



# Towards Understanding the User Interface Designer's Environment: An Empirical Approach

## Survey Report

Guided Research at the chair for Software Engineering for Business Information Systems (sebis) at the Technical University of Munich.

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I confirm that this Guided Research in Data Engineering and Analytics is my own work and I have documented all sources and materials used.

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Peter Mortimer

Munich, 13.10.2017

## Abstract

Extensive inquiries into the UI designers creative process have been conducted, yet its working environment is highly dynamic. There have been many innovations in how data can be presented to the user. This requires artifacts designed by UI designers to be quickly converted into a functioning user interface. This production step requires communication between the UI designers and the development team. Understanding the context for creating UI by UI designers makes the continuous research in this domain necessary.

The following research questions are answered in the Guided Research:

- How do UI designers create UI prototypes?
- What are currently the state of the art UI design tools?
- How does the communication between the developer and the UI designer work?
- What are the main artifacts created in the UI design process?

This Guided Research explores the UI designer's workflow using an empirical approach. An explorative survey with professional UI designers is conducted to understand the UI designer's current design process and to explore the desired improvements from the UI designer's perspective.

The design tools used by the professional UI designers are compared to current design trends extracted from popular UI design platforms. The observations gathered in the interviews are consolidated and common patterns in the UI design process are extracted.

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## Introduction

There are many difficulties when creating an accurate overview of the UI designer's work environment at large. The work environment of UI designers is highly dynamic and lead by innovations in different prototype categories and software solutions. To get a general understanding of this field we conducted a survey with UI designers from different companies around Germany. Our survey report should give an overview on the current industry practices of UI designers. This can reveal shortcomings in current UI design approaches and offer insight on future work to be done in this field.

## Research Process

This chapter describes the process to gather the data for this report in detail. The chapter is divided into three parts: *Prototype-driven Development*, *Survey* and *Selection*. The first part *Prototype-driven Development* discusses a popular design methodology, that is analyzed in this survey. In *Survey*, the empirical strategy, that the survey is based on, is explained and in *Selection* the audience, that the survey was targeted towards, is introduced.

### Prototype-driven Development

The survey is based on a general assumption, that the UI design process can be described as a process driven by prototypes. Starting from a very basic prototype, in each step of the UI design process a new prototype with a higher level of fidelity is produced, until the final UI design is established<sup>1</sup>.

The prototypes, that are created, are also documents holding different kinds of information. These documents can be exchanged between the designer and developer. The research questions consider a prototype-driven development methodology and the questions in the survey are constructed with prototype-driven development in mind.

### Survey

Surveys are the most common tool to capture a snapshot of the status of a targeted population. A questionnaire is distributed to a sample of a group, but the conclusions made in a survey aim to hold as a generalization for the whole targeted population. The survey of this report can be classified as an explorative survey<sup>2</sup>.

The questionnaire is rather loosely structured with many open questions. An explorative survey is the best approach based on the research questions, which expect rather qualitative answers, than quantifiable responses (e.g.: *How do UI designers create UI mockups?*). This allows the participant to describe his UI design process in a very unrestricted way. The survey is also a pre-study, since the conclusions made here should be used as motivation for new UI design approaches and software solutions to build upon current UI design trends uncovered in this survey, as well as solve shortcomings discovered in this survey.

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<sup>1</sup> [E. Srivastava, Effective Techniques for Rapid Prototyping \(article from http://usabilitygeek.com\)](http://usabilitygeek.com).

<sup>2</sup> Wohlin et al., Experimentation in Software Engineering, p.13.

The questionnaire is thematically structured into two parts.

The first part of the questionnaire is concerned with understanding the UI design process of the participant. This involves questions about the prototypes the UI designer produces in his design process and which tools the UI designer uses to create the prototypes and the final UI designs. We also establish in this part, which roles are involved in each step of the participant's design process.

The second part of the questionnaire focuses on the communication process of the participant with developers during the UI design process. For this part, we assume, that the UI designer can not necessarily produce the final UI design in code by himself, but works in a team with a software developer. Here we establish what type of files are exchanged and which medium is used for the communication between the UI designer and the software developer.

These are the questions, that were asked in the questionnaire:

*Part 1: UI design process and design tools*

1. What type of prototypes do you produce in your design process?
2. Could you briefly describe your prototype generation process?
3. Could you describe the roles involved in each of the steps?
4. Which tools do you use to create your prototypes?
5. What are in your opinion the main limitations of the current UI design tools?
6. In what format do you deliver the final product to the customer?

*Part 2: Communication process with the developer*

1. Where does the developer work?
2. What are the main communication forms you use to communicate with the developer?
3. How often during the design process do you communicate with the developer?
4. What kind of formats do you exchange with the developer during the design process?
5. How could this communication process be improved?

## Selection

The survey was constructed with experts in UI design as target audience in mind. This led to a focus on professionals that would describe themselves as *UX Designers* or *UI Designers*. In the field of UX/UI design it is commonplace to work as a freelancer on a project-to-project basis. The survey targets both employed UX/UI designers, which work full-time for the same company, and freelance UX/UI designers, that are contracted for one project, to accurately represent the full range of different UI designers and their work environments. All groups receive the same questionnaire.

The survey was distributed to **60 companies** and **100 freelancers** in total. All participants live in Germany and 80% of the contacted companies have an office in Munich. The companies were selected based on the services they offered on their web site. A company was selected if it offered “Web Design”, “UI Design” or “UX Design” as a service to its customers.

The freelancers for this survey were selected based on the same selection criteria as the contacted companies. The freelancers were found using freelancing platforms like [bettertalk.to](https://bettertalk.to/)<sup>3</sup>. These platforms allow freelancers to create a profile and include their skills and knowledge. The freelancers were added, if they included experience in “Web Design”, “UI Design” and “UX Design” on their profile and after reviewing their personal website for evidence of past work in the mentioned fields.

## Prototype Categories

Prototype-driven development has been a common methodology to apply in the UI Design and Website Design process for many years now<sup>4</sup>. Since then the emergence of new tools like Sketch<sup>5</sup> and others allowed users to create prototypes with a higher level of fidelity without having to be able to write code. We consolidate all forms of prototypes into eight prototype categories. These prototype categories establish a shared understanding of the different type of prototypes, that are commonly created in different steps of the design process.

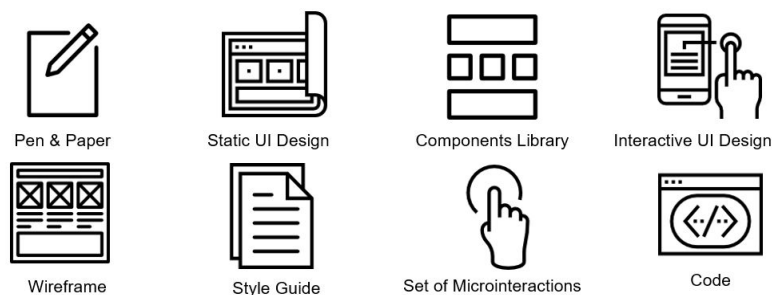


Fig. 1: Prototype Categories

In this chapter, the eight different prototype categories are explained. The prototypes will be presented, starting with prototypes with a low level of fidelity and concluding with prototypes with a high level of fidelity.

### Pen & Paper, Whiteboard



Paper prototypes and whiteboard sketches are commonly considered as low-fidelity prototypes. A low-fidelity design prototype is a visualization of design ideas in a very early stage of the design process and does not take long to develop<sup>6</sup>. Paper prototypes only use

<sup>3</sup> <https://bettertalk.to/>

<sup>4</sup> [Mark W. Newman. Sitemaps, storyboards, and specifications: a sketch of Web site design practice.](#)

<sup>5</sup> <https://www.sketchapp.com/about-us/>

<sup>6</sup> [R. Sefelin. Paper Prototyping - What is it good for? A Comparison of Paper- and Computer-based Low-fidelity Prototyping.](#)

paper sketches and therefore offer only limited interactivity and limited detail. The same properties apply for drawings done on a whiteboard, which additionally offer easier collaboration due to the larger scale of the prototype. Paper prototypes and whiteboard drawings can also reveal usability issues in a very early stage of the design process

7.



## Wireframe

A wireframe presents the functionality, features, content, and user flow your web interface without explicitly specifying the visual design yet<sup>8</sup>. This is accomplished only using lines, boxes, and different gray colors to indicate different levels<sup>9</sup>. Wireframes can be drawn on paper (or other ephemeral materials like whiteboards), but there exist many software solutions to create wireframes digitally. Wireframes and paper prototypes are the only prototypes with a low enough level of fidelity, that the visual design is not conveyed in the prototype. For more complex UIs, multiple wireframes are used<sup>10</sup>. Wireframes can be presented to the customer to receive feedback on navigation and information design without the customer being distracted by visual design details (e.g. color scheme, fonts,...)<sup>11</sup>

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## Static UI Design

A static UI Design is a prototype, where the interface design, navigation design, and information design of a wireframe is combined with the visual design to produce an early non-interactive image on how the final UI design could look like. Other terms, like design composite<sup>12</sup> are also used to describe a static UI design. A static UI design can give the first impression of the visual design, but it is not based on rules and methods specified in a Style guide, since a Style guide is usually not created at this point of the UI design process. The static UI design can be presented to the customer to receive feedback on visual design details.

## Style Guide



The style guide often takes form as a written document defining all standards and conventions that are needed to create new content, while keeping the overall design consistent across the whole domain. The style guide typically contains definitions on layout and composition, typography, and color palette<sup>13</sup>. Especially for customer-facing systems, it is important to provide a consistent UI in the system to improve the system's overall usability

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<sup>7</sup> [M. Walker, High-Fidelity or Low-Fidelity, Paper or Computer? Choosing Attributes when testing Web Prototypes.](#)

<sup>8</sup> [M. Angeles, Wireframes \(Glossary on http://konigi.com\).](#)

<sup>9</sup> [Basic UI/UX Design Concept Difference Between Wireframe & Prototype \(article from www.mockplus.com\).](#)

<sup>10</sup> [J. J. Garrett, The Elements of User Experience: User-Centered Design for the Web and Beyond, chapter "Wireframe" \(pp. 128-131\).](#)

<sup>11</sup> [Mark W. Newman, Sitemaps, storyboards, and specifications: a sketch of Web site design practice.](#)

<sup>12</sup> [J. J. Garrett, The Elements of User Experience: User-Centered Design for the Web and Beyond, Chapter "Design Comps and Style Guides" \(pp. 148-151\).](#)

<sup>13</sup> [J. Bolton, Writing an Interface Style Guide \(article from alistapart.com/\).](#)



<sup>14</sup>. Style guides can be generated using dedicated software solutions or one manually creates a style guide using any word processing system.



### Components Library

A component is a piece of the website UI. When a collection of components is combined and organized in a meaningful way, then it is called a components library<sup>15</sup>. The components are created with the same visual design in mind and based on the standards defined in the style guide. A components library can make extending a web site easier, since pre-built UI elements can be quickly combined. Especially for web services, automatic UI composition tools are useful, since the data representation can dynamically change, while also keeping the visual design consistent with the UI components<sup>16</sup>.



### Set of Microinteractions

A microinteraction is a contained product moment focused on a single use case<sup>17</sup>. For example, a microinteraction could be the press of a button or entering information into an input field. Microinteractions represent small functions within a larger system and their fine degree of granularity make them prototypes with a high level of fidelity<sup>18</sup>. Microinteractions are often interactive prototypes or animations, which can convey the intended user experience.



### Interactive UI Design

An interactive UI design represents the final UI design with many interactive components, but often without writing explicit UI code yet. The interactive UI design combines the UI components of the components library and the set of microinteractions to form a prototype with a high level of fidelity<sup>19</sup>.



### Code

Code is also considered as a prototype and not the final product, since an incomplete version of the final UI could be written in code, to test its usability and performance. In context of customer-facing web and mobile UIs the prototype would commonly be written in HTML, CSS, and JavaScript.

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<sup>14</sup> [S. Gale. A Collaborative Approach to Developing Style Guides.](#)

<sup>15</sup> [M. Perkins. On Building Components Libraries \(article from https://clearleft.com\)](https://clearleft.com)

<sup>16</sup> [E. Karuzaki. Yeti: Yet Another Automatic Interface Composer.](#)

<sup>17</sup> [D. Saffer. What is a Microinteraction? \(article from http://microinteractions.com\)](http://microinteractions.com)

<sup>18</sup> [R. McDaniel. Understanding Microinteractions as Applied Research Opportunities for Information Designers.](#)

<sup>19</sup> [S. Li. Xketch: A Sketch-Based Prototyping Tool to Accelerate the Mobile App Design Process.](#)

## Software Solutions

The following overview of the state of the art UI design tools is necessary to understand the work environment of UI designers. Apart from the whiteboard prototype, every other prototype is created digitally. This overview is focused on software solutions, that UI designers use during their design process to create UI prototypes.

### UI Prototype Focus

UI design software solutions can be categorized by which of the previously introduced UI prototypes can be created with the software solution. In some cases, different types of UI prototypes can be created within the same software solution, but here the software solutions are categorized based on the prototype that is most commonly produced within the given software solution. In Table 1, the software solutions are listed based on this output prototype criteria.

UI Prototype	Software Solutions
Wireframe	Balsamiq, POP
Static UI Design	Adobe XD, Adobe InDesign, Keynote, Omnigraffle, Adobe Photoshop, PowerPoint, Sketch
Style Guide	UXPin, Sympli
Components Library	Adobe Illustrator
Set of Microinteractions	After Effects, Principle, Prototyp
Interactive UI Design	Atomic, Axure, Briefs, Craft, Figma, Flinto, Form, InVision, Justinmind, Marvel, Mockup.io, Origami Studio, Proto.io, Prott, Silver Flows
Code	Adobe Dreamweaver, Framer, Fuse

Table 1: software solutions categorized based on UI prototype.

Table 1 shows that there are more known software solutions among UI designers for the two prototypes static UI design and interactive UI design in comparison to the other prototypes. This could be explained when considering that creating UI designs, regardless of static or interactive prototypes, can be easily created and yield a high similarity to the final product. static UI designs or interactive UI designs are reasonable prototypes regardless of scale, while style guides or components libraries first make sense, when the project takes on a certain scale where consistent visual design is harder to maintain.

The diversity in software solutions for interactive UI designs can also be explained by the fact, that in recent years it first became feasible to create software solutions for interactive UI designs. Currently there are many different software solutions to create interactive UI

designs with no software solution standing out, but all sharing almost equal popularity among UI designers. These insights are further explored in the results section of the survey report.

## Survey Results

In this section, we review the results from the survey and analyze how these results give us insight to our stated research questions. We review the outcome of each survey question and indicate what inferences can be made based on the survey results.

### General Survey Information

18 survey participants completed the survey. This gives us a moderate completion rate of 11.25%. The average completion time for the survey was 12 minutes and 27 seconds for a total of 11 questions. For the survey data, we also accepted incomplete surveys and only included the completed part of the survey in our analysis process.

### Part 1: UI design process and design tools

For the first question “What type of prototypes do you produce in your design process?” we gathered a total of 23 responses. Participants could select multiple answers. As Fig. 2 shows, the use of fast paper prototypes (or whiteboard prototypes) are still widely used among UI designers (91% of all respondents to this question produce Pen & Paper, Whiteboard prototypes during their design process). Many respondents elaborated, that paper prototypes offer a quick way to sketch early design ideas with other UI designers in the team or with the customer.

Prototypes in form of wireframes are also still in use like paper prototypes (91% of all respondents to this question produce wireframes during their design process). Respondents use wireframes to solidify the navigational and information design of their UI in wireframes, without having to consider the visual design of the UI yet.

When reviewing newer kinds of prototypes such as the set of microinteractions and interactive UI designs one can see that interactive UI designs are more popular among UI designers (70% of all respondents to this question produce interactive UI designs during their design process). We believe that the use of interactive UI designs will increase in the next years with the sophistication of the software solutions in this area.

Only 22% of all respondents use code prototypes during their design process. This can mean, that there still is a separation between the skill set of an UI designer and web developer. The UI designer does not have to produce the code for their UI design.

Overall, there was no difference between the responses given by freelancers or UI designers in companies regarding these two questions.

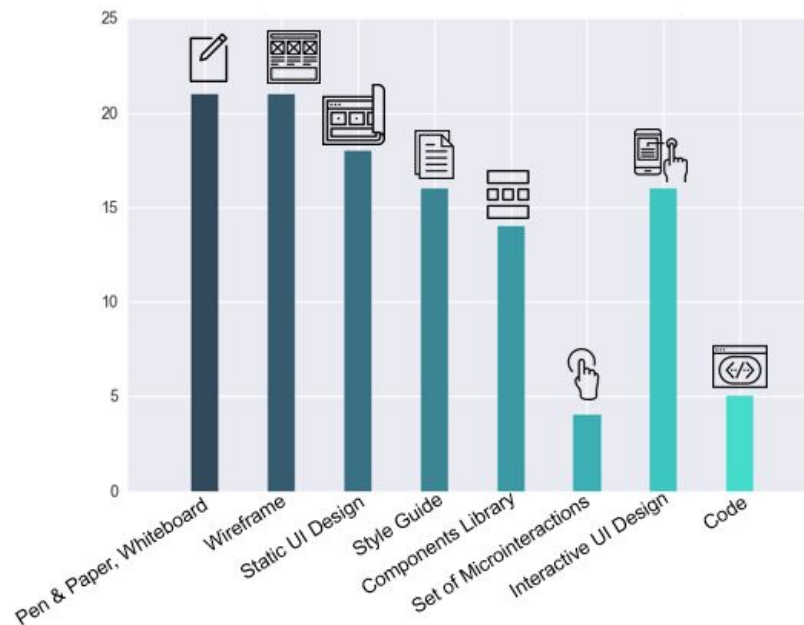


Fig. 2: Survey results to the question “What type of prototypes do you produce in your design process?”.

The next two questions in the survey asked the respondents to briefly describe their UI design process and which roles are involved in each of these steps. The participants responded to these questions by writing a text.

Respondents described their process in a step-by-step manner, but did not attribute their process to known design methodologies. Most respondents mentioned, that factors like the customer domain, the product requirements, time and budget constraints play a major role in deciding how elaborate the UI designers focus on prototyping during the design process. A few mentioning that creating a components library or a set of microinteractions is only done if the project required it, since these prototypes require a lot of time and attention to detail. Every respondent developed an intermediate prototype during their design process and most UI designers leveraged the prototypes to more easily communicate with customers over decisions concerning the navigational or visual design of the final UI.

23 participants responded to the question “Which tools do you use to create your prototypes?”. This question required the participants to select any software solution they use from a total of 32 listed tools. The survey results are visualized in Fig. 3. When reviewing the five most popular software solutions, one notices that four are used to create static UI designs (Sketch and Adobe Photoshop) and interactive UI designs (InVision and Axure). Adobe Illustrator being the exception which is used to design components and is therefore categorized as a software solution for components libraries. This for one signifies the popularity of prototypes, that resemble something like the final UI design, which both static and interactive UI designs provide.

When comparing the survey results exclusively for prototypes used to create interactive UI designs, many different software solutions with almost equal popularity among UI designers exist. This can mean, that there does not exist one established software solution for

interactive UI designs yet and most software solutions in this category were released only in the last ten years.



Fig. 3: Survey results to the question “Which tools do you use to create your prototypes?”. The bars are color-coded based on which type of prototype is commonly created with the given software solution. The 5 most popular software solutions have their logo included beside their respective bar.

The follow-up question to the respondents’ choice of software solutions is asking “What are in your opinion the main limitations of the current UI design tools?”. The respondents answered this question by writing a text. A few respondents mentioned the shortcoming of microinteractions. It takes a lot of time to learn how to use existing software solutions to create microinteractions, but the outcome often still is too basic, so that the microinteractions do not showcase the intended functionality to the customer or developers. This could also explain why tools intended to create microinteractions are still relatively unpopular among the UI designer community.

Collaboration tools used to collect and organize design components among UI designers were critiqued for being very time-consuming to set up, which is the reason why these software solutions are only utilized for larger projects, where the benefit of easier standardization of the visual design outweighs the startup cost.

A common critique towards current software solutions was that there is no one-for-all software solution regarding prototype development. Software solutions rather focus on designing one kind of prototype well, which comes at the cost, that UI designers must learn how to use many different software solutions.

The final question of the first part of the survey “In what format do you deliver the final product to the customer?” focuses on the form of the product that is delivered to the customer. Depending on the project the final design can resemble something like one of the

specified prototypes. The static UI design is still the most popular form how to submit the design to the customer. It is noticeable, that code prototypes and sets of microinteractions are not commonly in use among UI designers and therefore also rarely delivered to the customer.

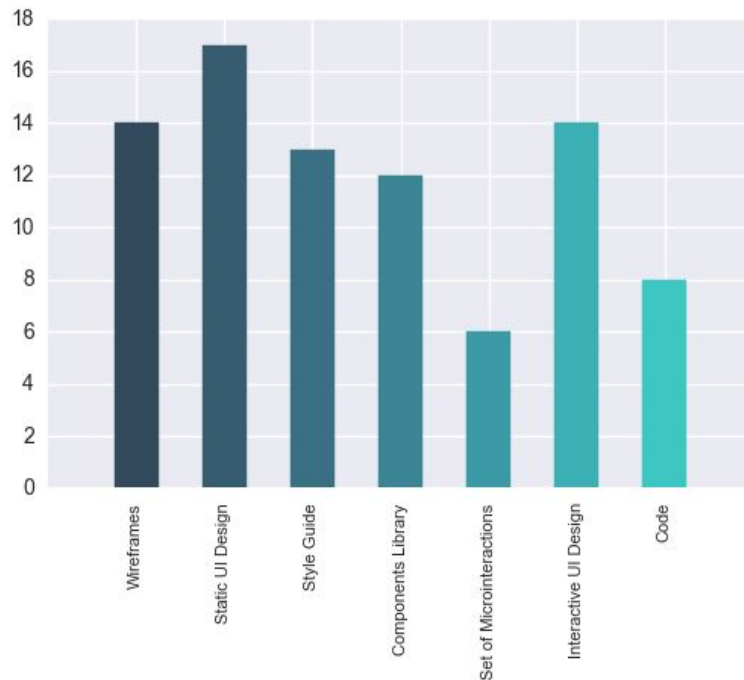


Fig. 4: Survey results to the question “In what format do you deliver the final product to the customer?”.

This concludes all questions about the UI design process and the design tools. The results indicate a popularity in the use of different prototypes during the UI design process, especially static UI designs and interactive UI designs. More specialized prototypes like style guides or components libraries are only in use if the project significantly benefits from its use. On the other hand, more obscure prototypes as the set of microinteractions and code prototypes are not so commonly used during the design process and the final UI design is also not delivered in these formats

## Part 2: Communication Process with the Developer

The second part of the survey focuses on the interaction between the UI designers and the developer.

The physical distance between the UI designer’s workspace and the developer’s workspace gives some initial insight into the ease of communication between them. The first question of the second part of the survey “Where does the developer work?” asks the UI designer to describe the distance of the developer’s office to his own office. In Fig. 5, the survey results show, that there are no clear tendencies on how the UI designer and the developer are located. The developer and UI designer sometimes share the same office space, which would allow for easy in person meetings, but companies also have the developers and UI

designers at different locations working together. The UI designer and developer also work at different companies in some scenarios.

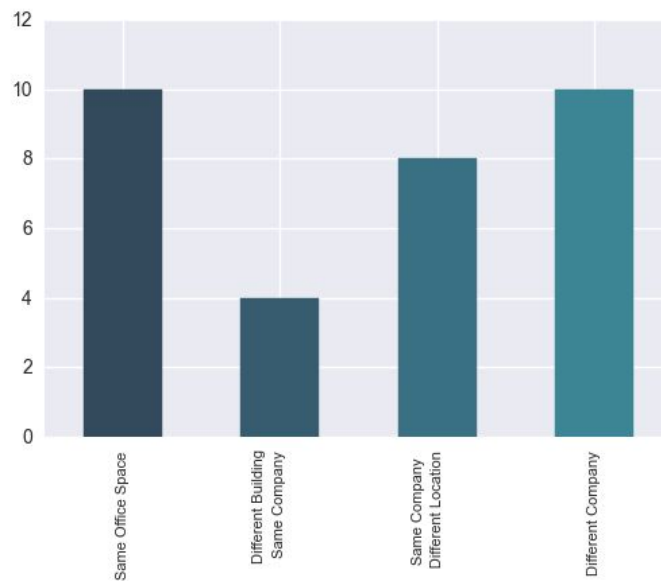


Fig. 5: Survey results to the question “Where does the developer work?”.

The format with which the UI designer and developer communicate adds more understanding to the communication process and the question “What are the main communication forms you use to communicate with the developer?” asks for the UI designer to select all formats that he uses to communicate with the development team. The results to this survey question show, that there almost all forms of communication is used to collaborate with the developer (see Fig. 6). The previous question and this question indicate, that there exist widely used solutions to communicate, so that the development team and the UI design team can work from different locations and companies.

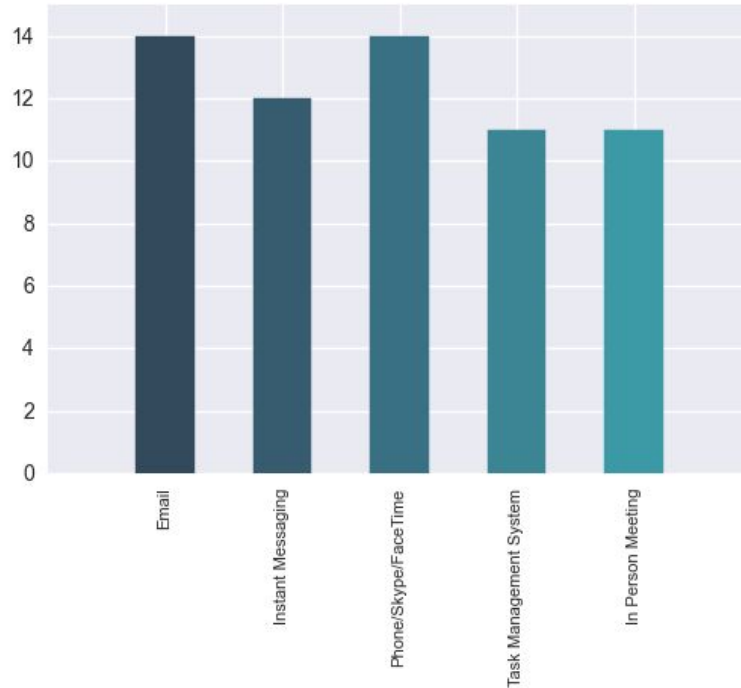


Fig. 6: Survey results to the question “What are the main communication forms you use to communicate with the developer?”.

The survey question “How often during the design process do you communicate with the developer?” aims to understand how involved the developer is in the UI designer’s design process in terms of the frequency of communication between both actors. All respondents to this question communicate at least once a week with the developer (see Fig. 7) and no of the least frequent response options “At least once every 2 weeks” or “At least once a month” were selected. There is a strong communication process between the UI designer and the developer in the industry. The previous questions have shown, that this communication is done using many different formats and from possibly many different locations.



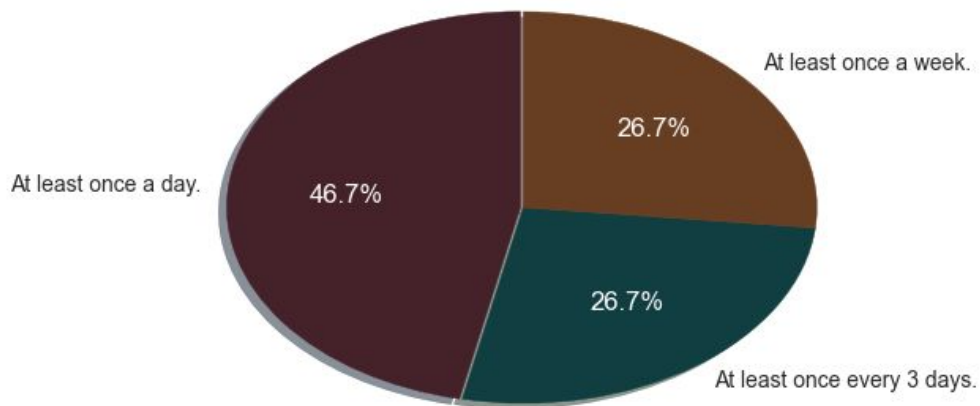


Fig. 7: Survey results to the question “How often during the design process do you communicate with the developer?”.

The question “What kind of formats do you exchange with the developer during the design process?” might give some insight, which prototypes are used to present UI designs to the developer and more specifically in which format are the designs delivered to the developer. As the popularity of static UI designs and interactive UI designs suggests, using the format of images and interactive UI designs very popular among UI designers (see Fig. 7). The high response to the format of design components is reasonable, since the developers require the assets proposed by the UI designer to create a similar production UI in code. This does not mean, that the UI designers are creating components libraries, since these are almost only used for larger projects as the previous survey results revealed, but rather the singular components required to create the final UI designs in code.

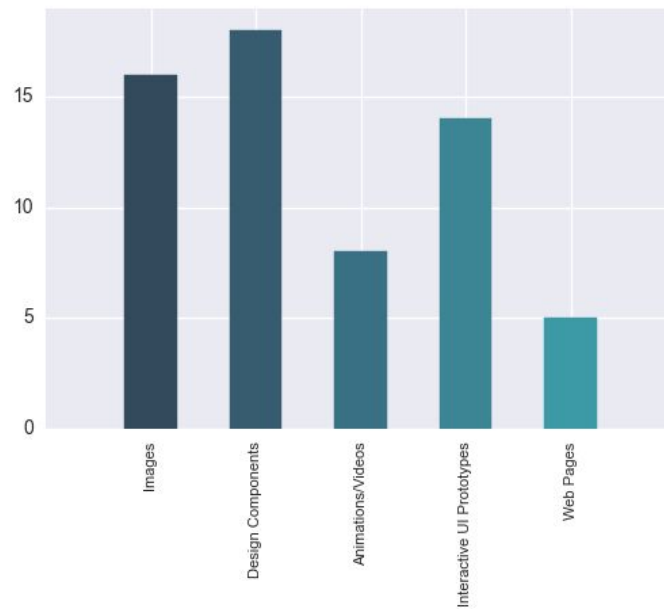


Fig. 7: Survey results to the question “What kind of formats do you exchange with the developer during the design process?”.

The final survey question “How could this communication process be improved?” expects a text response from the survey participant. The responses revolved around three general topics. For one the software solutions don’t have very expressive comment functions built in, so that the UI designer can not convey details to the developer without having to communicate with him directly instead of doing this implicitly with comments in the design prototype. The need for searchable style guides, that are combined with components libraries to make it easier for the developer to find the right components and to look up the visual design defined in the style guide. Finally, UI designers would like to see developers have more knowledge regarding design rules and user oriented work to make the communication process easier.

## Conclusions

The survey results provide answers to the initially stated research questions of this report. The design process of UI designer’s is guided using intermediate prototypes. The exact workflow and use of prototypes depends highly on project factors like the budget, project size, and requirements. This prototype-driven workflow requires the use of different software solutions, which are often only specialized in designing one kind of prototype.

The prototypes are also used to communicate design ideas with the developer and the customer, which leads to a trend of developing prototypes visually similar to the final UI design, such as static UI designs and interactive UI designs. The use of interactive UI design is emerging and UI designers are learning how to use these software solutions to incorporate them into their design process.

There is still a separation between the skills of UI designers and developers with only very few UI designers writing their solutions in code. The communication between developers and UI designers uses many different mediums, where the survey could not offer insight how the

communication changes at different stages during the UI design process. The UI designers send the developers their designs as images or individual components, that are required to create the desired UI.

## Future Work

Gathering the information for this research in a web survey allowed for responses from a wide range of UI designers across Germany, but cannot provide detailed insight of the individual UI design processes like an expert interview could. This explorative survey is viewed as a pre-study, which offers results indicating in which directions further research could be conducted. The software landscape for UI designers is diversified leading to software solutions being only specialized for one prototype. Further research in creating processes to easily transition between prototypes would be valuable.

The more widespread use of interactive UI designs should be followed to see if these prototypes replace static UI designs as the most used prototype during the UI design process.