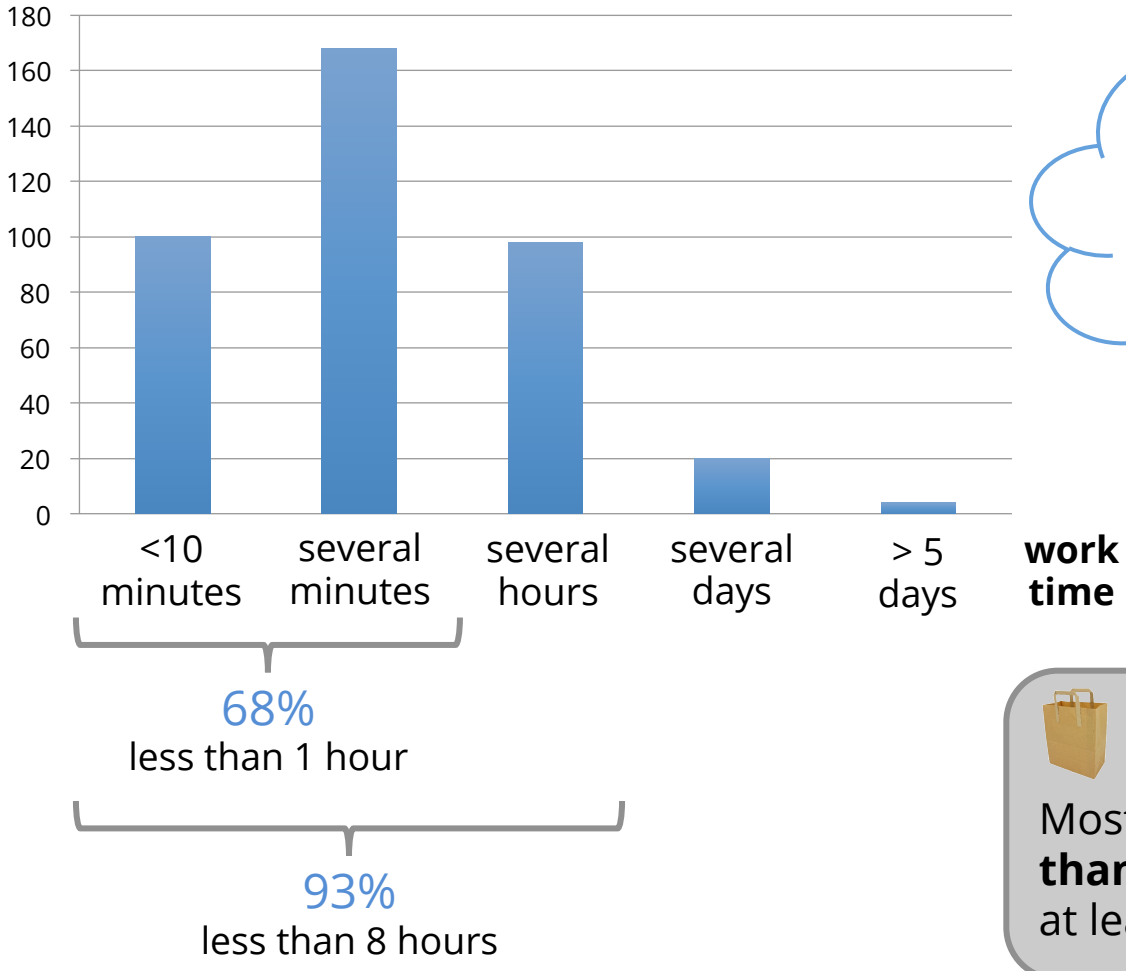


Effort and Revision

How much effective work time went into the creation and revision of the sketch/diagram up to now?



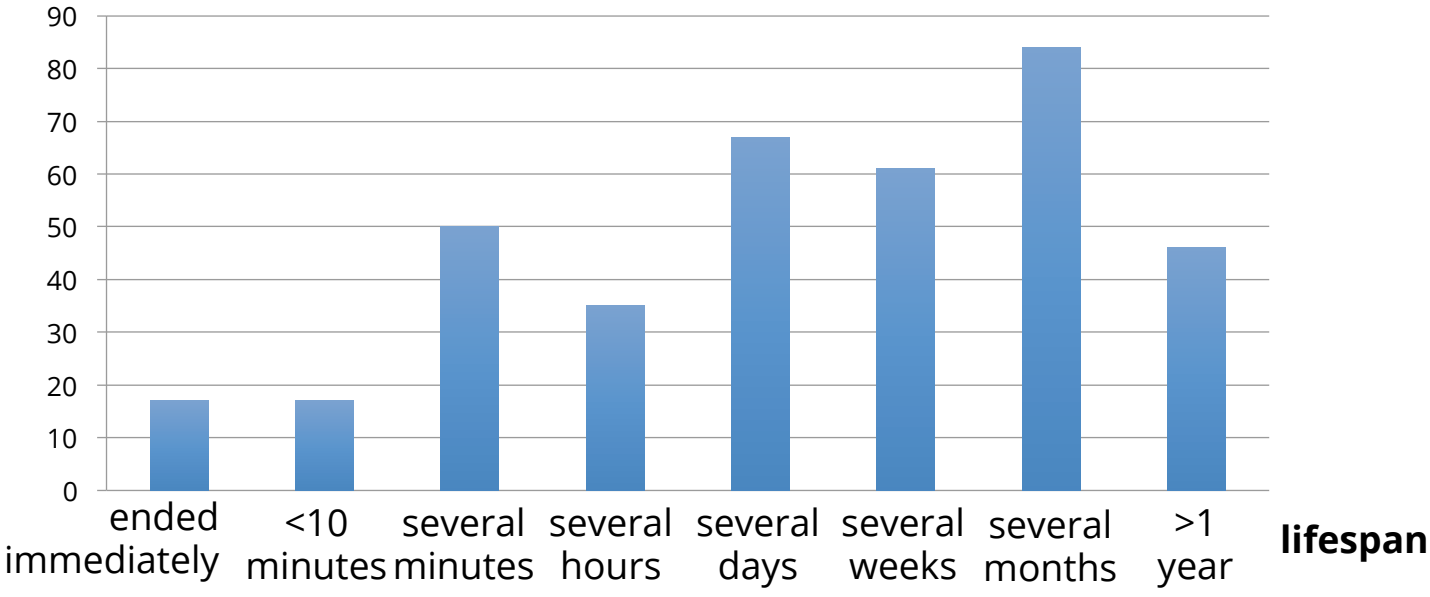
Revision:
15% revised once,
74% multiple times

Takeaway 2:

Most sketches are created in **less than one hour** and are **revised** at least once.

Lifespan

Please try to estimate the lifespan of the sketch/diagram (how long did/will you use it)?



30%
less than one day

65%
at least several days

48%
at least several weeks

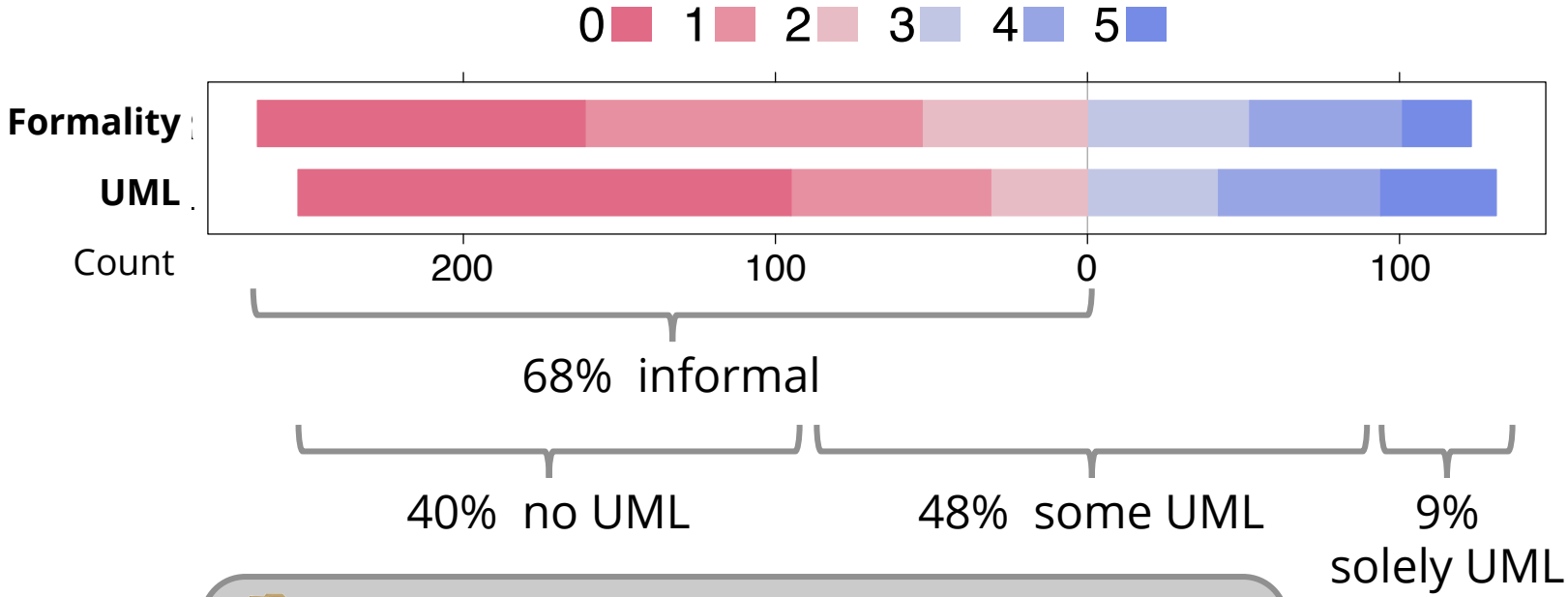
Takeaway 3:

Almost half of the sketches are used for **at least several weeks**.

Formality and UML

Formality: Please try to specify the formality of your sketch/diagram.
(6-point Likert scale (0-5) from "very informal" to "very formal")

UML: To which degree does the sketch/diagram contain UML elements?
(6-point Likert scale (0-5) from "no UML elements" to "only UML elements")



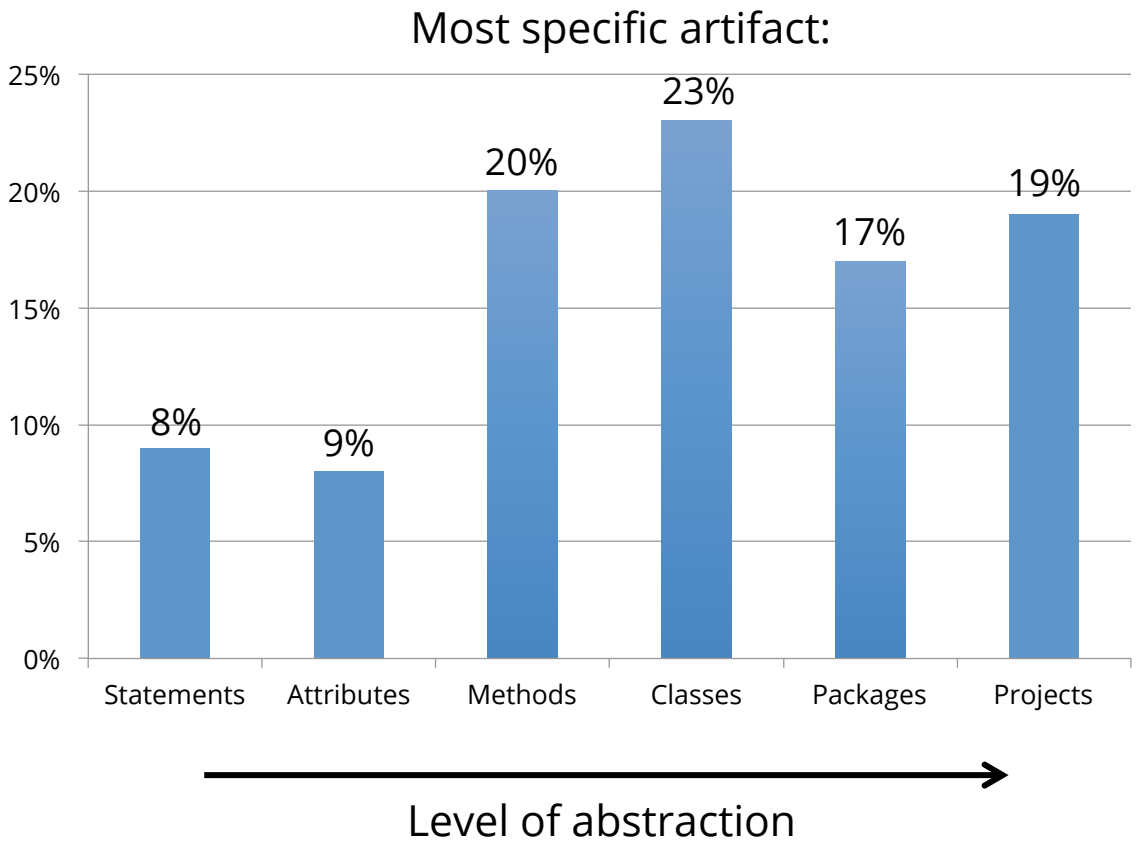
Takeaway 4:

The majority of sketches and diagrams are **informal**.
If UML is used, it is often mixed with other notations.

Relation to Source Code

- Please select the software artifact(s) to which the content of the sketch/diagram is related?

  (multiple answers or no answer possible)



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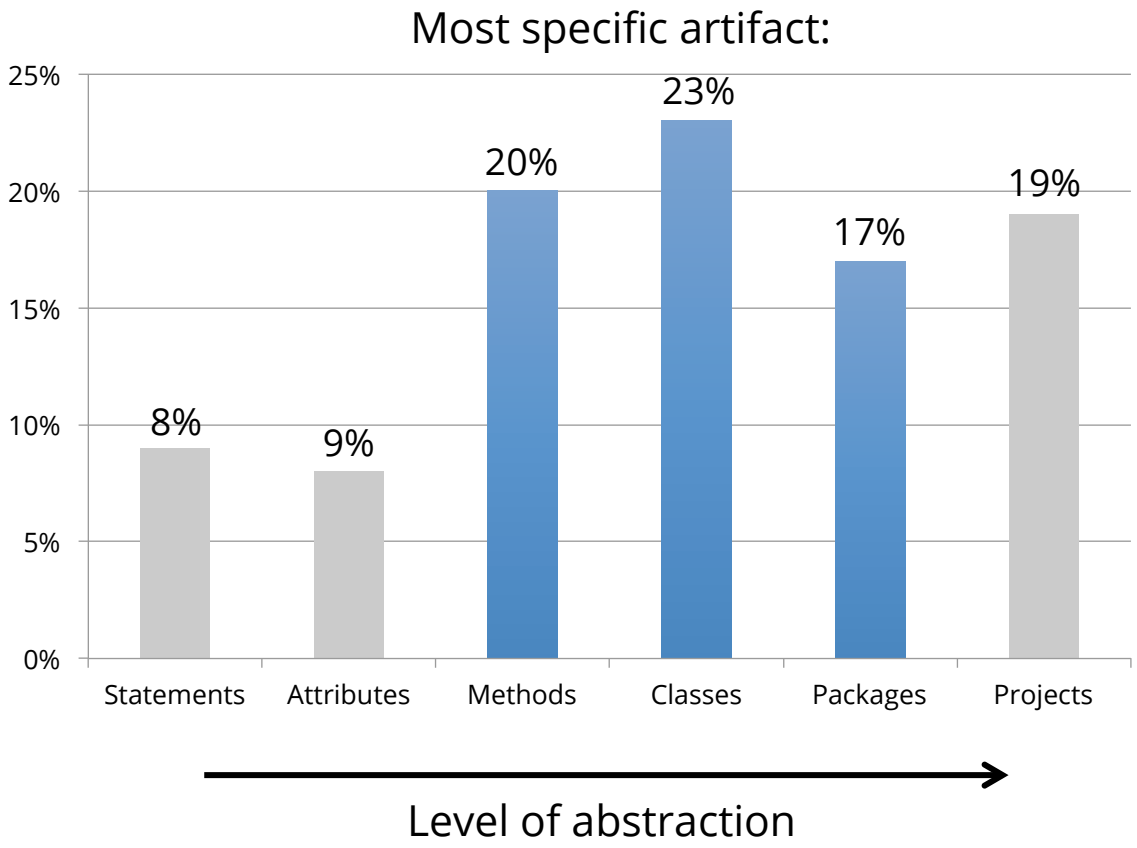
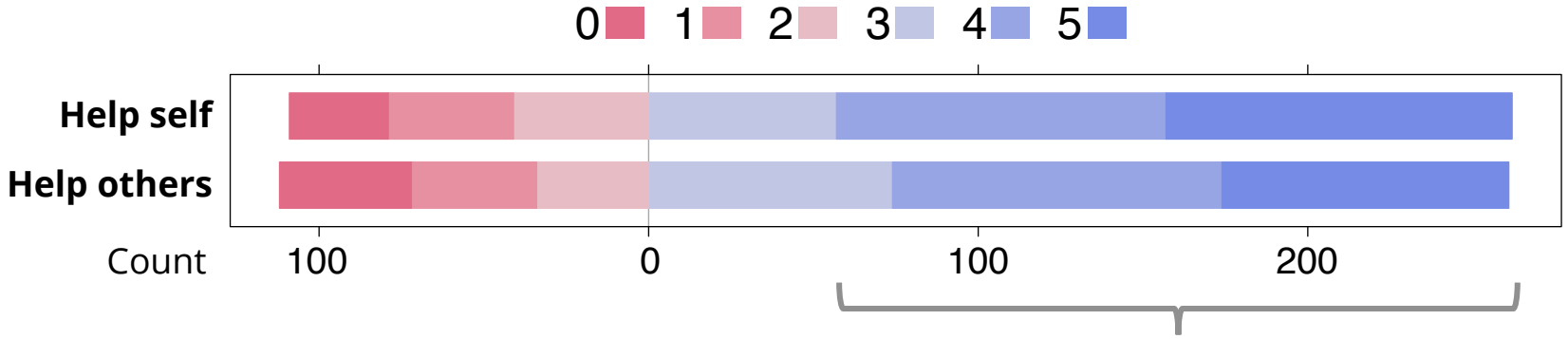


Relation to Source Code

Help self: Do you think that the sketch/diagram could help you in the future to understand the related source code artifact(s)?

Help others: ... help other software developers ...

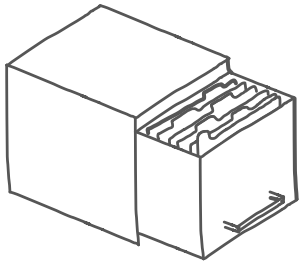
(6-point Likert scale (0-5) from "It will definitely not help " to "It will definitely help")



Takeaway 5:

About **half of the sketches are rated as helpful** to understand the related source code artifact(s) in the future.

Archiving



Three questions:

1. **Has** the sketch/diagram been archived or will it be archived?

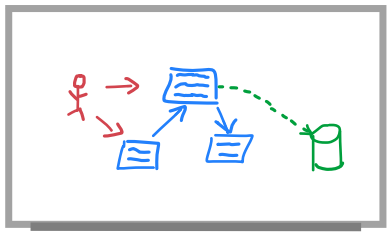
58% archived

2. If the sketch has been archived or will be archived, **why do you want to keep it**?

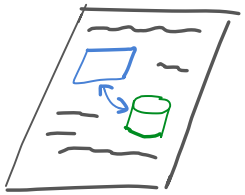
3. If the sketch has not been archived and won't be archived, **why do you not want to keep it**?

- Answers analyzed using open coding
- Extracted four categories for the answers to each question
- One category for archiving practice

Archiving



Whiteboard (40%)



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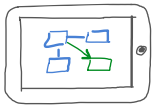

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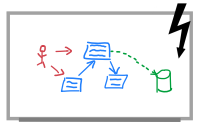
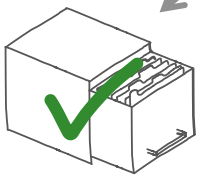


E-Whiteboard (1.5%)

Takeaway 6:

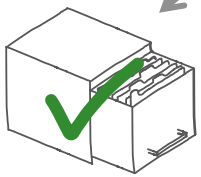
Most digital sketches, but also more than one third of the analog sketches, **are archived**.

Analo **42%)**



Archived (38%)

Not archived (62%)



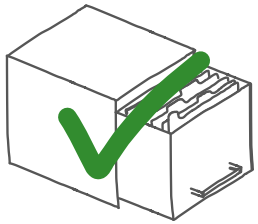
Archived (94%)

Not archived (6%)

Archiving – Why?

If the sketch has been archived or will be archived, why do you want to keep it?

- Documentation
- Future Use
- Understanding
- Visualization



"It will be difficult to understand the code without the diagram."

"[The code] can be quickly understood due to the visual representation without hours of digging through complex source code."

"[The sketch] shows concepts that are not directly visible from code."

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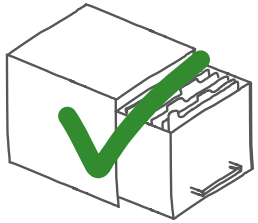


- Understanding
- Visualization

Takeaway 7:

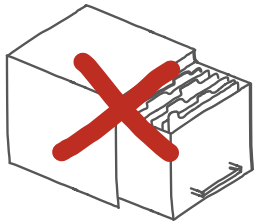
Sketches are kept, because they **document** software, **visualize** it, and support its **understanding**.

Archiving – Why not?

If the sketch has not been archived and won't be archived, why do you not want to keep it?

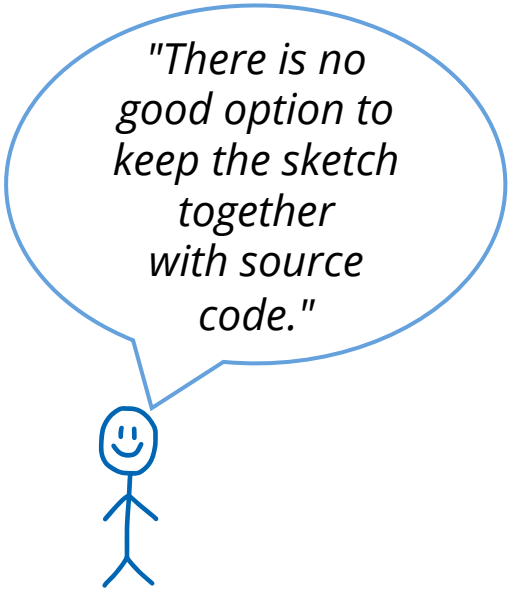
Served its purpose

Substituted



Outdated

Technical Issue



Archiving – How?

Summary

Takeaways

Creating own sketches/diagrams **and using** sketches/diagrams created by others are frequent tasks among software practitioners

Most sketches/diagrams are **created in less than one hour** and are **revised** at least once after creation

Almost half of the sketches/diagrams are **used for at least several weeks**

Majority of sketches/diagrams are **informal**

About half of the sketches/diagrams are rated as **helpful** to understand the related source code artifact(s) in the future

Most digital sketches/diagrams, but also more than one third of the analog ones, are **archived**

Sketches/diagrams **document** the implementation, visualize it, and support its understanding

Conclusion

- **Software documentation** is frequently **poorly written** and out of date
  [Forward02, Lethbridge03]
- Sketches and diagrams could serve as a **supplement** to conventional documentation
- Software practitioners are **willing to keep** their sketches and diagrams
- **Better tool support needed** for archiving and retrieving sketches/diagrams related to source code artifacts
- Tools should support **evolution** of sketches/diagrams (and software)

Future Work

? What **distinguishes** helpful from not **helpful sketches**?

? What **context information** is required to understand sketches later?

? Do (informal) visualizations for certain source code artifacts share **common characteristics**?

Recommendations on how to create, augment, or annotate sketches so that they can serve as a valuable software documentation.

Questions?

Survey data and questionnaire available at:

http://st.uni-trier.de/survey-sketches

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