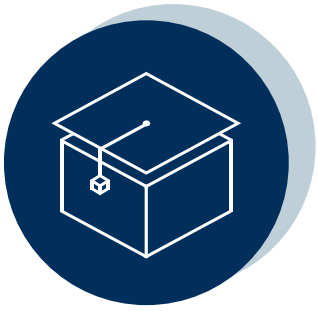

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BACHELOR'S THESIS

Integrating Narratives for User Onboarding in Gamified Information Systems

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Abstract

High abandonment rates pose significant challenges for information systems designers and developers, especially with the increasing reliance on subscription-based or advertising-supported payment models. The success of any information system heavily depends on user retention rates. Many software products lose potential users due to an insufficiently compelling first impression during initial interactions. In response to this issue, this thesis explores a novel approach to user onboarding by incorporating the gamification element 'narrative' to create more engaging and compelling onboarding experiences for new users. To evaluate this approach, a pilot study was conducted, comparing three different onboarding approaches for the use case Scrumlr, an open-source tool for online collaboration and agile retrospec-tives. The study found that the use of narrative elements significantly improves the perceived ease of learning, perceived ease of use, and system use enjoyment for new users. Moreover, the findings suggest that narratives...

Keywords: Gamification, Information Systems, User Onboarding
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Integrating Narratives for User Onboarding in Gamified Information Systems

Bachelor Thesis

by

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Preface

This thesis would not have been possible without several people.
Firstly, I want to thank my supervisor Dr. Manuel Schmidt-Kraepelin for providing me with the opportunity to investigate the fascinating domain of gamification and how narratives can change the way we approach the design of information systems. I also want to thank Dr. Manuel Schmidt-Kraepelin for his great feedback during the process of creating this thesis and for supporting my request to collaborate with inovex GmbH for this work.
Secondly, I am thankful to inovex for their support in creating this thesis. Alongside the many talented people that work at inovex, I want to give special thanks to my supervisor Jann Schulz-Kuhnt, who introduced me to the use case Scrumlr and provided many helpful suggestions during the work on this thesis.
Lastly, I want to thank my family for always supporting me. To my father, Lars Hotze, thank you for sparking my interest in computer science and for supporting me all my life, no matter what I aspired to do. I wish I could share this success with you.

Abstract

High abandonment rates pose significant challenges for information systems designers and developers, especially with the increasing reliance on subscription-based or advertising-supported payment models. The success of any information system heavily depends on user retention rates. Many software products lose potential users due to an insufficiently compelling first impression during initial interactions.

In response to this issue, this thesis explores a novel approach to user onboarding by incorporating the gamification element ‘narrative’ to create more engaging and compelling onboarding experiences for new users. To evaluate this approach, a pilot study was conducted, comparing three different onboarding approaches for the use case Scrumlr, an open-source tool for online collaboration and agile retrospectives.

The study found that the use of narrative elements significantly improves the perceived ease of learning, perceived ease of use, and system use enjoyment for new users. Moreover, the findings suggest that narratives may positively impact learning outcomes, perceived usefulness, and the intention to use the target system.

By utilizing narratives in user onboarding, designers and developers can potentially address the issue of high user abandonment rates, leading to better user experiences and increased success for information systems.

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List of Abbreviations

IS	Information System
UO	User Onboarding
TtV	Time-to-Value
UI	User Interface
UX	User Experience
MI	Minimalist Instruction
PBL	Points, Badges, Leaderboards
F2P	Free to play
SDT	Self-Determination Theory
AM	Agile Manifesto
XP	Extreme Programming
URL	Uniform Resource Locator
KIT	Karlsruher Institut für Technologie
SHJ	Soap Hero’s Journey
CtA	Call-to-Action
KWT	Kruskal-Wallis-Test

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1. Introduction

1.1. Problem Definition

Developers of information systems (IS) often encounter the problem of motivating users to interact with the system and guiding them towards a correct and effective use of the system. Studies show that up to 21% of users abandon an application after only one use (Upland, 2018, p. 2). Users will most likely abandon applications that do not feel relevant to them or that make them feel overwhelmed or frustrated, e.g., due to insufficient ease of use (Google, 2016, pp. 4, 10, 13). It is obvious that the user retention rate has a critical influence on any IS' success (Lin et al., 2020, p. 569). Furthermore, depending on study and industry, customer acquisition is said to be anywhere from five to 25 times more expensive than retaining an existing one while an increase in customer retention rates by 5% can increase profits by 25% to 95% (Gallo, 2014, p. 1). This suggests that there is a need for better onboarding experiences which decrease abandonment rates by increasing user engagement and user competence in using the IS. Even if the features of an IS have the potential to provide high value for the users, it is of little use if the user abandons the IS before he can really use it due to low satisfaction and motivation and difficulty in acquiring the competence to make use of it.

One promising solution to the challenge of making user onboarding (UO) processes more enjoyable and engaging might be the use of gamification. Designers of gamified IS make use of game design elements to create meaningful engagement which consists of both providing enjoyable experiences as well as fostering instrumental task outcomes simultaneously (Liu et al., 2017, pp. 1025, 1029). In the context of UO in IS, important instrumental outcomes of UO may be the users' 'intention to use' the target system, as well as 'user competence' (Section 2.3.1). 'User competence' in this thesis is defined to consist of both 'learning outcomes' regarding domain knowledge of the target system that is conveyed through the onboarding process and the users' 'task proficiency' that concerns how well a user can perform tasks by making use of the features of the target system. The constructs 'perceived ease of learning', 'perceived ease of use', 'perceived usefulness', and 'system use enjoyment' were chosen to represent the experiential outcomes. While there are there are several other constructs that could be regarded as instrumental or experiential outcomes of UO, this work focuses on a limited number of aspects to make measurements feasible. As one major use of narratives in gaming besides user engagement is guiding the player through a game by giving him clues and information and providing a narrative justification for why he does certain tasks (Bateman, 2006, pp. 89f.) narratives in gamified IS could have a positive influence on the onboarding experience of new users as well as their motivation to use the system, thus increasing user satisfaction and user retention. Thus, I ask the following research question:

> **RQ:** *How does the use of narratives influence instrumental and experiential outcomes of user onboarding in gamified information systems?*

In recent years, gamification of IS has been the topic of a vast amount of publications and many gamified applications were developed and deployed (Lowry et al., 2020, p. 609). Most research on gamification focused on specific game elements such as levels, points or badges as means to increase user motivation and engagement (Koivisto & Hamari, 2019, pp. 198, 204). However, the specific game element narrative, which may be one of the most memorable elements of many games, has been neglected in a lot of research on gamification and is missing from many typologies of gamification elements (Blohm & Leimeister, 2013, p. 276; Thiebes et al., 2014, pp. 12-13). Some intentionally ignore narratives in gamification as they aim to build 'nonfiction' experiences (Zichermann & Cunningham, 2011, p. 35). Narratives are also missing in most frameworks for gamification as they do not consider them to be essential game elements (Toda et al., 2019, p. 87). Yet, as narratives have shown an immense potential to motivate and persuade people in different disciplines such as marketing, politics, education and healthcare, there is reason to investigate their potential in gamified IS (Schmidt-Kraepelin et al., 2023, p. 1).

While narratives were not at the focus of gamification research, there are various real-world examples of gamified applications where the use of narratives had a big impact on their success, such as the famous running app '*Zombies, Run!'* which immerses users in the narrative of a zombie apocalypse where they have to run for their survival (Farič et al., 2021, p. 15). Real-world examples for the use of narratives in onboarding processes for new users are scarce, but the limited number of research efforts and applications that explore this new approach to UO suggest that the use of narrative elements can lead to improvements regarding experiential and instrumental outcomes of UO (Li et al., 2012, p. 104).

First studies on comparing narratives to other game design elements in gamification further motivate the use of narratives as they achieved the greatest positive effect regarding keeping users motivated to interact with an IS (Mazarakis & Bräuer, 2023, p. 624).

Since narratives can be more complex to implement compared to other game design elements, it is also important to search for characteristics of effective narratives in gamification. Just as gamification design elements must be congruent with the target task to be effective (Liu et al., 2017, p. 1019), to foster meaningful engagement, a high congruence of narrative and instrumental task should be a consideration when using narratives in gamified IS (Schmidt-Kraepelin et al., 2023, p. 8).

Extant research on gamification also found that the effects of gamification are highly sensitive to a multitude of contextual factors such as the system domain or target group (Koivisto & Hamari, 2019, p. 199). Since this is likely to be true for narratives as well, it is of importance to test the effects of narratives in gamification in a multitude of areas with different types of applications and different user demographics. Therefore, the positive effects that narratives have shown in popular applications for education (Hirschi, 2019, p. 357), physical activity (Farič et al., 2021, pp. 2, 15), or (mental) health (Auf et al., 2021, pp. 1652f.) motivate further research but they do not suffice to guide the development of narrative UO experiences reliably predict the effects of using narratives for a different context like UO.

For this thesis, the effects of narratives for UO in gamified IS will be investigated in the context of implementing UO for the system Scrumlr, an open-source web application for collaborative retrospectives in agile work environments (inovex GmbH et al., 2023). Scrumlr presents itself as an interesting use case as its' collaborative nature might lead to new users having a hard time to understand the value of the application on their own. By using narrative elements, the UO may be able to substitute the presence of real team members, helping users to understand the value of the tool without the need to invest the effort to recruit other people to conduct test sessions.

1.2. Objective

The overreaching goal of this work is to answer the main research question *"How does the use of narratives influence instrumental and experiential outcomes of user onboarding in gamified information systems?"*.

The work towards fulfilling the research goal will be guided by the findings from former research in the domains of UO, gamification, and narratives. Through investigating prior research papers and reports of industry practitioners, this thesis aims to create a thorough theoretical foundation for achieving the research goal. Based on this theoretical foundation, several hypotheses will be formulated regarding the expected influence of narratives on instrumental and experiential outcomes of UO. To further support achieving the main research goal of the work, it will be divided into three research objectives, as outlined below.

(1) First, this thesis aims to design and implement three versions of a UO experience for the use case Scrumlr. The first version of the UO is supposed to utilize narrative elements in order to provide users with a more enjoyable and engaging onboarding experience. To enable more accurate measuring of the influence of narrative elements on UO, the second version provides users with a more traditional, minimalistic, approach to UO. The base version of the target system Scrumlr, which does not provide users with a dedicated onboarding experience, is used as a third version and control group.

(2) Secondly, this work aims to design an experimental setting capable of measuring the influences of narratives on the instrumental and experiential outcomes of UO. The experiment will be designed as an online experiment and feature a combination of questionnaires and instructional tasks, aimed to generate data on the instrumental and experiential outcomes of the three versions of the UO.

(3) Lastly, this thesis aims to conduct a pilot study using the developed UO versions and the experimental setting to gain new insights regarding how the use of narrative elements can influence the instrumental and experiential outcomes of UO.

This work contributes to research and practice in several ways:

First, it contributes to research on narratives in gamified IS by providing novel data from the domain of UO. The findings may contribute to the development of a uniform theory on narratives as an integral gamification element and motivate further research on the topic.

Secondly, because this work considers prior research on the design and the influence of narratives in different domains (e.g., gaming, education, general gamification, and other entertainment media), it may contribute to an understanding regarding which of these findings may be applicable to the use of narrative elements for UO.

Thirdly, this thesis investigates a novel approach to UO and may equip researchers and industry practitioners with a new option for designing and developing information systems that provide users with meaningful experiences.

The findings of this work might help designers and developers of UO experiences predict, whether investing resources for the development of narratives will lead to increased value for the user and the other stakeholders.

1.3. Structure

Theoretical Foundations: This chapter aims to provide a strong foundation for the design and development of narrative based UO experiences for IS by exploring prior research in the domains of UO, gamification, and narratives, attempting to extract best-practices but also risks and problems in these domains (Chapter 2).

Hypotheses: In the third chapter of this work, hypotheses regarding the expected influence of narratives on instrumental and experiential outcomes of UO are formulated which are based on the findings from the second chapter (Chapter 3).

Methodology: The chapter 'Methodology' depicts the process for designing and conducting the pilot study for this work, consisting of the sections 'Research Context', 'Experiment Setup', and 'Data Collection'. In the section 'Research Context', the use case Scrumlr and its application context, agile retrospectives, are explored. The section 'Experiment Setup' explains the design and development process and decisions for the different versions of UO experiences that were developed for the pilot study, while the section 'Data Collection' explains the process of recruiting participants, preparing a survey, and conducting the pilot study (Chapter 4).

Results: This chapter depicts the results from analyzing the data which was collected during the pilot study and aims to use this data to validate the hypotheses from the third chapter (Chapter 5).

Discussion: The sixth chapter presents the principal findings of this work and how they contribute to answer the research question, the theoretical and practical implications of these findings, and it also acknowledges limitations of this thesis and topics for future research efforts (Chapter 6).

Conclusion: The last chapter concludes the thesis by provides a summary of the entire study, including a concise overview of the process that led from the theoretical foundations to conducting a pilot study, and the most important findings (Chapter 7).

2. Theoretical Foundations

2.1. User Onboarding

2.1.1. Definition

The term onboarding is originally a business term that describes the introduction of new employees to their workplace and learning the organizations' values and norms (Kim, 2021, p. 3; Renz et al., 2014, p. 1). With the rise of computers and IS, the term was adopted as User Onboarding (UO) by designers and developers of this new industry. Some designers, researchers and developers follow the definition of UO as a *process with the purpose of introducing new users to the product and equipping them with the knowledge necessary to interact completely with the product's feature set* (Chou, 2015, p. 98). Others focus on making the user realize the value of the product, defining UO as a *process that takes people from perceiving to experiencing and adopting the product's value to improve their lives* or *the process of guiding new users to find value with your software product or service (Balboni, 2022, p. 2; John & Bush, 2021, p. 12)*. No matter the focus of these definitions, most authors agree that UO primarily consists of a *sequence of steps that introduce users to a new product or system* (Cascaes Cardoso, 2017, p. 264).

2.1.2. The problem of user retention

To understand the problem that UO aims to solve, one must look at the concept of user retention. User retention is defined as the number of initial users who are still active in a given time frame (Lin et al., 2020, p. 569). It is obvious that having a high retention rate has a critical influence on any IS' success. The importance of a good UO experience for new users becomes clear when one looks at various studies from industry practitioners and researchers. For most software products, 40-60 % of users will only sign up once and never come back and it is even worse for mobile applications where around 73% of users abandon the application after one-time use (John & Bush, 2021, pp. xx, 36). Other studies yielded similar results with 25% of applications being opened just once and mobile applications loosing 77% of daily active users within the first three days (Froehlich et al., 2021, p. 79). This is even more problematic as it can cost up to five times more to acquire new customers than to retain them (Gallo, 2014, p. 1). With even a small amount of 5% increased retention rate can boost profit by anywhere from 25% to 95%. These numbers are similar to reports from other industry practitioners which report increases in revenue by 40% by increasing week one retention rates with better onboarding by 15%. The perspective of users aligns with these findings. When asked what users find most valuable about their favorite apps, 61% of users reported that they are easy to use and navigate and 24% reported that these apps feel more relevant to them than others (Google, 2016, p. 10). Applications that are hard to use and navigate and that fail to feel relevant or useful to users are most likely to be abandoned (p. 13). A good onboarding experience

can contribute to improve these factors by helping users realize the value and helping them learn to use and navigate the application.

2.1.3. Goals of User Onboarding

Two subgoals of UO can be identified that contribute to the main goal of minimizing the drop out of users (Froehlich et al., 2021, p. 78).

(1) One subgoal of UO is to minimize the Time-to-Value (TtV) for the users, thus helping them reach their first 'Aha-moment' (Balboni, 2022, p. 5; John & Bush, 2021, p. 44). In this context, the TtV is the amount of time it takes a new user to realize the value of a product while the 'Aha-moment' may be understood as the exact moment when the user perceives some value of the product. It is also important to note that there is not necessarily just one of these 'Aha-moments' during a users' onboarding journey but there can be multiple of these moments, each adding to the perceived value of the product (John & Bush, 2021, p. 5).

(2) The second of these subgoals is to increase the learnability of the IS. The learnability of an IS the *degree to which it is easy to learn by the class of users for whom it is intended* (Grossman et al., 2009, p. 650). This learnability can further be divided into three types, namely 'initial learning', 'extended learning' and 'subsequent learning'. (a) The term 'initial learning' refers to *allowing users to reach a reasonable level of usage proficiency within a short time*. (b) 'Extended learning' refers to *the ease at which new users can begin effective interaction and achieve maximal performance*. As such, it may also be described as the quality of use for users over time. (c) Lastly, 'subsequent learning' is about *the learning by a user who is a novice to that specific software system but experienced with a similar system*. Such users will not only have the required domain knowledge, but also a general understanding of what tools and functions will likely be available. When designing an onboarding experience, one is advised to cater to all three types of learning to increase the learnability of the IS.

Consequently, onboarding is not limited to the initial instructions on how to use the IS, instead it may include elements to give them advanced knowledge that are disclosed over time or re-engagement elements such as emails, notifications, or feature promotion for existing users (Cascaes Cardoso, 2017, pp. 264f.; John & Bush, 2021, p. 7). Therefore, UO can be divided into three phases (Renz et al., 2014, p. 2).

(1) Firstly, the main ***onboarding (or introduction) phase*** with the purpose of helping users become effective users of the system.

(2) The purpose of the second phase, ***help and support***, is to provide support and motivation to the user while using the platform.

(3) The last phase is the ***re-engagement*** phase with the purpose of reactivating users who have not been active within the IS for some time.

This work will focus on the potential of narrative elements for the first phase of UO for two reasons.

Firstly, the other two phases would require that participants of the pilot study use Scrumlr for an extended amount of time to report their experience with the help and support phase which would not be feasible in the timeframe of this work without reducing the quality of the literature review or of the development and design of the different onboarding experiences.
Secondly, the introduction phase of UO seems most suitable for integrating narrative elements. The use of narrative elements during the help and support or re-engagement phase of UO would likely to be severely limited if the users were not introduced to some of the narrative elements in the introduction phase. Therefore, it makes sense to first confirm the influence of narratives on the introduction phase of UO before trying to utilize them for the other phases.

2.1.4. Risks and Problems of User Onboarding

As not all designers, developers and researchers agree on how, when, and if one should use UO, I want to highlight some of the risks and considerations regarding the development of onboarding experiences that both researchers and industry practitioners have pointed out. Some industry practitioners even go as far as stating that one should skip onboarding whenever possible (Joyce, 2020, p. 2). These industry practitioners highlight the relatively high cost of developing onboarding experiences as a reason for disregarding UO and argue that, ideally, the User Interface (UI) should be intuitive enough for users to learn how to use the application. While not all of them are that critical with their view of UO, all of them agree that onboarding can be beneficial for certain types of IS. These include feature-rich applications that might overwhelm users, applications with novel or complex features, applications where users with different levels of domain knowledge can be expected, and applications that only reveal their true value after extended use (Carroll, 2014, pp. 1f.; Dhanoa et al., 2022, p. 502; Froehlich et al., 2021, p. 78; Joyce, 2020, p. 3; Stoiber et al., 2019, p. 1). There are also researchers and industry practitioners who regard UO as a key aspect of the User Experience (UX) (Balboni, 2022, p. 16; Cascaes Cardoso, 2017, p. 263; John & Bush, 2021, p. 54; Stoiber et al., 2019, p. 1; Strahm et al., 2018, p. 361). These researchers that advocate for the importance of UO argue that no matter how intuitive one thinks a product is, there always exists a learning curve and even the best UI may be unable to completely replace onboarding. For this thesis, the author aligns his view on UO with those who regard UO as an opportunity to educate users and helping them realize how the product can be used to benefit their lives and solve their problems (Froehlich et al., 2021, p. 78; Stoiber et al., 2019, p. 1). While there is no consensus on the true value of UO for every type of IS, one should keep these thoughts in mind when planning an onboarding experience for IS. Figure 1 displays five questions one should ask themselves when designing UO experiences (Dhanoa et al., 2022, p. 502; Stoiber et al., 2019, p. 1).

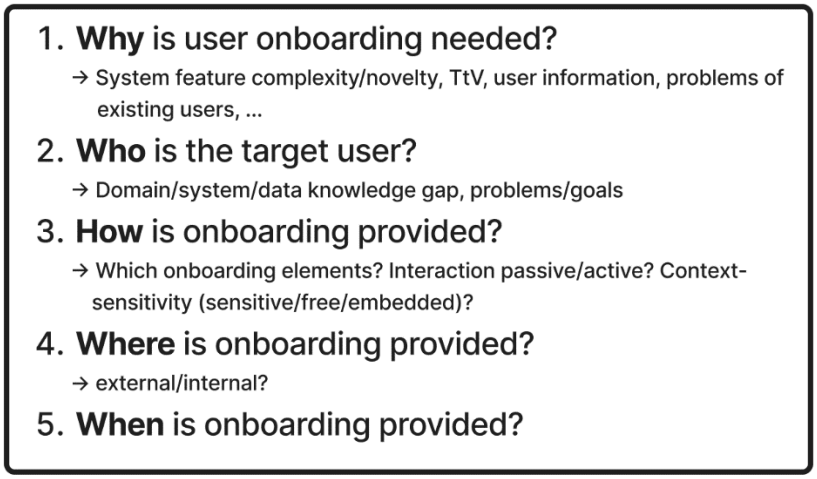


Figure 1: Five Questions for User Onboarding

Question two is of especially high importance for UO. When designing an onboarding experience, one should always keep in mind that the user's goals and problems should be at the center of the design process (John & Bush, 2021, pp. 12, 66ff.; Stoiber et al., 2019, p. 1; Strahm et al., 2018, p. 361). It should not be misunderstood as just a way to show off all the features of an IS but instead be regarded as the opportunity to educate users on how they can use the product to achieve their own goals or solve their problems, thus motivating them to become a long-term user or paying customer.

2.1.5. Elements/Components of User Onboarding

Both researchers and industry practitioners agree that there is not only one right way of building UO experiences (Cascaes Cardoso, 2017, p. 264). As such, there exist a plethora of different elements that have been used for UO. These include empty states, product tours, step-by-step wizards, video-based experiences, tooltips, walkthroughs, help-centers, mouseover-popups, overlays, dedicated learning environments, slideshows, and many more (Balboni, 2022, p. 16; Stoiber et al., 2019, p. 1).

2.1.6. Best Practices for User Onboarding

While all of these elements may have their own unique benefits, most research on UO agrees that one should opt for action-oriented elements and avoid passive educational techniques like introductory slideshows or videos because onboarding should not keep the user away from direct interaction with the IS (Froehlich et al., 2021, p. 86; Higgins, 2015, p. 2; Strahm et al., 2018, p. 363). While one should not force users to do a lot of reading, all information that the user needs to use the IS should be (optionally) provided during the onboarding, so that users do not have to leave the IS to look up additional information – possibly getting distracted in that process and not coming back (Balboni, 2022, p. 2). Another common trend in research and industry guidelines on UO is the principle of Minimalist Instruction (MI). MI proposes that one should rely on the user's initiative and sense making (Carroll, 2014, p. 4). Instead of telling them exactly what to do, one should emphasize their choice. This approach allows users to make errors they could make when using the actual application. To avoid frustration from this, it is

suggested to provide extensive error recognition and recovery, providing helpful error messages when a user encounters on. One should be brief with explanations and only highlight the minimum that the user needs to know to use the application to not create memory strain for the user and not having them loose focus (Froehlich et al., 2021, p. 86; Joyce, 2020, pp. 2, 13; Strahm et al., 2018, p. 363). This aligns with findings from one study that questioned users on their expectations regarding UO processes in (mobile) applications. Their expectations include onboarding processes being short, skippable, focused, integrated, lightweight, and they should allow the user to leave the onboarding at any time (Froehlich et al., 2021, p. 83; Higgins, 2015, p. 11).

2.1.7. Limitations of Minimalistic User Onboarding

While this minimalistic approach may work quite well for many applications limited complexity and required domain knowledge, it may not be suited for many of today's IS. Today's applications can include hundreds of features and may require some advanced knowledge to be used efficiently (Li et al., 2012, p. 103). In these cases, some users might feel lost due to the limited amount of guidance, and one might miss the opportunity to use onboarding to educate the user regarding domain knowledge and thus, close knowledge gaps between different users. However, the main reason for the use of the minimalistic approach was, that users do not enjoy lengthy onboarding processes with lengthy information. This conflict between providing users with sufficient guidance and keeping them engaged throughout the process reveals the need for a new approach for these scenarios. A solution to this challenge of providing sufficient guidance while keeping users engaged might lie in Gamification, which has been popular in recent years as a way to make tasks more engaging and to help steer employees and consumers toward targeted goals (Liu et al., 2017, pp. 1011f.; Schmidt-Kraepelin et al., 2019, pp. 3ff.).

2.2. Gamification

2.2.1. Definition

In research, the term gamification is often distinguished into two types (Hamari, 2019, p. 1). One type of gamification is called 'emergent gamification' where gamification is defined as *a gradual and emergent, albeit unintentional, cultural, and societal transformation stemming from the increased pervasive engagement with games and gameful interactions*. While this thesis acknowledges this cultural change and perceive it as a motivation to make use of game elements in a wider range of use cases such as UO, gamification in the context of this work will refer to the other type of gamification called 'intentional gamification'. Looking at it through the lens of intentional gamification, gamification can be defined as an *intentional process of transforming practically any activity or system into one which affords similar positive experiences, skills and practices as found in games in order of fostering cognitive or behavioral changes*. Therefore, at its' core, gamification is *the use of game design elements in non-game contexts*

or *the incorporation of game design elements into a target system while retaining the target system's instrumental functions* (Deterding et al., 2011, p. 10; Liu et al., 2017, p. 1013).

2.2.2. Gamification Contexts

In recent years, popularity of gamification skyrocketed and resulted in the creation thousands of peer-reviewed publications and gamified applications (Koivisto & Hamari, 2019, p. 192; Lowry et al., 2020, p. 609). While games are originally part of the entertainment industry, gamification has been celebrating success stories in a wide variety of different application contexts. Table 1 displays some of the application contexts mentioned in gamification research.

Table 1: Examples for Gamification Contexts

Gamification Context / Use Case	Research Paper Examples
Workplace, Enterprise Systems	Goethe, 2019a, p. 71; Liu et al., 2017, p. 1029; Schmidt-Kraepelin et al., 2019, p. 1
Industry	Lowry et al., 2020, p. 609; Reis et al., 2020, pp. 1,6
Education	Goethe, 2019a, p. 71; Lowry et al., 2020, p. 609; Schmidt-Kraepelin et al., 2019, p. 1; Thiebes et al., 2014, p. 2
Health	Auf et al., 2021, p. 1647; Farič et al., 2021, p. 2; Liu et al., 2017, p. 1029; Schmidt-Kraepelin et al., 2019, p. 1; Thiebes et al., 2014, p. 2
Finance	Goethe, 2019a, p. 71; Schmidt-Kraepelin et al., 2019, p. 1; Thiebes et al., 2014, p. 2
Entertainment	Liu et al., 2017, p. 1029; Thiebes et al., 2014, p. 2
Crowd Science / Collective Intelligence	Liu et al., 2017, p. 1029; Thiebes et al., 2014, p. 2
Government, Politics	Lowry et al., 2020, p. 609; Purwandari et al., 2019, p. 1

The wide variety of contexts where gamification can be applied may be explained by the cultural shift towards a higher appreciation of experiential values of IS, previously referred to as emergent gamification (Hamari, 2019, p. 1; Liu et al., 2017, p. 1014). Future employees and users of IS will have grown up in a world where video games are common and available to everyone, and as many users might have already experienced the interaction with gamified products and consequently expect similar enjoyable experiences from your products (Goethe, 2019b, p. 26; Schmidt-Kraepelin et al., 2019, p. 8). However, while there are many examples of successful gamification projects, it is not as simple as just taking random game design elements and applying them to your IS (Liu et al., 2017, p. 1020). One needs to be aware of the possible effects of gamification and the game design elements available to make the right choices and not waste time and money on gamifying an IS without reaching one's goals.

2.2.3. Effects of Gamification

While some critics regard gamification as a mere 'party trick' that is insufficient to truly motivate people, many studies have revealed positive effects of enhancing IS with game design elements (Lowry et al., 2020, p. 610; Thiebes et al., 2014, p. 2).

The main purpose of gamification is to make the use of IS more enjoyable and engaging without compromising instrumental outcomes of the target system (Liu et al., 2017, p. 1011; Thiebes et al., 2014, p. 2). Beyond increased enjoyment and engagement, research has mentioned many more positive effects regarding the use of gamification. Table 2 displays some of these effects.

Table 2: Positive Effects of Gamification

Effect	Research Paper Examples
Motivation	Deterding, 2015, p. 304; Goethe, 2019b, p. 26; Li et al., 2014, p. 3369; Schmidt-Kraepelin et al., 2019, p. 7; Thiebes et al., 2014, p. 2; Toda et al., 2019
Enjoyment	Deterding, 2015, p. 304; Li et al., 2012, p. 111; Schmidt-Kraepelin et al., 2019, p. 7; Thiebes et al., 2014, p. 2
Engagement	Goethe, 2019a, p. 79, 2019b, p. 26; Liu et al., 2017, p. 1011; Pian et al., 2020, pp. 367f.; Schmidt-Kraepelin et al., 2019, p. 7
Learnability	Goethe, 2019b, p. 27; Li et al., 2012, p. 111, 2014, p. 3369; Pian et al., 2020, pp. 367f.
Counteract Complexity	Schmidt-Kraepelin et al., 2019, p. 8; Thiebes et al., 2014, p. 2
Involvement	Schmidt-Kraepelin et al., 2019, p. 7; Thiebes et al., 2014, p. 2
Behavioral Impact	Goethe, 2019b, p. 26; Thiebes et al., 2014, p. 2
Cost Savings	Goethe, 2019b, p. 27; Li et al., 2014, p. 3371; Liu et al., 2017, p. 1011

When one believes in the findings of these research papers, gamification can provide positive effects for some of the core goals of UO processes such as increasing the learnability of a system or making users more motivated to use the product. With its potential to counteract complexity, using gamification in onboarding for systems where the minimalistic onboarding approach may be insufficient seems promising.

2.2.4. Instrumental and experiential task outcomes

To achieve these positive effects of gamification (Table 2), designers of gamified information systems make use of game design elements to create meaningful engagement which consists of both providing

enjoyable experiences (experiential outcomes) as well as fostering instrumental task outcomes simultaneously (Liu et al., 2017, pp. 1025, 1029). This means that gamified systems must have specific experiential and instrumental goals, and the way to achieve these is by the selection of game design elements (p. 1013). Experiential outcomes are primarily related to the users' engagement, enjoyment, curiosity, and satisfaction (Liu et al., 2017, p. 1014; J. Zhang et al., 2023, p. 5). Experiential outcomes are more commonly linked to the experience of playing the game, or in the case of gamified IS, the experience of interacting with the game-enhanced interface and functionality of the IS. Instrumental outcomes on the other hand reflect the users' task efforts toward or performance in completing the instrumental tasks behind the gamified application (e.g. learning outcomes, job performance, and training effectiveness) (J. Zhang et al., 2023, p. 5). Traditionally, IS were considered to be either hedonic (i.e., pleasure-oriented systems that primarily provide self-fulfilled values to users) or utilitarian (i.e., productivity-oriented systems that provide instrumental value to users) (Schmidt-Kraepelin et al., 2022, p. 3). While many studies only focus on the experiential outcomes of gamification, research suggests that gamified systems can have impact on both experiential and instrumental outcomes and therefore provide both hedonic and utilitarian value simultaneously. Whatever the choice of experiential outcomes, the key is to identify them along with the intended instrumental outcomes and design accordingly (Liu et al., 2017, p. 1014).

2.2.5. Taxonomies and Gamification Design Elements

To foster the experiential and instrumental outcomes of gamified IS, one needs to be aware of the different gamification elements that can be used to target specific outcomes. While some researchers describe gamification elements by example, others have introduced different taxonomies of gamification design elements, often resulting in confusion about how to categorize the different elements and the meaning of these categories (Liu et al., 2017, p. 1013). One of the oldest and most popular taxonomies is the MDA framework (standing for Mechanics, Dynamics, and Aesthetics) (Hunicke et al., 2004, pp. 1-2). In this framework, mechanics describe *the particular components of the game, at the level of data representation and algorithms*. Dynamics describe *the run-time behavior of the mechanics acting on player inputs and each others' outputs over time*. Lastly, aesthetics describes *the desirable emotional responses evoked in the player when she interacts with the game system*. While the MDA framework explores some interesting concepts, such as the focus on the desirable emotional responses of the user, it is not as easy to identify gamification design elements following this approach compared to other frameworks. It is also problematic that other taxonomies also make use of the terms mechanics and dynamics while providing different definitions, further creating confusion when reading papers that classify elements with these terms. Other taxonomies using the same terms include Borges et al.'s (2014) mechanics, aesthetics, and game thinking', Deterding et al's (2011) 'interface design patterns, mechanics, design principles, conceptual models, and design methods' or Werbach and Hunter's (2012) 'dynamics, mechanics, and components' (Goethe, 2019a, p. 73; Liu et al., 2017, p. 1013). Werbach and Hunter's taxonomy (2012, pp. 78-82) classifies gamification design elements as game dynamics, which

reflect the big picture that shows the structure of a game (e.g., emotions, narrative, progression, …), game mechanics which are *the elements that trigger an action in a game* (e.g., challenges, competition, rewards, win states, …), and game components that are the *specific instantiations of the game dynamics and mechanics* (e.g., avatars, badges, points, leaderboards, …) (Goethe, 2019a, p. 73). This thesis will follow the definitions of Werbach and Hunter (2012) when using the terms game dynamics, game mechanics, and game components. The inconsistency of these different taxonomies may be one reason of why certain important game design elements are not featured as prominently in research as others.

Some of the most commonly featured game design elements featured in gamification research are, for example, point systems, leaderboards, levels, and challenges, and especially the triad of points, badges, and leaderboards (PBL) were at the center of gamification research for the longest time (Mazarakis & Bräuer, 2023, p. 614; Thiebes et al., 2014, p. 3; Werbach & Hunter, 2012, pp. 71ff.). Table 3 displays ten of the most mentioned game design elements in research.

Table 3: Ten Common Game Design Elements

Game Design Element	Research Paper Examples
Goals	Mazarakis & Bräuer, 2023, p. 614; Thiebes et al., 2014, p. 12; Toda et al., 2019, p. 87
Achievement	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 12; Toda et al., 2019
Point	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 12; Toda et al., 2019, p. 87
Feedback	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 12
Badges	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 12
Leaderboards	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 13
Levels	Thiebes et al., 2014, p. 13; Toda et al., 2019, p. 87
Social facilitation (-> Competition/Collaboration)	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 13; Toda et al., 2019, p. 87
Progressive disclosure	Li et al., 2012, p. 105; Thiebes et al., 2014, p. 12
Virtual character (Avatar)	Goethe, 2019a, p. 73; Thiebes et al., 2014, p. 13

If one chooses the wrong gamification elements for the application context and the desired outcomes, they may seem artificial and out of place for the real-world tasks of the IS, thus losing their stimulation power (Liu et al., 2017, p. 1020). When thinking about the importance of choosing the right game design elements for the target system, it is surprising that research has mainly focused on specific game components while often overlooking the game dynamics such as emotions or the narrative of games that give structure to games and consequently, give reason and meaning to these game components.

2.2.6. Difficulty and Risks of good Gamification Design

Even with knowledge of the different gamification elements and the effects one can aim for, it can be very difficult to find the right gamification approach for a given context and IS (Goethe, 2019a, p. 75). One challenge is, that the source of innovation (games) is complex, multifaceted, and difficult to transfer to other environments. Furthermore, gamification involves understanding a host of (motivational) psychology and a deep domain knowledge of the target system. As the goal of gamification is commonly not just making the system use more fun but also to affect behavior, it adds yet another layer into the scope of gamification design (pp. 75f.).

One cannot expect that by adding some gamification design elements, such as PBL, into a boring application, the once-boring product will become exciting instantly (Goethe, 2019b, p. 28). A designer of gamified IS must always keep in mind the domain of the target system and make decisions accordingly. For instance, introducing competition into an IS by adding leaderboards and similar game design elements can work very well in some environments, but can be inappropriate in other contexts that rely on cooperation or privacy considerations (Liu et al., 2017, p. 1023). In serious environments with users that do not appreciate playful design, adding the wrong game design elements may actually decrease user acceptance of the IS. It is also important that gamification does not distract users from the instrumental tasks of the target system by creating a disproportional emphasis on the enjoyable gamified processes and, consequently, reducing the task quality (Liu et al., 2017, p. 1020; Thiebes et al., 2014, p. 10).

There are also ethical considerations regarding gamification. With its' potential to affect behavior, one may be tempted to make use of this to trick the user into performing actions that do not benefit the user but produce a profit for the IS owner. However, once the user feels used, patronized or tricked, it might be just a matter of time for the first negative reviews to appear and for users to abandon the IS (Goethe, 2019b, p. 33). Thus, deceptive interactions, designed to mislead or trick users to make them do something they do not want to do are dark patterns that should be avoided when designing gamified IS (Goethe, 2019c, pp. 89f.).

2.2.7. Rules and Best Practices of Gamification

To mitigate the risk of designing ineffective or inefficient gamification many researchers have attempted to uncover and define principles of good gamification design. Liu et al. (2017) defined one of the most prominent sets of gamification principles, displayed in Figure 2.

General Principle:
Game design elements incorporated in a target system must match the intended purpose of the system (p. 1018).

Principle A:
To be effective, gamification design elements must be congruent with the target task (p. 1019).
Principle B:
Gamification design elements must match users' characteristics (p. 1020).
Principle C:
Gamification design elements must fit with the target system technologies (p. 1021).
Principle D:
Gamification design elements must match desired user-system interactions (p. 1022).
Principle E:
Gamification design elements must match the expected recurrence of system use (p. 1024).
Principle F:
To create meaningful engagement in gamified systems, enhanced experiential outcomes should be associated with higher levels of instrumental outcomes (p. 1025).

Figure 2: Gamification Principles by Liu et al., 2017

The gamification principles in Figure 2 put great emphasis on the requirement of a fit between the chosen game design elements and the target system. This need of congruence between game element and target system further makes it clear, that there is no one-stop solution for gamification design but just principles one can follow while creating a unique design for the specific target system. Thus, it is further advised to gain a profound understanding of the target user group and the characteristics of the system and one of the most important questions gamification designers can hast themselves is '*How do I want people to feel?*' (Goethe, 2019a, p. 76, 2019b, p. 30).

Additionally, one should keep in mind the importance of visual aesthetics in games and make use of game theory regarding the visual design of games, such as theories on the best use of color, tone, and mood (Goethe, 2019c, pp. 86-88). After all, even a game that may be 'just okay' from a gameplay perspective can be elevated by strong aesthetics.

2.3. Gamification in User Onboarding

2.3.1. Instrumental and Experiential Task Outcomes of User Onboarding

As stated in the last subsection, gamified systems must be designed with specific experiential and instrumental goals in mind. Therefore, one needs to understand what truly understand what the target, in

the case UO for IS, tries to achieve. As stated in section 2.1, the main goal of UO is to minimize the drop out of users or in other words, to increase the user retention rate while two subgoals consist of minimizing the TtV and increasing the learnability of the IS. The instrumental task outcomes of UO are focused on achieving specific goals or tasks related to the product or service. Therefore, the instrumental task outcome of UO can be defined by the *user competence* related to the target system and the '*Intention to Use'* the target system. This includes the *learning outcomes* regarding required domain knowledge and the *users' proficiency* in completing essential tasks or actions. The experiential task outcomes of UO on the other hand focus on the user's subjective experience and emotional responses during and after completion of the onboarding process. As these outcomes are related to the general quality of the *UX,* there are many specific parts of UX that one could consider. As UO is essentially about motivating users to keep using the target system by helping them learn the value und functionality of the system, this thesis will focus on only a limited number of aspects of UX, namely '*Perceived Ease of Learning'*, '*Perceived Ease of Use*', '*Perceived Usefulness*', '*System Use Enjoyment*'. The author of this work believes these experiential task outcomes to be able to be suitable to help determine the effectiveness of a UO experience. When considering these instrumental and experiential task outcomes of UO in gamified IS, especially the '*Intention to Use*' regarding the target system will ultimately determine whether the UO was a success. Figure 3 displays these task outcomes of UO.

Instrumental Task Outcomes	Experiential Task Outcomes
• **User Competence** **a.** Learning Outcomes **b.** Task Proficiency • **Intention to Use**	• Perceived Ease of Learning • Perceived Ease of Use • Perceived Usefulness • System Use Enjoyment

Figure 3: Instrumental and Experiential Task Outcomes of User Onboarding

2.3.2. Onboarding in Games

Just as the term UO was derived from the onboarding of new employees in workplaces and organizations, UO is not limited to the context of traditional IS, but it is also a common part of many games. The goals of UO in games are largely the same as in IS in general and consequently, the definitions introduced in section 2.1 also apply to research on onboarding in games (Chou, 2015, p. 98; Petersen et al., 2017, pp. 379f.).

After all, similar to traditional IS, upon first entering a game, there is one very challenging obstacle players have to overcome which will decide their entire perception of the game: learning how to play (Endresen & Nathan-Roberts, 2018, p. 1135). As players are exposed to an enormous amount of foreign information, it can be extraordinarily difficult to create effective strategies to mitigate player confusion and increase learning due to the differences between each video games contextual information and mechanics (pp. 1135, 1138). Especially with the rise of free-to-play (F2P) games, it is easier than ever for

players to drop games that do not hook them immediately upon starting the game (Hodent, 2017, pp. 164, 180; Petersen et al., 2017, p. 377). This high user abandonment makes a user's first session with a product an even more critical determinant of the user's lifetime with the product and therefore it is of great importance that the product team treats that phase of the user's experience with special care (Seufert, 2014, p. 98).

While not all games succeed in their onboarding and the right onboarding design is highly dependent on the type of game, prior research has proposed three onboarding success factors in games. Namely, these success factors are creating a ***sense of competence***, a ***sense of purpose***, and a ***sense of immersion*** for the player (X. Zhang & Yibin, 2021, pp. 14f.).

(1) It is important to facilitate a ***sense of competence*** in the players during the onboarding process so that they are not left confused about the gameplay and controls as they will likely not find that situation enjoyable and abandon the game (Hodent, 2017, pp. 141, 164). As such games should, especially in the onboarding phase of the game, support player skill development and mastery (Sweetser & Wyeth, 2005, p. 5). Games should include all the information that the player may need, so that players do not need to stop playing to get help (pp. 5, 8f.).

(2) Facilitating a ***sense of purpose*** in the player might be the most important part of the game design and therefore should be addressed during the onboarding phase (Hodent, 2017, pp. 71f., 168). Even if the players know *what* they can do and *how* to perform these activities, if they do not understand *why* it is important or of value for them, it is likely that they will lack the (intrinsic) motivation to play the game.

(3) Lastly, games and especially the onboarding phase should create a ***sense of immersion***. Players should experience deep but effortless involvement in the game (Sweetser & Wyeth, 2005, pp. 5f.). To allow for that during the onboarding, the learning should not be presented as boring information but as part of the fun. It is important not to break that immersion for the player as they might have a hard time regaining the state of immersion and stop playing. Consequently, one should be careful with the content and timing of interrupted tutorials and try to integrate tutorials with contexts into the natural game flow where possible (X. Zhang & Yibin, 2021, pp. 59 ff.). Also, while not over-weakening the visual impact of UI elements and guidance, one should choose overlay elements or natural visual highlights over interruptive elements like popups or modals.

It Is also Important to look at psychology to understand how to motivate players to keep playing the game. Motivation is commonly divided into ***extrinsic and intrinsic motivation***. Intrinsic motivation is defined as *the doing of an activity for its inherent satisfactions (e.g., fun, challenge, …) rather than some separable consequence* (R. M. Ryan & Deci, 2000, p. 56). Extrinsic motivation on the other hand is a construct that pertains whenever an activity is done in order to attain some separable outcome (e.g., pressures, rewards, …) (p. 60). As games are typically played for entertainment purposes and therefore subject to intrinsic motivation, it is important to design games and their onboarding phase in a way that fosters intrinsic motivation (Hodent, 2017, p. 65). Self-determination theory (SDT) is the dominant

framework for research on intrinsic motivation (p. 66). SDT proposes three innate psychological needs that are the basis of intrinsic motivation: ***competence***, ***autonomy***, and ***relatedness*** (R. M. Ryan & Deci, 2000, pp. 57,65).

(1) To satisfy the ***need for competence***, one should make the player feel skillful, in control, and feel a sense of progression and mastery (Hodent, 2017, p. 138). Good onboarding will equip the player with all necessary skills and knowledge to succeed in exploring the main part of the game on his own. However, that does not mean that onboarding must end after the tutorial, onboarding can be a continuous process that also happens in later parts of the game when the player learns new skills or options (p. 88).

(2) The ***need for autonomy*** concerns the sense of meaningful choice, self-expression, and free will, agency, and volition (p. 66). While this need can be addressed during the game by, for example, providing multiple questlines and endings, satisfying this need can start during the onboarding phase. For instance, players may be able to configure their character background-story and look or the onboarding can be made optional for players that enjoy exploring on their own.

(3) The ***need for relatedness*** refers primarily to the need to feel affiliated with others and to experience social interactions (Hodent, 2017, p. 66). While not every game may be able to provide social interactions with real people, they might be able to use characters and roleplay as sources for relatedness (Grasse et al., 2022, p. 3).

Good onboarding in games will create intrinsic motivation for players through satisfying all or some of these needs and thus, increase player retention rates. While player onboarding in games is not completely the same as UO in IS, where users are not always primarily intrinsically motivated, one should keep these success factors for onboarding in games in mind when trying to gamify the onboarding process for IS.

2.3.3. Examples of gamified User Onboarding in IS

As displayed in Table 1, there are many examples of gamification in a variety of different application contexts. However, limited scholarly investigations in the domain of gamification have been directed towards the UO of such IS, which is surprising because many IS struggle with user retention rates due to not being able to provide engaging onboarding experiences that convey the true value of the IS (Section 2.1.2). Gamification seems like an obvious approach to make the onboarding experience of these IS more enjoyable and thus, create the necessary motivation for users to overcome the difficult task of learning how (and why) to use IS.

Even though it was not at the center of gamification research in the past, there are some examples for gamified UO in IS. For some complex IS, such as Microsoft Office or AutoCAD, gamified UO experiences were created, namely ‘Microsoft Ribbon Hero’, ‘GamiCAD’ or ‘CADament’ (Li et al., 2012, p. 104, 2014, p. 3370). In both GamiCAD and CADament, users of the gamified systems produced significantly faster test task completion times and reported a more enjoyable experience compared to a control group using a non-gamified system (Li et al., 2012, pp. 103, 111, 2014, p. 3369). Both gamified UO

systems chose very different gamification strategies. GamiCAD provided users with the Apollo program as a backstory where users were responsible for helping NASA build components of a spacecraft, thus primarily making use of game design elements (Table 3) such as missions with clear goals, levels, rewards, and the commonly overlooked game design element narrative (Li et al., 2012, pp. 106f.). CADament on the other hand primarily made use of the game design elements challenge, competition, and leaderboards by creating a multiplayer onboarding experience where users can compete against each other in accomplishing different tasks, either in a split-screen or a replay mode (Li et al., 2014, pp. 3372f.). The researchers reported their reason for creating CADament to be the time and cost consuming process of creating authored tutorials for software applications, hoping to reduce time and cost by using multiplayer components instead (p. 3371). While their results are promising for the specific software application AutoCAD, one must keep in mind that the best game design elements for a specific gamification project are Is highly dependent on the specific target system. Not every system will benefit from elements of competition. Thus, a game dynamic (Section 2.2.5) such as the narrative, which is present in most games and highly adjustable to the context of the target system, might be a more broadly applicable game design element for UO. Considering the mentioned high cost in time and financial resources of creating such solutions, more research seems to be required to investigate if such narrative-based solutions are worth the cost.

2.4. Narratives

Narratives do not just exist in many forms of entertainment, media, and even life itself as narrating is a condition intrinsic to human behavior (Cobos & Salvador, 2022, p. 1). Research also states that narrative is central to human cognition (Mott & Lester, 2006, p. 675). With narratives being such an integral part of people's life, and being of high importance to many games as a game dynamic (Section 2.2.5), it is surprising that narratives were commonly disregarded in gamification research and development (Langer et al., 2014, p. 1).

2.4.1. Definition

One of the difficulties of doing research on narratives is that research often disagrees on what narratives actually are and confuses them with related concepts or components of narratives such as storytelling (Palomino et al., 2019, p. 97; Schmidt-Kraepelin et al., 2022, p. 1). From a classical viewpoint*, narrative presupposes a narrator (or narrative instance) telling a story – a fixed sequence of past events – to a narratee* (Dubbelman, 2016, p. 40). Further, narrative is perceived as the semantic structure within a media text that represents – encodes – this particular sequence of events. Others highlight that narrative is experienced differently by different narratees. They see narrative as a mental image – a cognitive construct – built by the interpreter as a response to the text (M.-L. Ryan, 2004, p. 9). But it does not take a representation proposed as narrative to trigger the cognitive construct that constitutes narrativity: we may form narrative scripts in our mind as a response to life itself.

In game research, narrative is commonly distinguished into two types – *embedded narrative* and *emergent narrative* (Goethe, 2019a, p. 77; Palomino et al., 2019, p. 98). The classical view of narratives focusses on the category of *embedded narratives* which concerns pre-generated narrative content that exists prior to a player's interaction with the medium (Salen & Zimmerman, 2003, ch. 26, p. 7). Designed to provide motivation for the events and actions of the game, players experience embedded narrative as a story context. *Emergent narrative* on the other hand highlights the narrative that arises from the player's interaction with the game, often in unexpected ways. The definition of Ryan (2004, p. 9) largely aligns with this type of narrative. Palomino et. al. (2019, p. 99) provides a definition that takes into account both of these types of narratives. They define narrative as *the process in which the user builds his own Ie through a given content, exercising their freedom of choice In a given space and period of time, bounded by the system's logic*. This thesis will follow the definition of Palomino when referring to the term narrative. To gain a deeper understanding of what narratives are, one must be aware of the different components and elements that narratives are made of.

2.4.2. Components of Narratives

Narratives are commonly divided into two main components, namely the ***narrative content*** (i.e. what is told) and ***narrative discourse*** (i.e. how it is told) (Schmidt-Kraepelin et al., 2023, p. 3).

Narrative content refers to the totality of characters, actions, and events taken by themselves and the backbone and structure of the story describing who did what, where, when, and why.

The ***narrative discourse*** on the other hand refers to how the story is told as it manifests in a written text, audio-visual medium or any other type of narrative object. The chosen narrative discourse can influence many aspects of the narrative content, such as the order in which the content and events or the feeling that is invoked by the presentation of the content. All content could be presented in a linear sequence of events, or one could emphasize the choice of the user, allowing one to choose between different paths of narrative events.

While narratives can be very different from each other, and one has nearly endless possibilities when designing a narrative, there are certain narrative elements and structures that are present in most narratives. Many stories of narratives follow the so called 'Soap Hero's Journey' (SHJ) which consists of a minimum of four phases (Marczewski, 2018, pp. 21f.):

(1) The calling is the event that triggers the characters to start the journey.

(2) The challenge consists of the conflicts, difficulties, and tasks that the characters must overcome.

(3) The transformation can be understood as the change that happens to the characters as they learn to overcome the obstacles in their way.

(4) The resolution explains how all the characters finally overcome or rationalize the challenges by using all their new knowledge gained through their transformation.

While not all narratives are based on these four phases, for instance some narratives contain a story with a bad ending and no resolution, following these phases makes it easier to craft a simple story that has

the potential to resonate with the audience (p. 22). One can also add additional phases such as a twist before the resolution that increases the tension of the story in the later parts and forces the characters to have a final moment of unexpectedly overcoming a hopeless situation.

A designer of narratives is also not limited to creating just one big narrative that stretches over the whole user journey. Instead, one can make use of so-called **narrative atoms**, which are *small units of narrative that can, within the context of the overall narrative, stand alone* (Atmaja & Mandyartha, 2020, p. 127; Marczewski, 2018, p. 5). Each of these atoms should have a start, a middle, and an end (Marczewski, 2018, p. 7). Using narrative atoms, one can create deeper narrative experiences that do not have to follow given path but give the people an opportunity to discover the whole picture in their own unique way (p. 13). Consequently, narrative atoms enable building complex choice architectures and include optional content that people can choose to experience if it fits their taste (pp. 14, 20).

Apart from big story and choice structures, there are many more elements which designers of narratives should consider when trying to create a compelling narrative. It is important to consider elements like the *genre* (type of the story), *theme* (central topic/subject/concept) and *atmosphere* (main tone/style/colors of the design) of the narrative and its' story early on as these decisions will shape many other components such as the *characters*, the *imagery*, and the *plot* (Pivac & Granić, 2017, p. 1541).

Depending on the narrative discourse, especially the medium through which the narrative is delivered (e.g., book, audio-book, game, IS, …), many of the components of the narrative can be presented in different ways (Armstrong & Landers, 2017, p. 516; M.-L. Ryan, 2006, p. 149).

When trying to make use of narratives for UO in gamified IS it is therefore important to take a closer look at how narratives can work in games and gamified IS.

2.4.3. Narratives in Games

As a game dynamic, the chosen narrative contributes to determining the big picture of the game (or gamified system) that influences the viable game mechanics and components (Werbach & Hunter, 2012, p. 78). Conversely, the used game mechanics and game components also influence the narrative, making them some of the most powerful narrative devices game designers have at their disposal (Dubbelman, 2016, p. 39). Through mechanics and components such as the move-set, the game environment, item management, resource management, and attack options, the constructed narrative in the mind of the player can change (p. 42).

Narratives in video games have long been used to give meaning to raw game mechanics and components, heavily contributing to holding the player's attention and keeping them playing late into the night to better understand the game world and to find out what will happen next (Langer et al., 2014, p. 1).

Through providing meaning and engagement before the player has mastered the game controls, narratives also help in retaining players during the early stages of the game (Hodent, 2017, pp. 72, 168). Narratives may be able to substitute the initially lacking sense of mastery by fostering a sense of purpose and immersion while the player learns the game along the way. Without providing a trail of 'narrative

breadcrumbs', the player is left to explore on his or her own without a compelling incentive to do so (Bateman, 2021, pp. 95, 98). Very few games can afford this lack of direction as it is likely to lead to frustration for many players.

2.5. Narratives in Gamification

Even in the early phases of gamification research it was stated that fantasy is probably the most important feature of computer games that can be usefully included in other user interfaces (Malone, 1982, p. 67). While narratives, which may be the most potent expression of fantasy, were not really explored in gamification research for the longest time, the idea of making use of narratives for IS has been on the rise in recent years (Langer et al., 2014, p. 1; Liu et al., 2017, p. 1023; Schmidt-Kraepelin et al., 2022, pp. 1-2).

While often ignored in gamification research, narratives have demonstrated immense persuasive potential and the ability to foster entertainment and engagement in disciplines like marketing, politics, education, and healthcare (Schmidt-Kraepelin et al., 2023, p. 1).

Unsurprisingly, narratives have been primarily featured in IS which are in need of higher user engagement or that aim to persuade the user to perform certain tasks, such as educational IS or IS that promote physical activity (Farič et al., 2021, p. 2; Palomino et al., 2019, p. 99; Schmidt-Kraepelin et al., 2023, p. 1). Specific examples of educational IS that use narratives include Microsoft Ribbon Hero for MS Office, GamiCAD for the application AutoCAD and other e-learning systems for project management applications, computer network concepts, or programming concepts (Darejeh et al., 2021, pp. 2452, 2455).

2.5.1. Positive Effects of Narratives in Gamification

Existing research on narratives as a gamification element has uncovered many positive effects that can be produced by incorporating well designed narratives into a target system. While not all research agrees on the positive effects of narratives (Section 2.5.2), most seem to agree that using narratives can benefit the target system if done with great care. Table 4 highlights some of the positive effects that narratives can have on a target system.

Table 4: Positive Effects of Narratives in Gamification

Effect	Research Paper Examples
Sense of Purpose; Meaning	Marczewski, 2018, p. 4; Mazarakis & Bräuer, 2023, p. 615; Palomino et al., 2019, p. 97
Immersion	Hull et al., 2023, p. 4; Murnane et al., 2020, p. 2
Motivation	Darejeh et al., 2021, p. 2452; Langer et al., 2014, p. 7; Marczewski, 2018; Mazarakis & Bräuer, 2023, p.

	622; Mott & Lester, 2006, p. 675; Palomino et al., 2019, p. 97
Enjoyment; Entertainment	Armstrong & Landers, 2017, p. 529; Hull et al., 2023, pp. 4, 8; Langer et al., 2014, p. 7; Schmidt-Kraepelin et al., 2023, p. 1
Engagement	Atmaja & Mandyartha, 2020, pp. 126, 130; Darejeh et al., 2021, pp. 2452, 2466; Hargood et al., 2008, p. 41; Hull et al., 2023, p. 3; Langer et al., 2014, p. 7; Mott & Lester, 2006, p. 675; Palomino et al., 2019, p. 97; Schmidt-Kraepelin et al., 2023, p. 1
Persuasion; Behavior Change	Kloppenberg & Dean, 1999, pp. 354, 358; Liu et al., 2017, p. 1023; Mazarakis & Bräuer, 2023, p. 615; Murnane et al., 2020, p. 2; Pivac & Granić, 2017, p. 1; Schmidt-Kraepelin et al., 2023, p. 1
Contextualizing	Atmaja & Mandyartha, 2020, p. 126
Reduce Complexity; Decrease Cognitive Load	Darejeh et al., 2021, pp. 2451, 2466ff.
Memorability; Learnability	Darejeh et al., 2021, p. 2468; Hull et al., 2023, p. 8; Mazarakis & Bräuer, 2023, p. 615; Virvou et al., 2005, p. 2

While Table 4 shows the immense potential of narratives as a gamification element, one must be aware of the following risks and problems they can cause when they are not used correctly.

2.5.2. Risks and Problems of Narratives in Gamification

While narratives can have a positive influence on gamified IS (Table 4), incorporating narratives the wrong way or at the wrong place and time can have the opposite effect. For instance, the distraction hypothesis proposes that narratives might require cognitive resources utilized for learning, thus not improving or even decreasing the learning outcomes (Armstrong & Landers, 2017, p. 530; Liu et al., 2017, p. 1020). Furthermore, users may find the gamified system too intrusive, even if they liked the gamified elements (e.g., narrative) at first (Liu et al., 2017, p. 1020). It is also not certain that the narrative will motivate and engage users as they might find the narrative to be irrelevant and boring (Hull et al., 2023, p. 4). Even if the narrative itself is fun for many users, other factors like preferences in genre or cultural differences may cause problems regarding the understanding and enjoyment of the narrative by some users (Atmaja & Mandyartha, 2020, p. 131; Dubbelman, 2016, p. 42).

This uncertainty regarding the effectiveness of a narrative is an especially big problem because the design and implementation of narratives can be overly complex and require a lot of effort which could consequently lead to a high waste in time and resources if the narrative fails to improve the instrumental and experiential outcomes of the target system (Mazarakis & Bräuer, 2023, pp. 614, 624).

The many problems that one must consider when designing narratives for gamified IS, and consequentially for UO, highlight the importance of finding guidelines one can follow to increase the chances of creating a narrative that improves the target system.

2.5.3. Guidelines for Narratives in Gamification

Schmidt-Kraepelin et al. (2022) have constructed six claims about narratives in gamified IS that can provide a starting point for finding guidelines or best-practices regarding the use of narratives in gamified IS:

(1) Narratives can convey both hedonic as well as utilitarian value (Schmidt-Kraepelin et al., 2022, p. 5). The hedonic value refers to the intrinsic self-fulfilling value that the consumer gains through their experience with a product while the utilitarian value refers less to the emotionally arousing parts of the product but the objective functional purpose that the consumer can achieve by using the product (p.3). As narratives can help IS provide both types of value, *they should be actively constructed to foster both values and avoid just increasing one of these values at the expense of the other*. For instance in training, narratives should be designed to both manipulate emotions and convey teaching points (Hull et al., 2023, p. 13). It would be of little use if the IS is more enjoyable, but no learning occurs for the users.

(2) Narratives are mind dependent (Schmidt-Kraepelin et al., 2022, p. 5). As stated in the definition in section 2.4.1, narratives are built by the user in his mind through his own experience with the given narrative components. Therefore, it is of high importance to *know the target users of the IS and what kind of narrative they can understand or what their preferences are* (Kloppenberg & Dean, 1999, p. 355). After all, one of the identified risks in section 2.5.2 was that users may not understand or enjoy a narrative due to their cultural background or preferences in genre. It can also be beneficial to allow users to influence the narrative through their choices as such interaction may have a higher impact in the mind of the user (Abubakar et al., 2016, p. 113; Marczewski, 2018, p. 20). However, even narrative artifacts that are noninteractive have been confirmed as being able to improve instrumental outcomes (Hull et al., 2023, p. 23).

(3) Narratives have a hierarchical structure (Schmidt-Kraepelin et al., 2022, p. 6). Especially when one makes use of narrative atoms (Section 2.4.2), the narratives will be connected to other related narratives in a hierarchical order. Such connections between narratives also exist when one adapts or takes inspiration from entertainment products (e.g., superhero franchises) or current pop culture to make it easier for the user to accept the narrative as the user is already familiar with some of the concepts and characters (Atmaja & Mandyartha, 2020, p. 131). When encountering familiar narratives, *it may be easier for users to learn new concepts if they can integrate them into their existing ways of thinking* (Darejeh et al., 2021, p. 2468; M.-L. Ryan, 2006, p. 149). This hierarchy of narratives may even extend up to so called ‘master narratives’ on the highest level of abstraction, such as the battle between good and evil, the search for enlightenment, or religious motives (Schmidt-Kraepelin et al., 2022, p. 6). When designing a narrative for a gamified IS, one should be aware of this hierarchy, and it might be beneficial

to *start the design of the narrative by choosing a master narrative that fits the target system* and then continue to add additional levels of abstraction from there.

(4) Narration is selective (Schmidt-Kraepelin et al., 2022, p. 6). Narratives being selective means, that a narrative object, or medium (e.g., a text, audiobook, game elements, …), is only ever able to represent a part of the corresponding narrative. Thus, one must *appraise which narrative objects are available in the target system and whether a chosen narrative object successfully conveys all the constitutive elements of the represented narrative* (p. 6). After all, how you say something is just as important as what you are saying and making use of the full range of available objects to convey the narrative may help different types of users understand and enjoy the narrative (Pivac & Granić, 2017, p. 1541). When one is not limited to just a textual representation of the narrative, which is most likely the case in the context of gamification, it is important to *consider how aesthetics (e.g., images, perspectives, music, sound effects, voice, color, shapes, ...) can be used to contribute to representing the narrative* and foster the experiential and Instrumental outcomes of the target system (Abubakar et al., 2016, pp. 111f.).

(5) Narratives require plausibility (Schmidt-Kraepelin et al., 2022, p. 6). To be captured and memorized, narratives need to be plausible. *There has to be an integrity and coherence in the narrative structure, both internally and externally* (Murnane et al., 2020, p. 10). Even in fantasy worlds, there need to be rules and those rules need to be stuck to (Marczewski, 2018, p. 24). If one disregards the plausibility of the narrative just because it is not the center but an addition to the target system, the narrative may lead to confusion and irritate users instead of helping them. One of the simplest ways to create a plausible narrative could be to design the narrative in the shape of a 'worked example'. Worked examples are defined as sample problem statements that include solutions to the problem and the steps taken to solve the problem and reach a resolution (Darejeh et al., 2021, p. 2454).

(6) Narratives can lead to persuasive effects (Schmidt-Kraepelin et al., 2022, p. 7). Narratives were proven to have the ability to persuade users and incite behavioral change in many cases (Table 4). However, it is important to understand that many other factors and the interplay of different narratives can influence the persuasive potential (p. 7). As with all gamification, one must keep in mind the ethical implications of their design (Goethe, 2019b, p. 32). *Narratives should be created in a way that adds value for the users, not in a way that exploits and manipulates them*.

Building on the ideas of the claims 1-4, there seems to be a need for congruence between the narrative and the target system (Schmidt-Kraepelin et al., 2023, pp. 2, 8). The narrative-task congruence can be defined as the extent to which a narrative is compatible with the instrumental task of a gamified IS (p. 4). This also aligns with gamification principles in Figure 2. If what the users are told through the narrative does not match the tasks that they have to perform, the ability of the narrative to give meaning to these tasks and to persuade the user to perform them will likely be compromised. Thus, *narratives should be designed in a way that fits the instrumental tasks of the target system*. The narrative should be chosen as appropriate to the topic as possible (Mazarakis & Bräuer, 2023, p. 619).

Figure 4 displays some guidelines that one should consider when designing narratives for gamified IS.

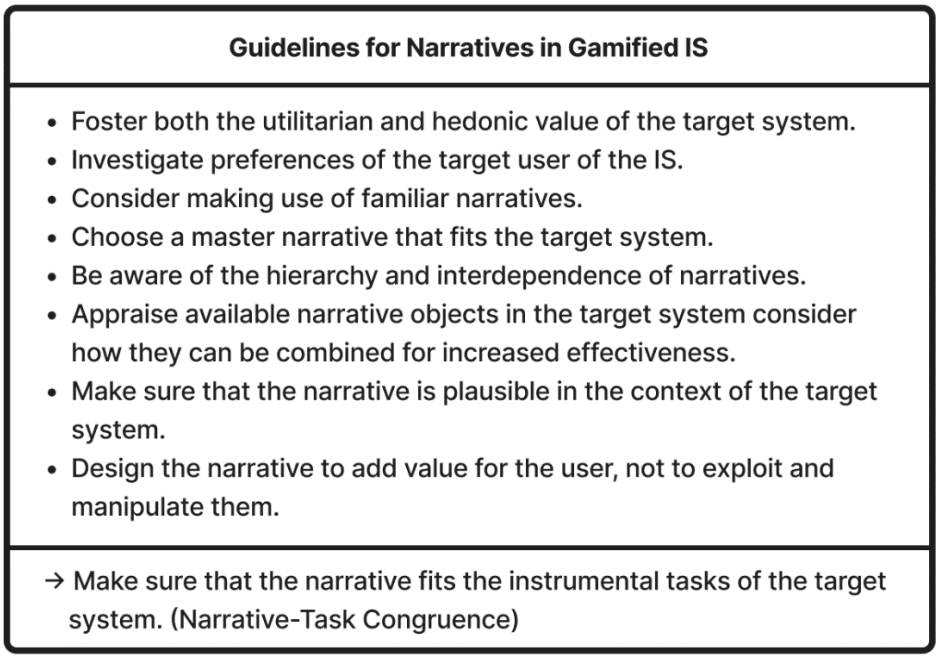


Figure 4: Guidelines for Narratives in Gamified IS

2.6. Narratives in User Onboarding

As narratives were proven to be a useful tool for the gamification of educational and training focused IS, it seems likely that they may be an effective tool for UO, which is concerned with teaching the user the value and functionality of the IS while often facing the difficulty of making that introductory experience enjoyable (Sections 2.1.3, 2.5, Figure 3).

The main risk of using narratives for UO, apart from not being engaging for the user, might be the danger of stretching the length of the onboarding due to introducing a narrative setup, since lengthy or complicated tutorials can often make users feel uncertain or confused (Langer et al., 2014, p. 3). However, narratives do not necessarily need to be complex and long. On the contrary, even a simple narrative can positively influence the experience that the user has with the target system (Langer et al., 2014, p. 7). Some authors even argue that with the inclusion of narratives into a target system, no matter how, we can be almost absolutely certain it will get better impact than if we did not include it (Pivac & Granić, 2017, p. 1541).

Another option to avoid that the length of the onboarding experience gets inflated could be the use of narrative atoms and a choice architecture. Different sets of features could be grouped and then explored inside their own narrative atom and the user could be allowed to choose which feature set to explore, thus making sure that the user is not presented with unwanted information. If an element of the narrative is not necessary or only essential for a subset of the userbase, it should be removed or made optional by allowing the user to make choices that influence his/her journey through the IS (Marczewski, 2018, p. 27).

Additionally, if the narrative makes the onboarding experience more enjoyable and engaging, users might also accept that it takes a bit longer to complete the UO, allowing for more information to be

presented. Ideally, the narrative could foster intrinsic motivation where the user performs the onboarding for the experience itself rather than a chore that must be completed. Their sense of competence could be positively influenced by defining a role for the user where they are the hero or a person of power and knowledge, actively contributing to solving the challenges presented during their journey through the UO (Kloppenberg & Dean, 1999, p. 354).

Using narratives for UO might also have one key advantage over traditional gamification of the general target system. While gamification often increases the user experience at first, it is always at the risk of declining effects over time and might even feel intrusive or annoying after an extended time of using the system (Thiebes et al., 2014, p. 10). Gamifying the UO (e.g., using narratives) on the other hand can help make a great first impression without the risk of annoying the user during their everyday use of the target system after they are familiar with the product.

3. Hypotheses

Based on the theoretical foundations of chapter 2, multiple hypotheses on what may be expected from the use of narratives for UO can be formulated. Through validating the hypotheses, valuable data will be gained which is essential to answer the research question "*How does the use of narratives influence instrumental and experiential outcomes of user onboarding in gamified information systems?"* (Section 1.1).

Looking back at the task outcomes of UO in Figure 3 and the possible positive effects of narratives in Table 4, this author expects that the use of narratives can improve both instrumental as well as experiential task outcomes of UO compared to a system that contains traditional minimalistic onboarding or a system that does not contain a dedicated onboarding experience.

The first hypothesis concerns the instrumental outcomes while the second hypothesis concerns the experiential outcomes of UO.

H1: *Using narratives in UO will improve the* ***instrumental outcomes*** *of UO compared to using an onboarding approach without narratives or using no onboarding.*

H1a: *Using narratives in UO will improve* ***user competence****, comprised of learning outcomes and task proficiency, compared to using an onboarding approach without narratives or using no onboarding.*

H1b: *Using narratives in UO will improve the* ***intention to use*** *the target system compared to an onboarding approach without narratives or using no onboarding.*

It is likely that the ability of narratives to contextualize information, reduce complexity, decrease cognitive load, and improve memorability and learnability of a system will increase the learning outcomes during the UO and help the use reach a higher task proficiency in a short amount of time (Table 4).

With its ability to persuade users and incite behavioral change, as well as providing a more enjoyable experience, users should be more likely to want to use the system if they were guided by a narrative during the onboarding phase of their user journey.

***H2**: Using narratives in UO will improve the **experiential outcomes** of UO compared to using an onboarding approach without narratives or using no onboarding.*

***H2a**: Using narratives in UO will improve the **perceived ease of learning** of the target system compared to using an onboarding approach without narratives or using no onboarding.*

***H2b**: Using narratives in UO will improve the **perceived ease of use** of the target system compared to using an onboarding approach without narratives or using no onboarding.*

***H2c**: Using narratives in UO will improve the **perceived usefulness** of the target system compared to using an onboarding approach without narratives or using no onboarding.*

***H2d**: Using narratives in UO will improve the **system use enjoyment** of the target system compared to using an onboarding approach without narratives or using no onboarding.*

Looking back at Table 4, the use of narratives should make it easier for the user to understand and accept the functionality and value of the IS, thus creating a more positive image of the IS in the mind of the user. By using narratives that feature the users as the hero of the story or that simply make the users seem competent, they will probably feel more confident and motivated to use the IS.

4. Methodology

To validate the hypotheses (Chapter 3) regarding the influences of narratives on instrumental and experiential task outcomes of UO, an IS was needed for which an onboarding experience could be developed and tested. Inovex, which supports this thesis, provided their open-source tool for collaborative online retrospectives, Scrumlr, for this purpose (inovex GmbH et al., 2023). Two versions of an onboarding experience were developed for Scrumlr. The decision to develop two versions of the UO was made to account for the possibility that not the inclusion of a narrative, but the presence of an onboarding experience itself may play a big role in the expected improvements in instrumental and experiential outcomes compared to the not modified target system that does not contain a dedicated onboarding experience. Additionally, both new and existing users were recruited to test the different versions of the UO and to compare their experiences.

4.1. Research Context

Before explaining the design and development process in detail, it is important to understand what agile retrospectives are and how Scrumlr is used in that context.

4.1.1. Agile Retrospectives

The agile methodology is *an iterative project management approach which involves breaking a project into phases and emphasizes continuous collaboration and improvement* (Atlassian, n.d., p. 1). Agile itself is not defined by a set of specific techniques or processes but rather a group of methodologies and principles that demonstrate a commitment to tight feedback cycles and continuous improvement. These methodologies and principles originate from the *Agile Manifesto* (AM) that was formulated in the year

2001 by a group of researchers and industry professionals in search of better ways of developing software (Beck et al., 2001a, p. 1). Rather than providing specific rules and procedures that should be followed when developing software, they defined four core values and twelve principles of the agile methodology, thus providing the foundation for a new work culture in software development (Beck et al., 2001a, p. 1, 2001b, pp. 1f.). Figure 5 displays the four core values of the agile methodology.

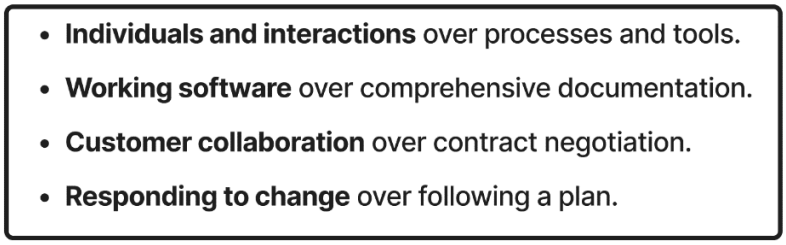


Figure 5: Manifesto for Agile Development (Core Values) from Beck et al., 2001a

Since the birth of the AM in 2001, many agile frameworks have emerged such as Scrum, Kanban, Lean, Extreme Programming (XP), and many more (Atlassian, n.d., p. 3). These frameworks follow the values and principles of the AM but also define additional rules, events and processes that guide the software development. Many of these frameworks were developed by some of the people that defined the AM before, such as Jeff Sutherland and Ken Schwaber that developed the Scrum framework (Schwaber & Sutherland, 2020, p. 1). While the processes of each of these frameworks differ, they all share the same core principles and values. One of the most important principles of the AM is the last principle which focuses on the self-reflection and continuous improvement of the team, as displayed in Figure 6.

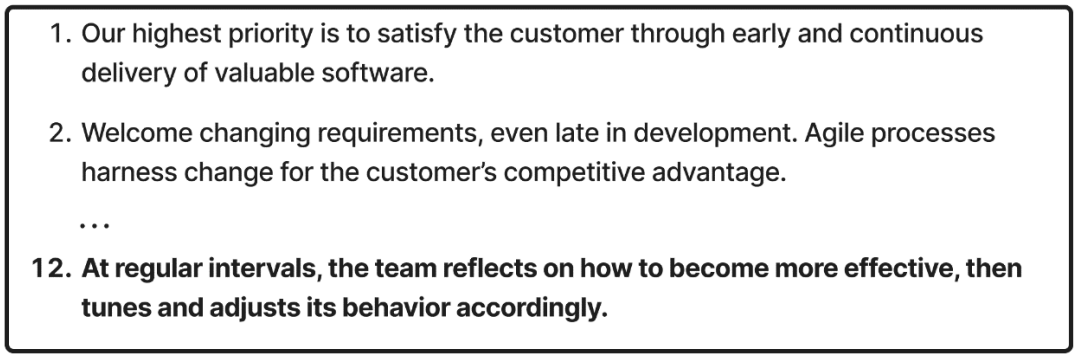


Figure 6: Excerpt of the twelve Principles behind the Agile Manifesto from Beck et al., 2001b

Due to principle twelve, many agile frameworks contain a event called retrospective as one of their suggested procedures in software development (EasyRetro, 2022, p. 3). A retrospective is *an opportunity to learn and improve by reflecting on past events and behaviors* (Baldauf, 2018, p. 1). In its simplest form, the retrospective tries to answer three questions:

(1) What worked well?

(2) What didn't work well?

(3) What are we going to do differently?

These questions are mainly targeted at the team, their interactions and the events and processes that they used to develop the product, they are not focused on the product itself (Derby & Larsen, 2006, pp. xvi-xvii). Retrospectives are not focused on what the team worked on but how the team does their work and interacts, and the goal of a retrospective is to identify both problems and highlights and to help the team discover and choose actionable solutions that can be implemented right away. Like most other agile events, retrospectives are not only performed at the start or at the end of a project but continuously in regular time intervals to foster continuous improvement. Figure 7 displays how retrospectives should be a part of each Iteration of the software development life cycle. Participants of a retrospective are not only the developers themselves but the whole team. In the context of the Scrum framework, that includes the development team, the product owner, and the scrum master (Baldauf, 2018, p. 1).

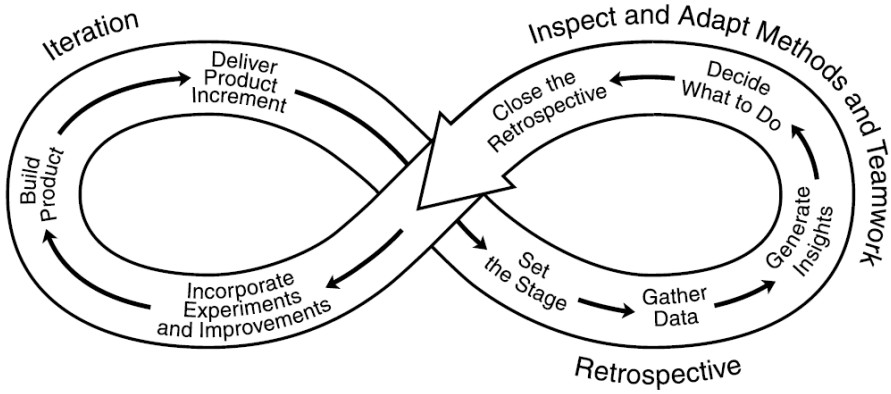


Figure 7: Retrospective steps as part of an iterative life cycle (Derby & Larsen, 2006, p. 5)

While a retrospective can consist of only a bunch of people meeting and freely talking about stuff to agree on some actions, most retrospectives are more sophisticated than that (Baldauf, 2018, p. 2). Most retrospectives follow five phases with special retrospective activities to guide and foster the discussions.

Table 5: Five Phases of Agile Retrospectives from Derby & Larsen, 2006

Phase	Definition
1. Set the Stage.	Setting the stage helps people focus on the work at hand. It reiterates the goal for the time the team has together in the retrospective. And it contributes to creating an atmosphere where people feel comfortable discussing issues (p. 5).
2. Gather data.	Help everyone remember and create a shared pool of information. Find the most important topics and discuss. Examine facts and feelings (pp. 8-9).
3. Generate insights.	Generating insights allows the team to step back, see the big picture, identify patterns, and delve into root causes. Why did things

	happen the way they did? What potential experiments could be conducted to solve the problems? (p. 11)
4. Decide what to do.	You should have some potential experiments and improvements at this point. Now pick the top items, plan in more detail. Make sure that people sign up and commit to tasks because without individual commitment, people assume that 'the team' will do the task, and no one does it. (pp. 11-12)
5. Close the retrospective.	All good things come to an end. End the retrospective decisively. Do not let people (and their energy) dribble away. Document the experience and plan for follow-up. (p. 13)

Inside of these phases, there are hundreds of potential activities and templates that one can use to give additional structure to the discussions and make them more fun (EasyRetro, n.d.–a). Retrospectives are supposed to be fun so that participants feel comfortable to contribute to the discussion. Depending on the preferences of the team, retrospective activities can reach from rather simple structural activities (e.g., Start/Stop/Continue, SWOT, …) to very creative processes (e.g., Harry Potter Retrospective, Star Wars Retrospective, …) (EasyRetro, n.d.–a).

Traditionally, these retrospective templates are used with a whiteboard. The board then gets divided into sections that are specified by the template and participants use post-it notes to write down their ideas related to a specific section. While using a whiteboard may work when the whole team works from the same location and everyone is able to meet in-person, most software developers today work remote (41.41%) or hybrid (42.18%) and even those that do not work remote may be at different locations (Stack Overflow, 2023, pp. 113-114). In the case of distributed or remote working teams, using a whiteboard with post-it notes will most likely hinder the natural flow of the discussion and will make contributing harder for remote participants. Thus, new tools were needed to support retrospectives in these new work environments.

4.1.2. Scrumlr.io

One of these tools for online collaboration and retrospectives is *Scrumlr.io*, an open-source project that is maintained by an internal team of the company *inovex* (inovex GmbH et al., 2023). Inovex is an information technology (IT) project center driven by innovation and quality, focusing its services on 'Digital Transformation' and it supported the author during his work on this thesis (inovex GmbH, 2023).

Scrumlr is free to use, open-source, and does not require any registration by the user (inovex GmbH et al., 2023). Additionally, it is equipped with localization (i18n) support, a responsive design that supports both desktop and mobile devices, and a dark mode.

Scrumlr provides users with an alternative to the traditional whiteboard, and it primarily supports the phases two, three, and four of the agile retrospective process (Table 5). Setting the stage and closing the retrospective is usually done separately from the board. Boards in Scrumlr consist of multiple columns which can be customized to correlate with the sections of retrospective activities. A board can also be secured against unwanted participants by setting the access policy of that board to 'protected' (participants must enter passphrase to join the board) or to 'manual approval' (participants must wait for manual approval by an admin before joining a board). To make it easy to get started, users can first choose from several templates and then customize the columns to fit their desired retrospective format. Figure 8 and Figure 9 display the template page and the options to edit columns on the board.

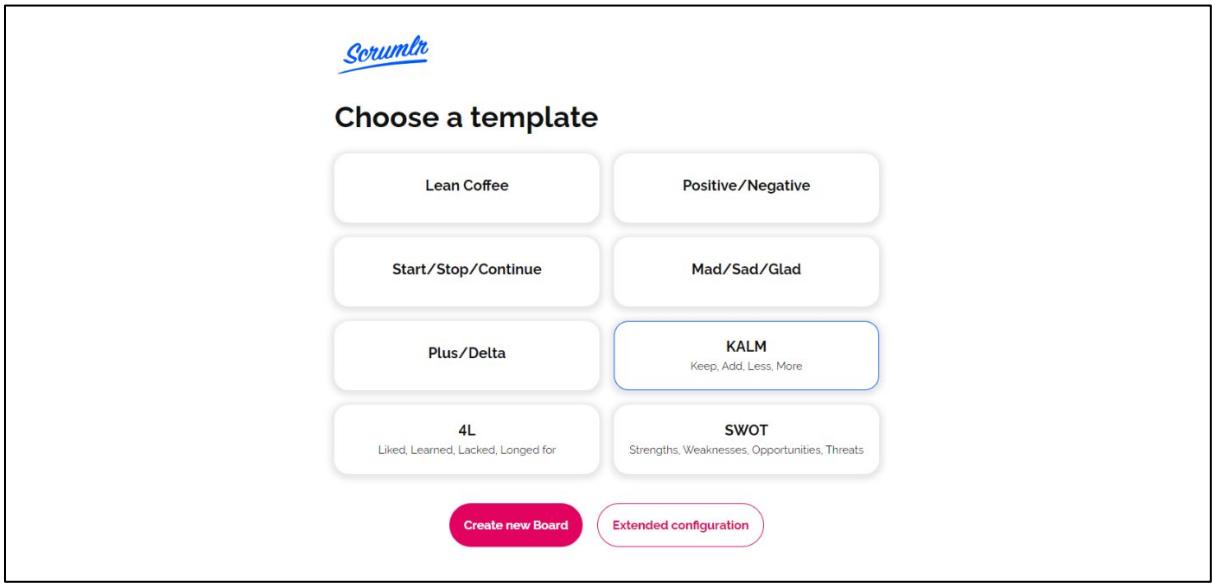


Figure 8: Scrumlr.io – Template Page

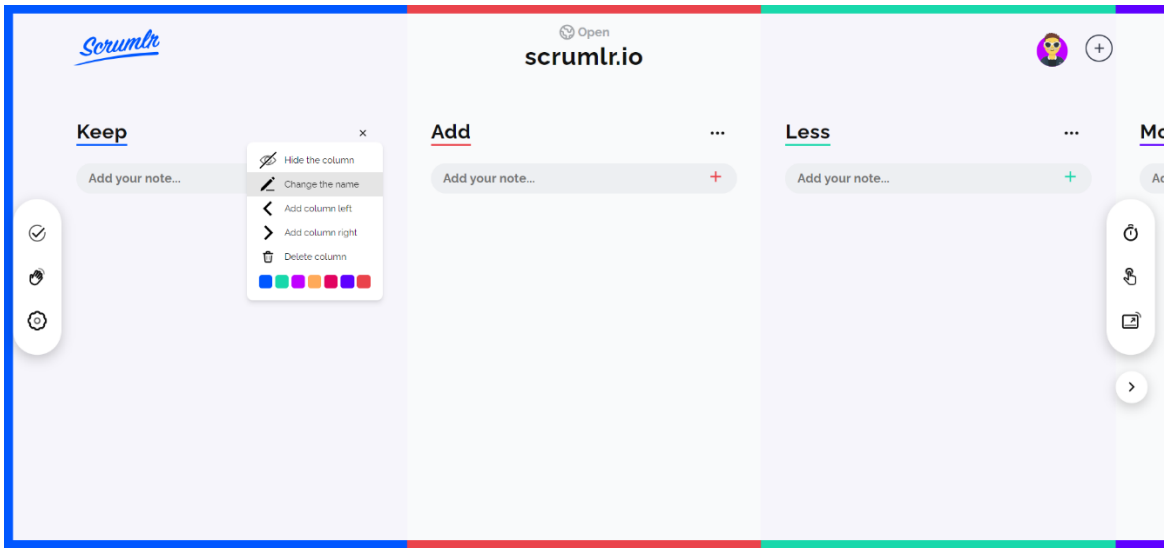


Figure 9: Scrumlr.io Board – Edit Columns

Like post-it notes on a whiteboard, users can write notes and stack them by dragging notes on top of each other. Users are divided into the roles 'Owner', 'Moderator', and 'Participant'. The user that created the board is called the board owner. The owner can then assign the moderator role to other participants. Owners and moderators are board admins, and they have access to additional functionalities, such as setting a timer, creating a vote, or starting the presenter mode which moves the view of all participants to the note that the presenter is inspecting. The admin features can be spotted at the right side of the screen in Figure 9. The features on the left side of the screen in Figure 9 can be used by all participants and they enable users to mark themselves as ready or raise their hand to report their status to the moderator and the other participants. Scrumlr also makes use of gamification elements like avatars, allowing users to be creative and express themselves (Figure 10).

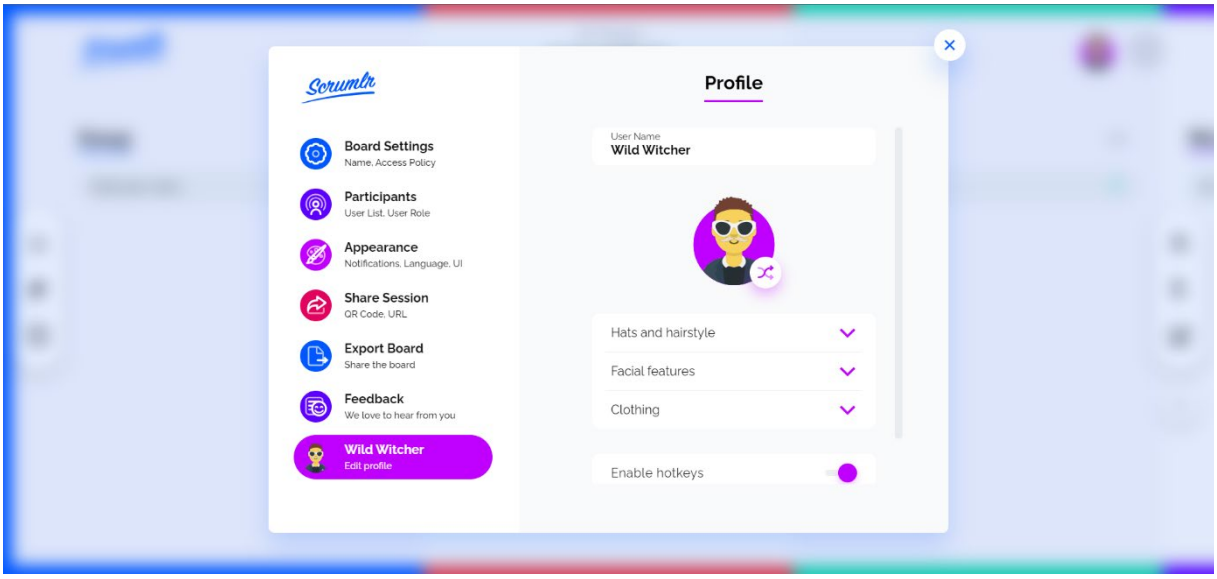


Figure 10: Scrumlr.io Board – Edit Profile

Users can also share the board both through a Uniform Resource Locator (URL) and by using a QR-code. Once a retrospective is finished, the board, or specific columns, can be exported in a variety of

data formats, namely PDF (Portable Document Format), JSON (JavaScript Object Notation), CSV (comma-separated values file), and Markdown.

4.2. Experiment Setup

4.2.1. Why is User Onboarding needed for Scrumlr?

Before starting the design and development process of an onboarding experience for the Scrumlr application, it is important to examine whether UO is actually needed and what needs to be onboarded as displayed in Figure 1 (Section 2.1.4).

Why is UO needed for Scrumlr? At a first glance, one might believe that Scrumlr should not need a dedicated onboarding experience due to its limited number of features and not requiring user information to function. However, one must keep in mind that the ultimate purpose of UO is to increase user retention by helping them understand the value of the application (Section 2.1.3). Considering that Scrumlr is a tool for collaboration, its true value is only revealed to the users when they interact with other users and experience how Scrumlr contributes to generating value for their team. As highlighted in section 2.1, this first interaction with an IS has a critical influence on whether the user abandons the application or not. Due to the collaborative nature of Scrumlr, gaining new users does not end with convincing the first user in a team that Scrumlr will be of value to them. First, the other members of the team need to be contacted and convinced to try the new tool. Then, a retrospective must be scheduled, performed, and evaluated. As turning a visitor into a group of regular users requires a considerable amount of commitment from the initial visitor, one should make sure to really convince the initial visitor that Scrumlr is the right solution for them.

Furthermore, to be able to make good use of Scrumlr, users must first have a minimum of domain knowledge regarding retrospectives. If users do not know what retrospectives are and how exactly Scrumlr can enhance them, they will likely not realize the value of the tool and they might end up intimidated by the thought of moderating a session. Once users leave Scrumlr to search for additional information, it is likely that they will encounter some of the numerous alternatives to Scrumlr, such as Reetro.io, EasyRetro, Retrium, parabol, or TeamRetro, who all offer guides and additional resources on how retrospectives work, which templates exist and how they work, and why their products are the right solution (EasyRetro, n.d.–b; parabol, n.d.; Reetro.io, n.d.; Retrium, n.d.; TeamRetro, n.d.).

Who is the target user? While many universities and schools have started to include the most common agile frameworks (e.g., Scrum) into their curriculums of relevant studies, such as ‘information systems’ or ‘computer science’, knowledge of the agile methodology is often just taught from a theoretical perspective and not through extensive use of the agile frameworks (Karlsruher Institut für Technologie [KIT], 2023). Since the agile methodology, and especially retrospectives, have a big focus on communication and teamwork, it is likely that beginners in the workplace that just finished their degree will have limited abilities regarding agile work. Some curriculums even still teach the ‘waterfall’ approach,

a non-iterative methodology that was prevalent in software development before the agile methodology took over (KIT, 2023, p. 167). Even in the industry, many still use the waterfall approach or other variations (Digital.ai, 2022, p. 6). Thus, one must expect that not all novice users will be equipped with the necessary domain knowledge to make use of the application.

Furthermore, even though the agile methodology was initially meant to be used in software development, many companies apply agile practices to their entire application delivery cycle (Digital.ai, 2022, p. 4). The agile approach is not only used in companies that are related to software development, in recent years it has been on the rise in numerous other industries as well, e.g., automotive, pharma, construction management, engineering (Dämon, 2017, pp. 2-3; Flynn, 2022, p. 1; Kanbanize, n.d., p. 1).

With new industries adapting to the agile methodology, the number of potential users that might be unfamiliar with agile principles increases even more. Educating users of the tool on the basics of agile development becomes even more relevant when one knows, that 44% of agile projects that fail do so due to lack of experience with agile methods (Digital.ai, 2022, pp. 13-15; Flynn, 2022, p. 4).

To summarize, the target users of the Scrumlr application are people who use (or learn to use) the agile methodology, and especially retrospectives, for their work. It is possible that users already are domain experts, but they could also be inexperienced and lacking in domain knowledge.

What needs to be onboarded? As detailed in this chapter, one thing that should be included in the onboarding is the basic domain knowledge that users may need to understand how to make use of Scrumlr. This required domain knowledge is depicted in section 4.1.1.

To understand which features of Scrumlr need onboarding, developers of Scrumlr, and users, were asked: *"What should new users (participants and moderators) know about Scrumlr, to successfully participate in (or moderate) a retrospective in Scrumlr?"* (Table 6, Table 16). Some answers were given in German, and they were translated for readability reasons. In table six, answers that were translated from German to English are highlighted in italic. Table 6 depicts a summary of the items that were identified to need onboarding.

Table 6: Which Scrumlr features need onboarding?

Which Scrumlr features need onboarding? (Table 16)	
Participants	**Moderators**
• Write notes • Stack notes • Mark as ready	• Choose & Customize templates • Change board access rights • Invite users • Create voting sessions • Setting timers • Presentation mode • Hide & Show columns • Document the results
→ General knowledge of the retrospective process in Scrumlr.	

While the number of answers in Table 6 is limited, there is clearly a focus on the main functionality of Scrumlr and there seems to be a need for contextualizing the core features so that users know when to use them. Additional hidden settings and special features seem to be of lower importance for new users.

This aligns with the personal experience of this author. When exploring the application, it became clear that the design of the application is very clean and the features are easy to use, but there was a lack of hints regarding why and when to use these features in the context of a retrospective to achieve optimal results. Only after doing research on retrospectives, and joining some retrospective sessions of the company inovex, the true value of retrospectives and Scrumlr was revealed. While one of the strengths of Scrumlr is, that it gives users a lot of freedom in how they want to perform their retrospectives, some users will need some help to get started.

To summarize, due to the collaborative nature of the application, the need for domain knowledge to use it correctly, and the problems that existing users face, there is a reason to believe that Scrumlr will benefit from UO, especially from an onboarding experience that uses narrative elements.

4.2.2. Design and Development

Two versions of an onboarding experience had to be developed to validate the hypotheses. One version (A) is supposed to include narrative elements, while the other version (B) should not include narrative elements. Due to limited development time, both versions were only designed and implemented for the light color theme of the application and the onboarding content was only formulated in English and not in German.

To decide how, where, and when onboarding is provided (Figure 1), the best practices for UO in section 2.1.6 were considered. It was decided that the onboarding would be provided as an optional application mode that can be accessed through the home page. The reason for making the onboarding optional is, that experienced users might feel annoyed when onboarding tooltips and modals open without them allowing it. Additionally, some users may prefer to explore new applications on their own without being constrained by a guided path through the application. To further enhance the user's sense of choice and control, they should be able to choose between two paths through the UO. As depicted in Table 6, participants and moderators need different amounts of information and users should not be forced to process information that they do not need, as it would just increase memory strain and the length of the onboarding process.

Due to limited time to implement the onboarding versions for this thesis, only the moderator path was designed and implemented in detail while the participant path would be disabled (Figure 11, Figure 12). This would also make it easier to compare the experience of the participants of the pilot study.

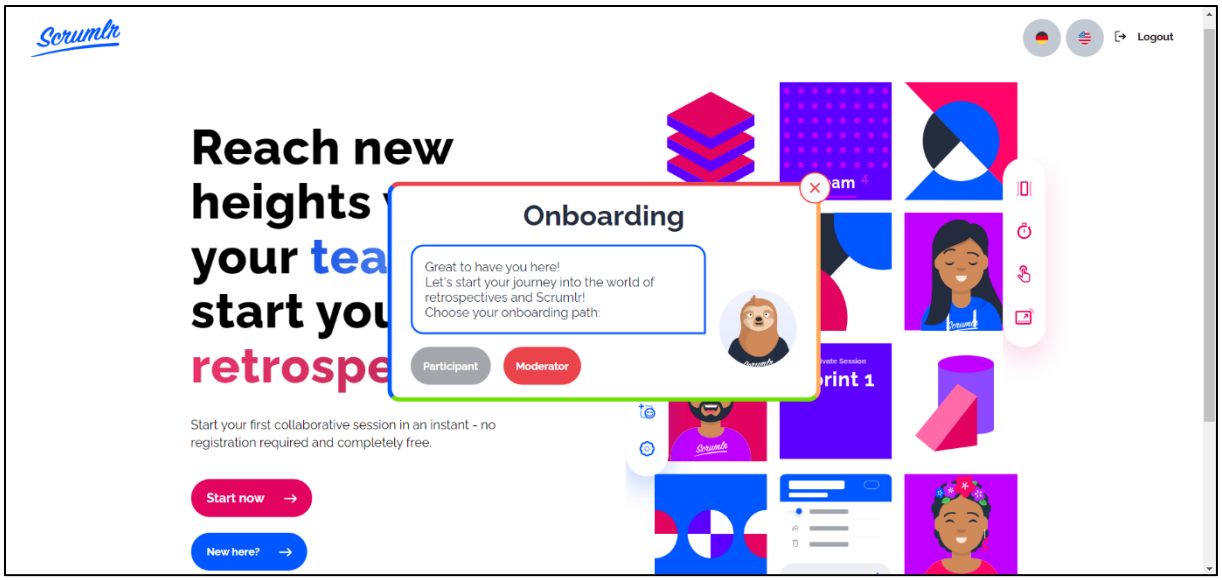


Figure 11: User Onboarding A – Homepage, Choose Onboarding Path

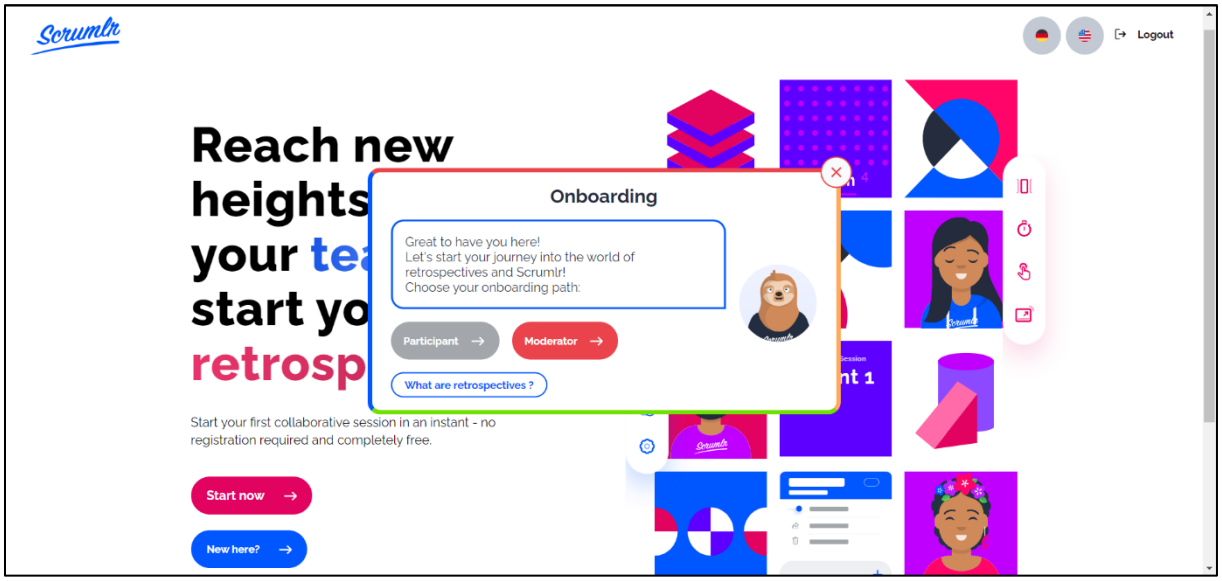


Figure 12: User Onboarding B – Homepage, Choose Onboarding Path

Because many researchers and industry practitioners recommend an action-oriented approach to UO, this approach was chosen for both versions of the onboarding experience (Section 2.1.6). Users should directly interact with the application to understand how it can benefit them. To be precise, it was decided that the users would experience a product tour or walkthrough through the entire application, from the homepage to the template selection and interacting with the created board.

To also fit the target system visually, both versions of the UO use the same colors, avatar looks, and styles as the target system.

Version A – Narrative Onboarding

The most difficult part of the planning and design process of version A was finding a narrative that fits the target system and the purpose of the UO. Because users usually prefer shorter onboarding experiences, it was decided early on that the story in the narrative should be simple and not too long (Section 2.1.6).

Additionally, both research on narratives and research on gamification highlight the importance of a fit between the gamification element, in this case the narrative, and the target system (Sections 2.2.7, 2.5.3). Thus, it was decided that the narrative should be built around the normal process of conducting a retrospective in Scrumlr. Other approaches to the narrative were considered as well, such as wrapping the retrospective in a fantasy story to make it more engaging, but due to the risks that come with using a fantasy theme for narratives in gamification (e.g., of some users not understanding the narrative, users being distracted from the onboarding content, or users being irritated by the fantasy elements because they might prefer a more serious tone for their work related applications), the idea of a fantasy narrative was dismissed.

As mentioned in section 2.4.2, a good structure for simple narratives can be the SHJ, consisting of a calling, a challenge, and a transformation that leads to a resolution. The process of a retrospective fits this structure quite well, providing a calling and a challenge in the problems, that the team faced during development, a transformation through gaining insights into the causes of these problems and evaluating experiments to get better as a team, and a resolution through the, hopefully, positive effects of conducting the experiments.

Table 7: Soap Hero's Journey – Retrospective Process

The Calling	The Challenge	The Transformation	The Resolution
- retrospective as mandatory process in many agile frameworks - desire to improve	- problems that the team faced during development (both factual and emotional)	- discussing both problems and highlights to gain insights into what works and what does not work - evaluate ideas / experiments that could lead to improvement	- The improvement of the team, such as higher productivity, happier team members, improved output quality, …

While following this structure could already be perceived as a light narrative by itself, two additional layers were added to further motivate the user to complete the onboarding and to justify the tasks that the user should complete. One additional layer of the narrative comes from the characters that are introduced during the onboarding process. The most important one is Mike, someone with little experience in agile processes that somehow ended up in the position of being the Scrum Master for a development team. As the Scrum Master, one of the roles defined by the Scrum framework, he oversees establishing and enforcing the values and principles of the Scrum framework, which includes a leading role in the different Scrum events, such as the retrospective. Due to his inexperience, he has many concerns and

problems, such as learning how the different Scrum events work and finding the right tools that can be used by his remote team, ideally without requesting expensive licenses (Figure 13). His problems match the most valuable aspects of the application Scrumlr (e.g., free, open-source, easy to use remotely, secure), presenting it as a great solution to the user. His inexperience with agile retrospectives also justifies the walkthrough through all five phases of the retrospective process. That way, users ideally do not feel irritated by information that they may or may not already know, as not they are portrayed as lacking knowledge, but instead Mike is the target of these explanations.

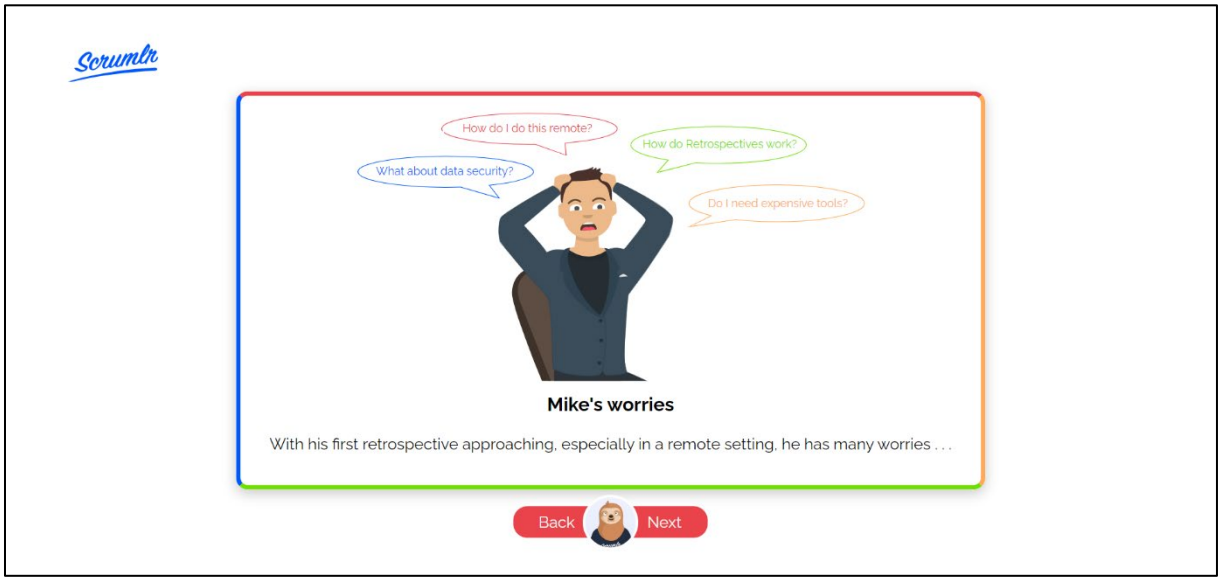


Figure 13: User Onboarding A – Problems of the new Scrum Master Mike

Through Mike, another implementation of the SHJ is present in the narrative, with his calling being his assignment as a Scrum Master.

Table 8: Soap Hero's Journey – Mike

The Calling	The Challenge	The Transformation	The Resolution
- Assignment as Scrum Master	- Insufficient knowledge about retrospectives and Scrum in general - In need of tools that support him - Lacking confidence	- Learning how to perform retrospectives	- Gaining the confidence to handle retrospectives by himself - Being of help to his team

The most important characters, apart from Mike, are the user I and the sloth Stan, who is the mascot of the Scrumlr application. Like Mike, the user and Stan are introduced during the intro part of the onboarding process. To help the user feel competent, they are introduced as a mentor of Mike that will help him moderate his first retrospective. While the user helps Mike by using the features of Scrumlr, Stan provides explanations about the different phases of the retrospective process and calls out the features that can or should be used during these phases. The role of Stan and the user during the onboarding can be perceived as a guide that supports the transformation process of the heroes.
The Introduction to the main characters, Mike, Stan, and the user, is depicted in Figure 20.

Apart from Mike, his team members are also part of the onboarding. Their role is mainly to fill the onboarding process with content, providing typical challenges that a software development team may encounter. Therefore, they mainly contribute to the SHJ of the retrospective process, depicted in Table 7. While following the process of the retrospective that is guided by Mike, who has help from Stan and the user, they realize that their main problem is the increasing frequency of bugs. They then identify rushed legacy code as the main source of these bugs and, after discussing multiple ideas on how to handle that situation, they decide to conduct a big code refactoring session before continuing the development. Additionally, that Mike should try to convince the higher ups to send more manpower or decrease the workload so that this situation of rushing development due to tight time constraints does not repeat itself.

In section 4.1.2, it was mentioned that Scrumlr primarily supports the phases ‘gather data’, ‘generate insights’, and ‘decide what to do’, while the phases ‘set the stage’ and ‘close the retrospective’ often happen outside of Scrumlr. To still model the whole retrospective process and to highlight the importance of discussions in these retrospectives, a chat modal was used (e.g., Figure 22, Figure 24, Figure 26). These chat modals display, in a shortened form, how discussions in these phases could look like.

Throughout the onboarding process, to help Mike with his retrospective, the user encounters several tasks, such as creating a board, stacking notes, marking I as ready, and creating a voting session. To follow best practices of UO, these tasks can be skipped, with skipped tasks being simulated by the program so that the user is always presented with the correct onboarding application state (Section 2.1.6).

When creating the board, the user is forced to use the ‘Mad/Sad/Glad’ template. Forcing the user to choose a specific template has multiple reasons. Firstly, the ‘Mad/Sad/Glad’ template is very easy to understand, and it does not require too many columns, leading to a simpler interface for the novice user. Secondly, when forcing the use of a specific template, the narrative can make use of that template. Due to the certainty that a specific template will be used, it is easier to fill the board with notes (from the fictional team members) that make sense. Thirdly, through ‘environmental storytelling’ using generated notes, the duration of the onboarding can be shortened as less modals and tooltips are needed to progress and explain the narrative.

The user can navigate through the different steps of the onboarding by using a ‘next’ button on the popups and tooltips of the onboarding or by using the onboarding controller, which present on the intro page and the board page of the application when the user is in the onboarding mode.

At the end of the onboarding, the users are presented with a call to action (CtA) to create a new board, keep looking around, or return to the homepage (Figure 14).

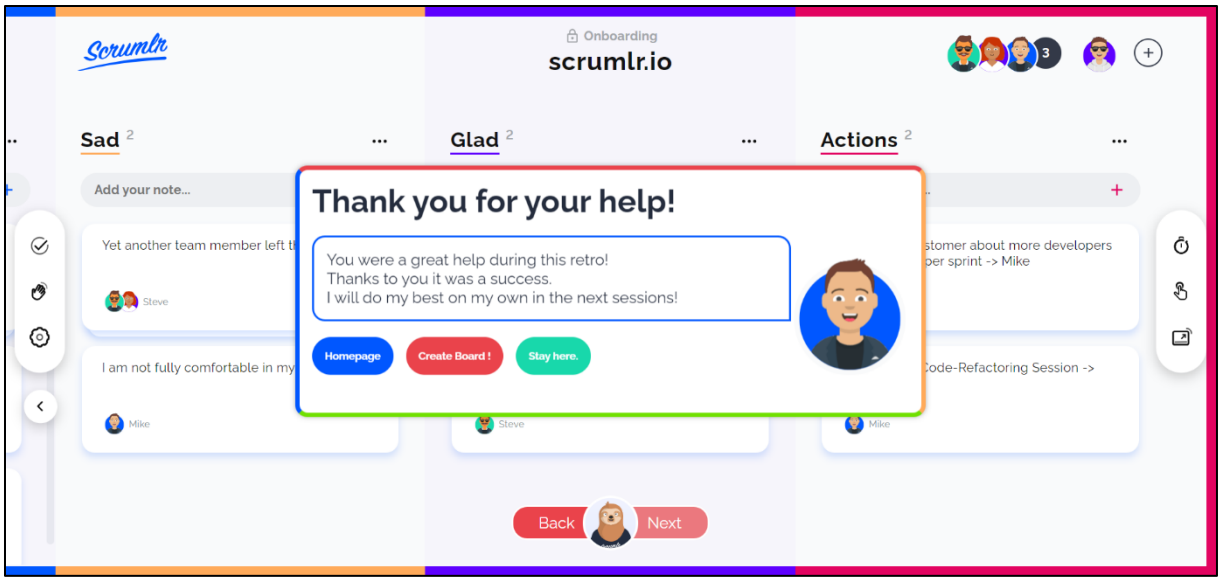


Figure 14: User Onboarding A – Call to Action in the Onboarding Outro

More figures depicting version A of the UO can be found in appendix A. An overview of the flow of the UO process of version A is presented in Figure 15.

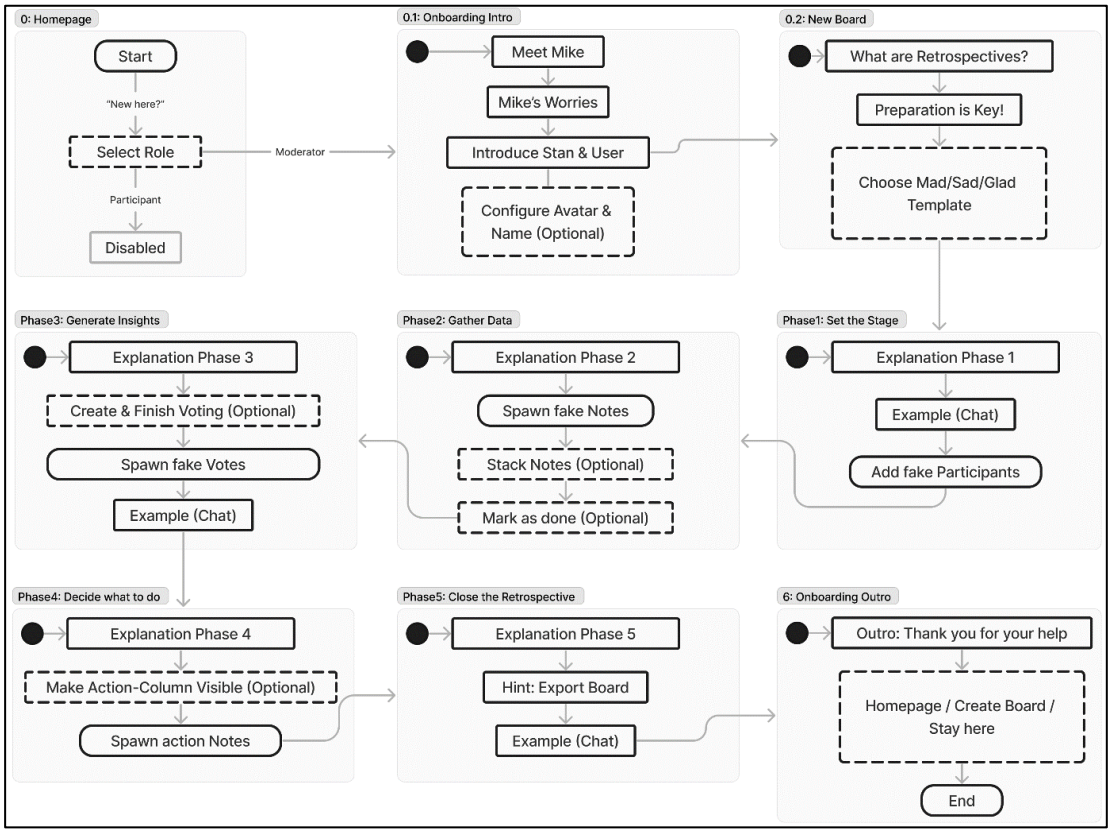


Figure 15: Onboarding Process – User Onboarding A

Version B – Onboarding without Narrative

One important change compared to the structure of version A is, that the onboarding does not follow the typical process of a retrospective but instead quickly presents the most important features of Scrumlr and then releases the user. The goal was to shorten the time duration of the onboarding by removing the narrative elements. Instead of embedding the information regarding how retrospectives work into the

onboarding process, users can request that information on the homepage before choosing their onboarding path (Figure 12, Figure 27). The users are then presented with the definition and goals of (agile) retrospectives and the five phases.

The only character that is used in version B is the sloth Stan, because he is the mascot of Scrumlr and therefore already a part of Scrumlr. His role is however limited to the explanations on what retrospectives are and visually improving the tooltips that are used during the onboarding, with the design of these onboarding portraying Stan as the one who is speaking through these tooltips. Figure 28 shows some of the tooltips presented during version B of the UO.

As in version A, users must create a board and then interact with the created board, learning about the features of Scrumlr while progressing through the onboarding process. Different to version A, users can choose any of the templates, as the example notes that are used in version B do not need to refer any story and narrative.

As one of the goals of version B is, that the users can finish the UO in a shorter duration, upon reaching the board view, they are only presented with the different main features of Scrumlr, instead of receiving further examples on how the different phases of the retrospective could be performed. This quick progression through the UO is supposed to keep users from feeling bored or annoyed by the onboarding process, as version B provides fewer engaging components due to the lack of a narrative that could keep them interested despite a longer onboarding duration.

Different from version A, users do not encounter specific tasks when interacting with the board. Instead, they are presented with several hints and tooltips that show them the main features of Scrumlr, leaving it up to the user if they choose to interact with the different features.

Similar as in version A, at the end of the onboarding, the users are presented with a CtA to create a new board, keep looking around, or return to the homepage (Figure 16).

An overview of the flow of the UO process of version B is presented in Figure 17.

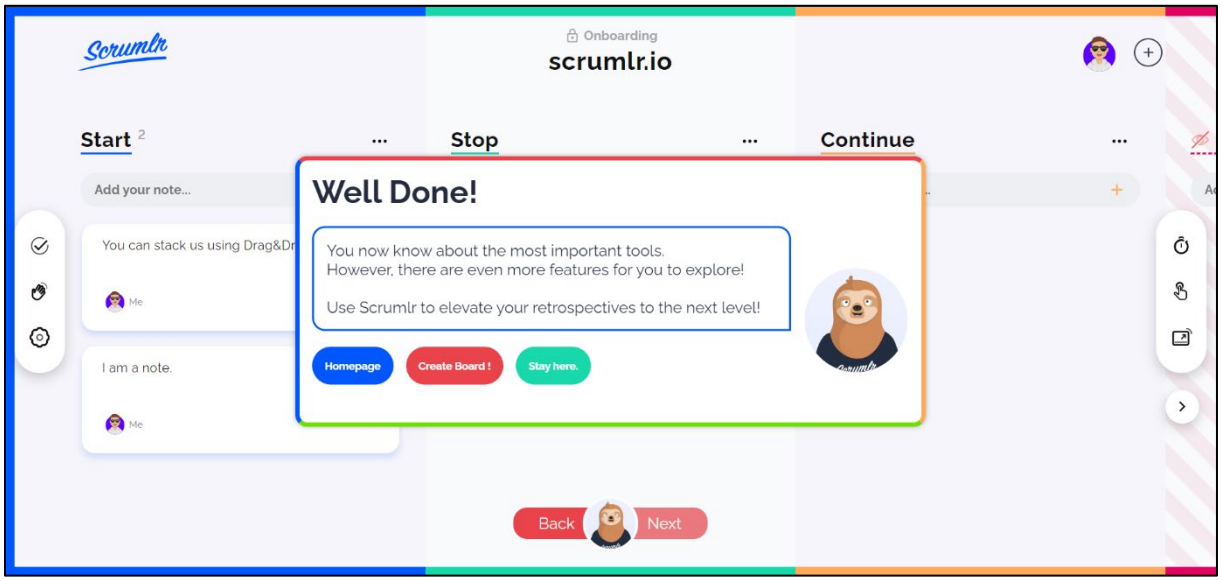


Figure 16: User Onboarding B – Call to Action in the Onboarding Outro

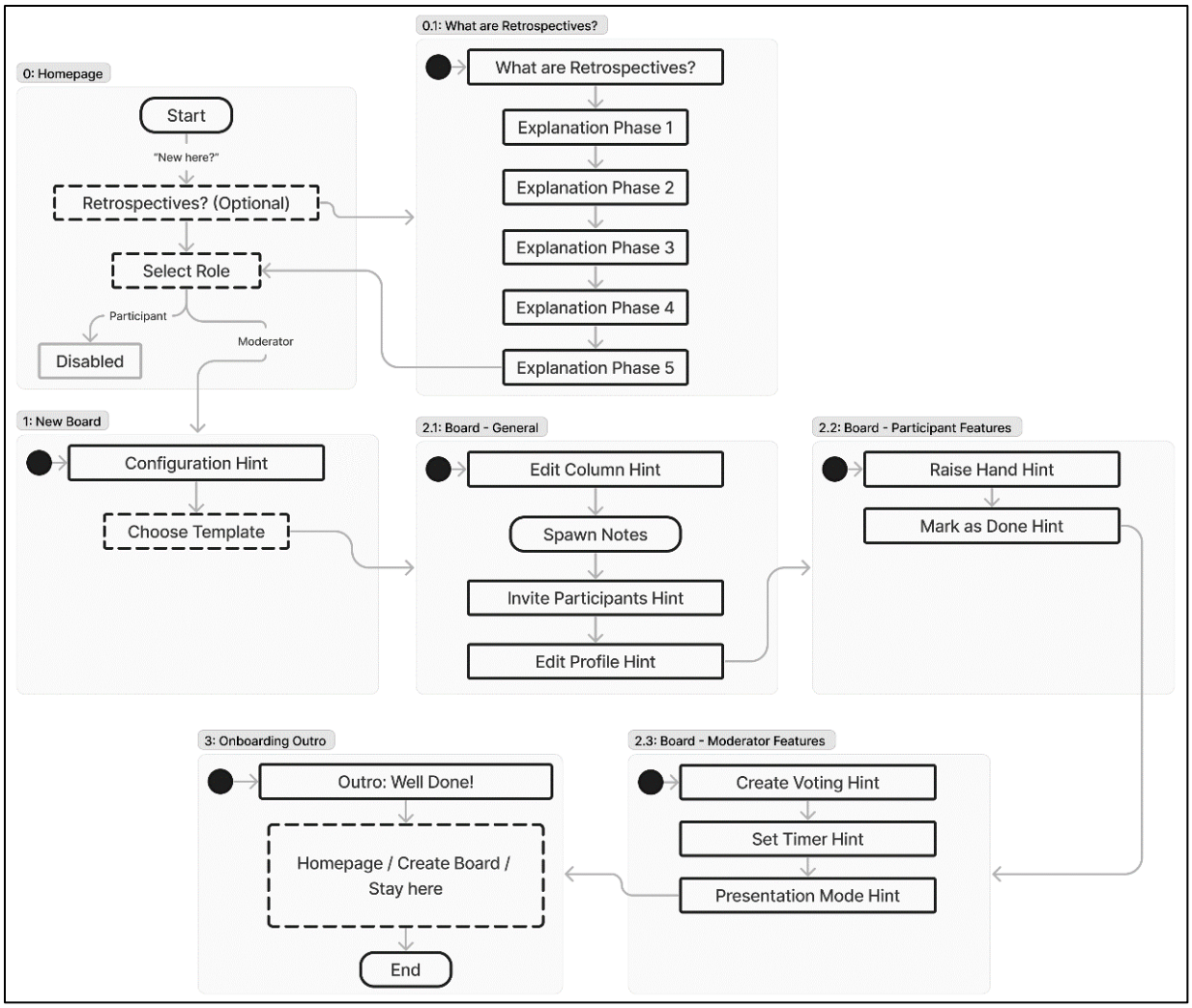


Figure 17: Onboarding Process – User Onboarding B

4.2.3. Implementation Details

The target system of the pilot study, Scrumlr, was developed using the frontend framework React, while the backend is handled by a custom Golang server (facebook & Open-Source, 2022; Google & Open-Source, 2022; inovex GmbH et al., 2023). Several other libraries were utilized, with Redux being the most notable one, responsible for state management in the frontend (Abramov et al., 2022).

For the pilot study, two versions of the UO system were implemented. Version A incorporates narrative elements, while version B provides a more traditional UO that does not use such elements. For both versions, new development branches were created with the main branch as the base. Version A was developed on a new branch called ‘onboarding’ while version B was developed on a branch called ‘onboarding_minimal’ (Hotze & inovex GmbH, 2023a, 2023b).

Considering that most users would likely experience the introduction phase of the UO only once, it was decided to implement the complete UO system in the frontend. An alternative approach was also considered, which involved handling the state management of the UO on the backend of the Scrumlr application, using the database to save and synchronize the onboarding state. However, implementing the

state management in the backend would have required additional columns or tables in the database, that would only be needed by a fraction of the created retrospective boards. Therefore, handling the complete UO in the frontend was regarded as the better approach.

Both versions of the onboarding experience consist of multiple phases with several steps for each phase, as depicted in Figure 15 and Figure 17. Thus, there was a need for persistent state management across different routes of the application. Scrumlr already utilized the library 'react-redux', providing a system capable of application-wide state management for various states, such as board data, notes, participants, votes, and more. Therefore, 'react-redux' was chosen to handle the state for the UO as well.

The onboarding system utilizes the library 'react-floater' to position modals and tooltips accurately within the application (Barbara, 2022). The 'react-floater' library allows to wrap components for the tooltips or modals of the UO in a 'Floater' component, which can target any other HTML (HyperText Markup Language) element in the application through a CSS (Cascading Style Sheets) selector based on the target element's class name.

To ensure that the users do not inadvertently remove board columns that are needed for presenting the narrative in version A, the onboarding system registers the required columns in the 'onboarding' state and prohibits their deletion.

For the pilot study, both versions of the UO had to be published in a way that the participants could access the application. Scrumlr provided an easy solution by automatically deploying branches to a development environment via the GitHub pipeline when a 'pull request' is opened into the main branch. The development environments remain active for one week, providing enough time to conduct the pilot study.

4.3. Data Collection

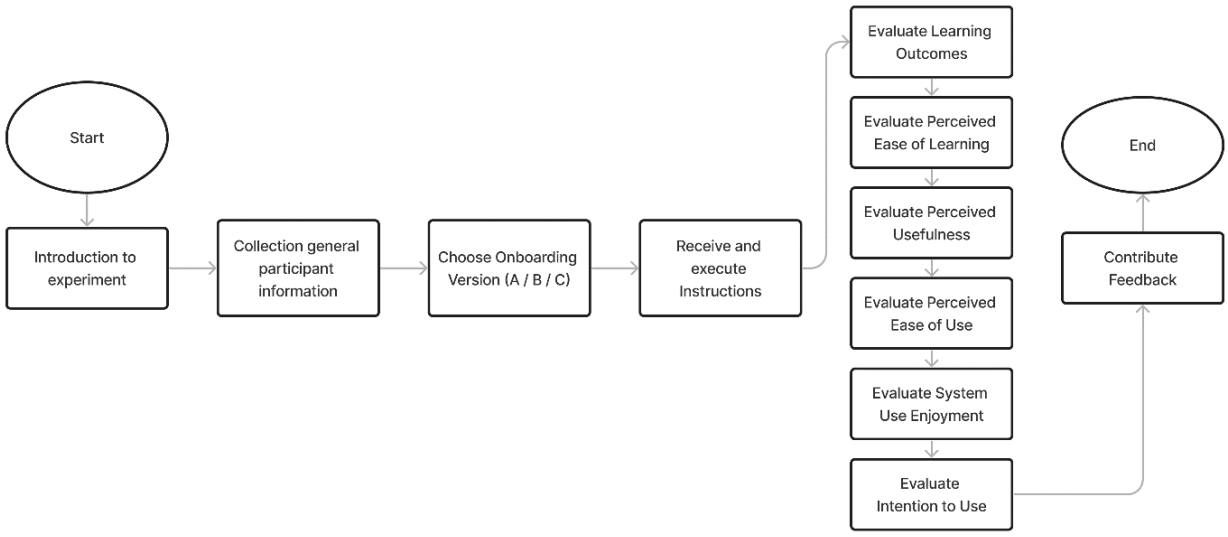


Figure 18: Pilot Study – Flowchart

To validate the hypotheses of chapter 3, a pilot study is conducted, using the application Scrumlr as the use case in which the hypotheses are evaluated. The pilot study consists of three phases. In the first phase of the pilot study, a survey is used to collect some general information on the participants to be able to cluster them later. In the phase part of the pilot study, participants leave the survey to interact with one of the versions of the UO. In the last phase of the pilot study, which again takes place inside of the survey, participants evaluate their agreement to different statements that correlate with the hypotheses.

The survey parts of the pilot study were built using Google Forms (Google, 2006). Using Google Forms reduced the development time as it has a simple but powerful feature set, such as shuffling answer options for multiple-choice items, automatically collecting responses inside a Google Sheets document, or providing some basic analysis and graphs of the survey responses (Google, 2012).

Who are the target participants and how are they recruited? In section 4.2.1 it was discovered that it is not easy to determine a specific target audience for Scrumlr as vastly different levels of experience exist, in part due to the varying incorporation of agile methodology into the curriculums of universities and the fast spread of agile processes into new industry sectors. Therefore, one should not only consider experienced software developers for this pilot study. Students that are likely to encounter agile processes, and especially retrospectives, in their future work can also provide meaningful data on how less experienced and younger people react to the different versions of UO. Additionally, members of other industries that use agile processes and retrospectives are viable candidates for the pilot study as well.

One more important decision to make, regarding the target participants of this pilot study, was, whether to include people who already used Scrumlr or even already moderated retospectives with Scrumlr. This author made the decision to include these people, as it is also of interest how existing users perceive the new onboarding experience as they may feel irritated by new content that they do not necessarily need.

To summarize, both students and members of the workforce were recruited for the pilot study, with the main qualification being that they are likely to encounter the agile methodology and retrospectives during their work. To ensure that participants belong to these categories of people, the pilot study was advertised inside the company inovex, as well as two companies of people that are associated with this author, and at the university (KIT) of this author.

What content are participants going to experience? Three versions of the application Scrumlr are supposed to be compared in this pilot study. The first version (A) includes a light narrative that guides users through their first interactions with the application Scrumlr. The second version (B) contains a shorter onboarding experience without a narrative. The decision to develop the first two version was made to account for the possibility, that effects on the instrumental and experiential task outcomes of the UO could stem from the existence of an onboarding experience, not from the use of narrative elements in UO. Additionally, to have a control group, the live version of the Scrumlr application, release 3.2.1, was included as a third version (C) for the pilot study (inovex GmbH et al., 2023).

How are the participants grouped for the evaluation? Items that can be used to group the participants are presented in the first part of the pilot study, in the form of a survey. Participants answer questions regarding their age, their familiarity with the agile methodology, their experience with the application Scrumlr, and the version of the UO that they are going to experience (Table 10). The main item in this part of the pilot study is the version of the UO that the participants choose as this allows a comparison of the experience of the different versions of UO, which is needed to validate the hypotheses. It is important to note that the participants do not which onboarding version the letters A, B, and C represent. After choosing one of the versions, they are presented with instructions that they must complete before continuing with the survey. These instructions are presented in Table 11. As version A and B include an onboarding experience, users are presented with the same instructions to ensure comparability of these versions. Version C, which does not include an onboarding experience uses a different set of instructions compared to version A and B. For version C, participants are tasked with exploring the application on their own for three to five minutes, because that was the time duration that it took test participants to complete the instructions for version A and version B.

How are the hypotheses validated? The hypotheses in chapter 3 correlate to the instrumental and experiential task outcomes of UO that were formulated in Figure 3. After completing their instructions in the second phase of the pilot study, the participants return to the survey to evaluate their experience with Scrumlr. The study participants encounter six sets of questions and statements that correlate with the different hypotheses (Table 12).

It Is Important to mention that for hypothesis H1a, which concerns the construct ‘user competence’, only one of its sub constructs, the construct ‘learning outcomes’, is evaluated in the pilot study. Due to limited time and resources, the construct ‘task proficiency’ is not included in the pilot study. To evaluate the ‘task proficiency’ of the participants after the onboarding, a more complex and controlled experiment environment would be required. The other hypotheses, H1b and H2a to H2d, are covered in their full form.

The construct ‘learning outcomes’ (H1a) is evaluated by three multiple choice questions that test if the user remembered the definition and goals of agile retrospectives and the names of the five common phases (Table 12). The answer options for the question items related to the ‘learning outcomes’ contain both the correct answer and several incorrect answers. To determine a ‘learning score’ for each participant, each correctly selected answer, the participant gains a point and for each incorrectly selected answer, the participant has one point deducted from their score (Table 14).

For the other constructs, namely ‘perceived ease of learning’ (H2a), ‘perceived ease of use’ (H2b), ‘perceived usefulness’ (H2c), ‘system use enjoyment’ (H2d), and ‘intention to use’ (H1b), the participants encounter a set of statements where they must evaluate their agreement to each statement using a seven-point Likert-Scale (Table 12). To ensure that each participant understands the different values of the Likert-Scale the same way, each set of statements included an explanation for the different values, which is depicted in Table 13.

At the end of the survey, participants can provide feedback regarding what they enjoyed the most or disliked during the onboarding and anything that they want to mention.

Figure 18 depicts the sequence of events of the pilot study.

5. Results

Distribution of the participants:

The pilot study was conducted from the fourth of July to the eleventh of July 2023. During this one-week timeframe, 30 participants (N=30) completed the pilot study, with eleven participants (N_A=11) choosing UO version A, eleven participants (N_B=11) choosing version B, and eight participants (N_C=8) completing version C. This resulted in a relatively even distribution of participants regarding the UO versions, which can be seen in Figure 19.

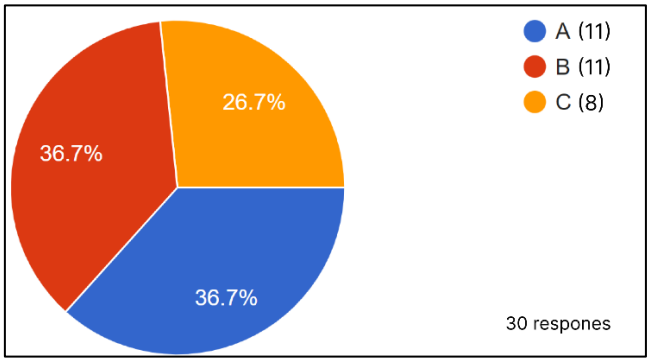


Figure 19: Results – Distribution of responses for Onboarding A, B, C

In section 4.3 it was stated that the hypotheses are validated by comparing the results of participants in the groups A, B, and C. Different items, such as 'intention to use' or 'perceived ease of use', correlate with different hypotheses from chapter 3.

Choosing the test functions for the analysis:

After the data was prepared for analysis, statistical tests had to be chosen to evaluate, whether the different UO versions resulted in significantly different construct scores. These statistical tests have to fit the structure of the data.

The goal of the analysis was to identify significant differences between the different groups of participants regarding the central tendencies (mean, median) of the construct scores. Because there are three groups, the ANOVA (Analysis of Variance) was identified as a promising statistical test (Universität Zürich, n.d.–a, p. 1; Walther, 2022a, pp. 1-2). In order to use ANOVA, the data must fulfill four preconditions.

Firstly, the dependent variable (the construct, e.g., 'perceived usefulness') must parametric, which means that differences can be compared or that there even is an absolute zero (Cornell University, 2016). Traditionally, the values of a Likert-Scale would be perceived as nominal- or ordinal-scaled since the difference between two values would likely not be interpreted equally by all participants. However, if one makes sure that the Likert-Scale is symmetrical and each value of the Likert-Scale is described to

the participants, it is permitted to use the response data from the Likert-Scale as if it was interval scaled (Grünwald, 2018, p. 2).

Secondly, the independent variable, which is the UO version that the participant chose must be nominal or ordinal scaled. That is the case for the data that is grouped by the different versions of the UO.

Thirdly, the residuals inside the groups must follow normal distribution. To test for normal distribution of the residuals, the Kolmogorov-Smirnov-Test or the Shapiro-Wilk-Test, which use the null hypothesis that the data is normally distributed, can be used (Walther, 2022d, p. 2). However, the most important sources that help with deciding whether a normal distribution exists may be the histogram and the Q-Q plot of the residuals, as big differences from the normal distribution can usually be identified visually.

The last precondition states that the error variances must be homogenous, which can be tested with the so called Levene-Test (Universität Zürich, n.d.–b, pp. 4, 13). The Levene-Test tests the null hypothesis that the error variance of the dependent variable is equal across groups. The Levene-Test is commonly conducted for both the mean and for the median, but the test based on the median is regarded as the more robust and preferred variation of the test (Walther, 2022c, p. 3).

If any of the preconditions are not fulfilled, one can use the Kruskal-Wallis-Test (KWT) instead of the ANOVA (Walther, 2022b, pp. 1-2). The only preconditions for the KWT are, that there are at least three groups that are compared, and that the dependent variable (the tested construct) is at least ordinal scaled.

When the preconditions of the ANOVA are fulfilled, the ANOVA uses the so called F-test to statistically test the equality of means (Singh, n.d., pp. 1-3). The F-Test, which is part of the between-subjects effects, tests the null hypothesis that the means of the groups are equal. Thus, to support the hypotheses, the null hypothesis of the F-Test must be rejected.

Validating the hypotheses:

The hypotheses H1 and H2 are not evaluated directly but through validation of their sub hypotheses.

> **H1a**: "*Using narratives in UO will improve user competence, comprised of* ***learning outcomes*** *and task proficiency, compared to using an onboarding approach without narratives or using no onboarding.*"

As stated in section 4.3, for hypothesis H1a only the influence of narratives on the learning outcomes are validated. To validate this part of hypothesis H1a, the mean learning scores of the groups A, B, and C are compared and tested for significant differences. Participants of group A achieved the highest learning scores on average with a mean of 7.09 points, followed by group B with a mean score of 6 points, and lastly group C with a mean score of 5.25 points (Figure 29). Thus, version A of the UO, which included narrative elements, performed best regarding the learning outcomes.

For the construct 'learning outcomes' the test for normal distribution in the residuals succeeded, as shown in Figure 31. While there is no perfect normal distribution of the residuals, both the Kolmogorov-Smirnov-Test ($p = .110$) and the Shapiro-Wilk-Test ($p = .229$) produced a significance higher than 0.05, thus supporting the null hypothesis of the existence of the normal distribution.

The Levene-Test for the 'learning outcomes' also supports the homogeneity of variances, both for the mean ($p = .132 > 0.05$) and for the median ($p = .404 > 0.05$) as depicted in Figure 33.

With this, the ANOVA can be used for the construct 'learning outcomes'. The test of between-subject effects ($p = .174$) supports the null hypothesis that the means of the different groups are equal (Figure 32). Therefore, the differences of the 'learning outcomes' scores of the different groups were not determined to be significantly and consequently, ***hypothesis H1a is not supported***.

> **H1b**: *Using narratives in UO will improve the **intention to use** the target system compared to an onboarding approach without narratives or using no onboarding.*

For the construct 'intention to use', participants of group A reported the highest intention to use (mean = 5.82), followed by group B (mean = 5.73) and then group C with a mean of 4.81.

The Kolmogorov-Smirnov-Test ($p = .040 < .05$) does not support a normal distribution of the residuals while the Shapiro-Wilk-Test ($p = .181$) does support the null hypothesis. Because the histogram only very roughly resembles a normal distribution, it was decided to not consider the residuals to be normally distributed. Therefore, not all preconditions for the ANOVA are fulfilled and the KWT is used. The KWT supports the null hypothesis that the distribution of 'intention to use' is the same across the categories A, B, and C, with a significance of $p = .221$, which is higher than 0.05, and consequently, ***hypothesis H1b is not supported***.

Because both, sub hypothesis H1a and sub hypothesis H1b, are not supported, ***hypothesis H1 is not supported***.

Hypothesis H1 not being supported means, that the differences between the groups A, B, and C, regarding the instrumental task outcomes of UO, are not significant.

While hypothesis H1 concerns the instrumental task outcomes of UO, hypothesis H2 concerns the experiential task outcomes.

> ***H2a**: Using narratives in UO will improve the **perceived ease of learning** of the target system compared to using an onboarding approach without narratives or using no onboarding.*

Participants that chose version A of the UO reported the highest 'perceived ease of learning' with a mean of 6.36 on the Likert-Scale. Participants of group B are in second place with a mean of 5.58, followed by the participants of group C with a mean of 5.5 (Figure 29). The Shapiro-Wilk-Test ($p = .010$) does not support the null hypothesis that assumes that the residuals are following a normal distribution and the histogram does not resemble a normal distribution (Figure 30). Therefore, the ANOVA can not be used and the KWT is used. The KWT ($p = .027 < .05$) rejects the null hypothesis that the distribution of 'perceived ease of learning' is the same across the groups of A, B, and C (Figure 34). Thus, there are significant differences between the groups and ***sub hypothesis H2a is supported***.

> ***H2b**: Using narratives in UO will improve the **perceived ease of use** of the target system compared to using an onboarding approach without narratives or using no onboarding.*

For 'perceived ease of use', members of group A (mean = 6.43) submitted the highest values, followed by group B with a mean of 5.77 and group C with a mean of 5.31 (Figure 29). While the tests for normal

distribution of residuals succeeds for ‘perceived ease of use’, which can be seen in Figure 31, the Levene-Test (p = .007 for the mean, p = .037 for the median) does not support the homogeneity of variances (Figure 33). Consequently, the KWT is used instead of the ANOVA.

The KWT (p = .014 < .05) shows significant differences in the central tendencies of the groups regarding ‘perceived ease of use’, as shown in Figure 34, and therefore, ***sub hypothesis H2b is supported***.

> ***H2c****: Using narratives in UO will improve the* ***perceived usefulness*** *of the target system compared to using an onboarding approach without narratives or using no onboarding.*

Participants in group A (UO with narrative elements) reported the highest ‘perceived usefulness’ with a mean of 5.5, followed by participants of group B (UO without narrative) with a mean of 4.89 and group C (no UO) with a mean of 4.88 (Figure 29). ANOVA can be used because the residuals are following normal distribution (Figure 31) and the Levene-Test (p=.731 for the mean and p=.757 for median > .05) supports the homogeneity of variance (Figure 33), thus fulfilling the preconditions of ANOVA. The F-Test produces a significance of p = .207, and therefore supports the null hypothesis that the differences between the groups are not significant (Figure 32). Because the differences between the groups A, B, and C are not regarded as significant, the ***sub hypothesis H2c is not supported***.

> ***H2d****: Using narratives in UO will improve the* ***system use enjoyment*** *of the target system compared to using an onboarding approach without narratives or using no onboarding.*

Particpants that chose version A of the UO reported the highest ‘system use enjoyment’ with a mean of 6.48, followed by participants that experienced version B of the UO with a mean of 5.52, and lastly participants that chose version C with a mean of 5.08 (Figure 29). Both the Levene-Test (p = .499 for the mean and p = .584 for the median > .05) for homogeneity in the variances and the tests for normal distribution in the residuals succeed and therefore ANOVA can be used (Figure 31, Figure 33). The F-Test (p = .003 << .05) of the ANOVA rejects the null hypothesis that the means of the groups A, B, and C regarding the construct ‘system use enjoyment’ are equal (Figure 32). The data confirms that the use of narratives in UO can significantly improve the ‘system use enjoyment’ that the user experiences. Thus, ***sub hypothesis H2d is supported***.

Hypothesis H2 concerns the experiential task outcomes of UO, and four sub hypotheses were chosen to evaluate the influence of narratives on these experiential task outcomes. The sub hypotheses H2a, H2b, and H2d are supported by the data of the pilot study while sub hypothesis H2c is not supported by the data. The use of narratives in UO can significantly improve three out of four selected constructs related to experiential task outcomes of UO. Therefore, ***hypothesis H2 is partially supported***.

While not all hypotheses were supported due to the differences between the groups A, B, and C not being significant, for each of the constructs related to the hypotheses, the results for participants of group A were the best, followed by participants of group B, and lastly participants of group C. Figure 35 displays line graphs for each of the constructs that show how version A of the UO, which includes narrative element, produced higher construct scores than version B, which does not use narrative elements, or version C that does not include a dedicated onboarding experience.

Table 9: Results – Validation of the Hypotheses

Hypothesis	Result
H1: *"Using narratives in UO will improve the **instrumental outcomes** of UO compared to using an onboarding approach without narratives or using no onboarding."*	Not Supported.
H1a: "*Using narratives in UO will improve **user competence**, comprised of learning outcomes and task proficiency, compared to using an onboarding approach without narratives or using no onboarding."*	Not Supported.
H1b: *"Using narratives in UO will improve the **intention to use** the target system compared to an onboarding approach without narratives or using no onboarding."*	Not Supported.
H2: *"Using narratives in UO will improve the **experiential outcomes** of UO compared to using an onboarding approach without narratives or using no onboarding."*	Partially supported.
H2a: "*Using narratives in UO will improve the **perceived ease of learning** of the target system com-pared to using an onboarding approach without narratives or using no onboarding.*"	Supported.
H2b: *"Using narratives in UO will improve the **perceived ease of use** of the target system compared to using an onboarding approach without narratives or using no onboarding."*	Supported.
H2c: *"Using narratives in UO will improve the **perceived usefulness** of the target system compared to using an onboarding approach without narratives or using no onboarding."*	Not Supported.
H2d: "*Using narratives in UO will improve the **system use enjoyment** of the target system compared to using an onboarding approach without narratives or using no onboarding."*	Supported.

In addition to data regarding the hypotheses, participants were able to optionally contribute feedback regarding "*What I liked the most*:", "*What I disliked the most*:", and "*What I want to mention*:". Table 15 displays the submitted answers for the feedback section of the survey.

One interesting observation is that participants in group A were most likely to submit feedback regarding what they liked the most, with eight out of the eleven participants submitting feedback. For group B only four out of eleven participants submitted positive feedback and for group C five out of eleven participants submitted positive feedback. For group A, most of the positive feedback concerns the design of the application. Four participants of group A also highlighted aspects of the UO, such as the user tasks, the reversibility of each step, or being provided contextual information before receiving tasks. Participants of version B on the other hand primarily highlighted the simplicity of the application and the duration of the UO as aspects that they liked and for version C, one of the participants highlighted the ability to explore on their own while the others appreciate the design of the application.

Only two out of eleven participants of group A submitted an answer regarding aspects of their experience that participants disliked, while there were four submissions for group B and five submissions for group C.

For group A, one of the eleven participants thought that the UO was too long while the other submission concerned a problem with one of the popups appearing partially out of view on their screen. For

group B, one participant did not understand how they could abort the onboarding while another participant considered the number of subsequent popups to be too high. Two participants from group C stated that they were not sure how to make use of the app as they did not really understand what the goal of Scrumlr is.

Regarding the last type of additional feedback, one participant in group A stated that they perceived Scrumlr to be a bit too "childish" with the colorful design as they prefer applications for work to be more serious. Another participant stated that the duration of the UO was a bit too long but fine due to the enjoyable experience as they liked reading the example chat modals that were used in version A. One participant of group C mentioned that an introductory page would have been helpful to them as they understood the functionality of Scrumlr but not the purpose.

6. Discussions

6.1. Principal Findings

The findings of this thesis implicate that the use of narratives can improve instrumental and significantly improve experiential outcomes of UO.

The research question aimed to investigate the influence of narratives on instrumental and experiential outcomes of UO in gamified IS. Three types of approaches to UO were distinguished and empirically investigated:

> ***A) Narrative User Onboarding***: This type of UO experience incorporates narrative elements such as story, characters, or environmental storytelling to make the onboarding process more engaging for the user and to better convey the value and context of the target system.
>
> ***B) Traditional (minimalistic) User Onboarding***: This version of UO provides a more conventional onboarding experience without or with limited use of narrative elements, that is instead focused on reducing the TtV as much as possible by introducing the user to the most important features of the application as quickly as possible.
>
> ***C) No dedicated User Onboarding***: The last type of UO is the base version of the target system that does not contain any dedicated UO process. It instead allows users to explore the target system on their own without specific guidance or tasks.

Guidelines, best practices, and risks in the domains of UO, gamification, and narratives were extracted from prior research and industry reports to gain an understanding of what one should consider when attempting to make use of narrative elements for UO (Chapter 2). The literature review further highlighted the importance of UO for the success of IS, and the immense potential of narratives to improve instrumental and experiential outcomes of UO.

Several instrumental and experiential task outcomes of UO were identified while inspecting prior literature (Figure 3). To make the evaluation feasible, a reduced number of constructs were chosen that were regarded as the most important experiential and instrumental outcomes of UO:

Instrumental Task Outcomes: The constructs 'user competence' comprised of 'learning outcomes' and 'task proficiency', and the 'intention to use' the target system were chosen to represent the instrumental outcomes of UO.

Experiential Task Outcomes: The constructs that were chosen to represent the experiential outcomes of UO were 'perceived ease of learning, 'perceived ease of use', 'perceived usefulness', and 'system use enjoyment'.

The two hypotheses of this thesis predict that the narrative UO approach (A) would perform better in instrumental and experiential outcomes compared to the other two approaches to UO that were considered in this work. For each of the constructs that represent the instrumental and experiential outcomes of UO, except for 'task proficiency', a sub hypothesis was formulated in order to allow to validate the influence of narratives on each of the constructs independently.

A pilot study was conducted to validate the hypotheses. Three versions of the application Scrumlr were designed and implemented, with each version corresponding to one of the three approaches to UO. Participants could choose one of three versions of the application Scrumlr: Version A that uses narrative elements, version B which provides a UO with limited use of narrative elements, and version C with no dedicated onboarding experience.

The results of the pilot study yield insights regarding the influence of narratives on instrumental and experiential task outcomes of UO:

Version A, the narrative user onboarding, achieved the ***highest scores for all six constructs*** that were used to validate the hypotheses.

Version B, the traditional, minimalistic, UO, achieved the ***second highest mean scores*** for each of the constructs.

Version C, which did not provide users with a dedicated UO process, had the ***lowest scores*** for each construct.

Though the ranking of the three approaches to UO regarding the construct scores aligned with the hypotheses, the tests for statistical significance of the differences between the groups (A, B, and C) only succeeded for the constructs 'perceived ease of learning' (H2a), 'perceived ease of use' (H2b), and 'system use enjoyment' (H2d). Thus, only ***hypothesis H2a, H2b, and H2d are supported***.

For the hypotheses H1a, H1b, and H2c, the data from the pilot study did not provide enough statistical evidence to confidently support the hypotheses.

It is important to note that not being able to support some of the hypotheses might be caused by the small sample size with only 30 participants which increases the possibility of so-called Type-II-Errors (Hayes et al., 2022, p. 1). A Type-II-Error is present when one fails to reject a null hypothesis that is actually false, and tests for significance use the null hypothesis, that there is no difference between the groups that are compared. The other possibility is that there really are no significant differences between the three approaches to UO regarding the constructs that correlate with the hypotheses that were not supported by the data.

The goal of this thesis is to answer the research question *"How does the use of narratives influence instrumental and experiential outcomes of user onboarding in gamified information systems?"*.
While it is not possible to give a definitive answer to this question due to several questions, the findings in this thesis strongly suggest that narratives can positively influence both instrumental and experiential outcomes of UO if they are designed with care and used in the right situations. Especially for the instrumental outcomes, most of the related constructs that were tested in the pilot study showed significant improvements for onboarding experiences that use narrative elements such as story or characters (Chapter 5).
The findings of this study indicate that even a simple narrative can improve the UO of a target system (Section 2.6, e.g., Langer et al., 2014, p. 7; Pivac & Granić, 2017, p. 1541). The results align with other researchers and industry practitioners who predict that most, if not all, IS can benefit from UO (Section 2.1.4, e.g., Balboni, 2022, p. 16).
Furthermore, the findings indicate that users will accepts a longer duration of the UO process when they encounter a more enjoyable and engaging experience in return. Especially the answers from the feedback section of the survey hint at this phenomenon (Table 15). While there was one participant in group A who criticized the duration of the UO, there was also one participant in group B who stated that the UO process was too long. On the other hand, one participant of group A even stated that they accepted the length of the UO because they enjoyed reading the example chats that were featured in version A of the UO for Scrumlr.

6.2. Theoretical and Practical Implications

The findings of this thesis contribute to a deeper understanding of how narratives can be effectively used in gamified IS, especially to enhance UO experiences.
The results of this work indicate that the use of narrative elements can improve experiential outcomes without compromising instrumental outcomes of UO. Especially the persuasive potential of narratives demands further investigation to ensure that narratives are designed to add value to users instead of being manipulative. This thesis provides further justification for the recently increasing interest of gamification researchers regarding the gamification element narrative.
The positive results of using narratives in UO support narratives being a viable approach to face some of the biggest challenges in UO, conveying the value of the IS and providing sufficient information to new users without making the process boring or annoying for the users. Thus, industry practitioners and researchers should welcome the option of using narrative elements when designing UO experiences for IS. Through more data from additional use cases, a more comprehensive understanding of how and when narratives can improve UO could be obtained.
Designers of UO experiences often focus on reducing the TtV as much as possible, but through providing a more engaging and enjoyable experience to the users, a longer duration of the onboarding experience might be accepted by many of the users. One should be careful not to confuse the TtV with the

duration of the onboarding process. The TtV concerns the time that it takes for the user to experience and understand the value of the target system. The TtV might be longer for a shorter, less engaging, UO process than for a longer, highly engaging, and enjoyable, UO process.
Especially when the IS already uses some gamification elements, such as avatars or uses some characters or mascots, designers of gamification and IS should consider how narrative elements could make use of these characters and elements to improve the experience for the user.

6.3. Future Research & Limitations

The author acknowledges several limitations of this work.
1) Firstly, the use of narratives in gamification has only gained attention in recent years, as explored in section 2.5 of this work. Consequently, the number of studies that explore the abilities of the gamification element narrative are limited. There is still no uniform theory on narratives in gamification and due to the vast differences between different types of IS, it is not clear if something like a uniform theory can even exist. Future research should continue to explore the influence of narratives in a vast variety of application contexts and use cases to gain more data on how narratives can be utilized to provide value for both the users and the designers of IS.
2) Secondly, when developing narratives for UO and gamified IS, there are near endless possibilities regarding the narrative content and narrative discourse that were introduced in section 2.4.2. While this worked used a simple narrative with a reduced amount of fantasy elements, there may be unexpected results when one uses a different type of narrative. The narrative in version A of the UO experience that was designed for the pilot study primarily conveyed the narrative content through a textual representation in the form of a chat between the team members in the story and through a kind of environmental storytelling by making use of the board columns and notes. However, there are other options that one could choose to represent a narrative, e.g., using audio and video elements. It is primarily known that the narrative should fit the target system and the tasks that the user must perform but the number of examples, which one can reference to guide their own design process, is limited (Section 2.5). Future research should utilize different combinations of narrative content and narrative discourse to gain further understanding regarding which combinations of content and discourse perform the best in different scenarios.
3) Thirdly, the sample size for the pilot study was relatively small and most of the participants were fellow students or co-workers of the author, located in Germany. The approach that was chosen for recruiting participants for the pilot study ensured that all participants fit the criteria for target participants, which were defined in section 4.3. However, it is possible that the results would be different for a group of participants with a different cultural background. For future research, one should consider repeating the experiment with different demographic clusters of participants to help identify additional characteristics that may determine the impact of narratives on instrumental and experiential outcomes, and to help understand which types of narratives may be most suitable for different types of users. Moreover,

a larger sample size could increase the reliability of the results, as potential bias caused by outliers could be reduced. Using a bigger sample size would decrease the influence of outliers and could help to understand whether the hypotheses H1a, H1b, and H2c were not supported due to there not being a significant difference between the different versions of the UO or due to a Type-II-Error caused by the small sample size.

4) Fourth, it was stated in section 2.1.3 that UO encompasses more than just the introduction phase of an IS. UO rather presents itself as a continuous process throughout the whole user journey which includes help and support while regular users interact with the IS and a re-engagement phase to reactive users that have not been active within the IS for some time. Future research should also consider how the use of narrative elements can impact the other phases of UO, apart from the introduction phase to gain a more complete understanding of the overall influence that narratives can have on the success of UO and the target system. It seems possible that users may be more likely to react to re-engagement efforts when these include characters and themes that are familiar to them, as they already encountered these narrative elements when they were first introduced to the IS.

7. Conclusion

In this work, the influence of narratives on instrumental and experiential outcomes of UO was explored. To answer the research question regarding the influence of narratives on the experiential and instrumental outcomes of UO, first, existing literature on the topics UO, gamification, and narratives was collected and analyzed to extract valuable insights on what one can expect from the use of narratives as a gamification element in UO and how one should design such UO experiences. Secondly, hypotheses were formulated based on the findings of the literature review with sub hypotheses that concern specific constructs related to the experiential and instrumental outcomes of UO (Chapter 3, Figure 3). Using the insights from the literature review, two versions of a UO experience for the application Scrumlr, a tool for online collaboration and retrospectives, were designed and implemented. To validate the hypotheses, a pilot study was conducted which used the two developed versions of the UO for the use case Scrumlr and the base version of the target system. Participants of the pilot study encountered one of the three versions of the application and their experience was evaluated.

Analyzing the data from the pilot study revealed that the use of narratives do significantly improve most of the constructs that were chosen to represent the experiential outcomes of UO, supporting the hypotheses H2a, H2b, and H2d (Chapter 3, 5). While the data did not provide enough evidence for significant improvements for the constructs related to the instrumental outcomes of UO, the narrative approach to UO still produced the highest construct scores out of the three versions of the application.

Overall, as the findings of this work suggest that even simple narratives can improve the UO of the target system, the author thinks that there is immense positive potential in using narratives in the domains of gamification and UO which is yet to be fully explored.

The author of this thesis encourages future research to further investigate how narrative elements can be used to improve UO, how they influence instrumental and experiential outcomes in detail, and how they may be able to improve the whole target system beyond just the UO.

Appendix

A. Onboarding A – Narrative Onboarding

Figure 20: User Onboarding A – Introduction

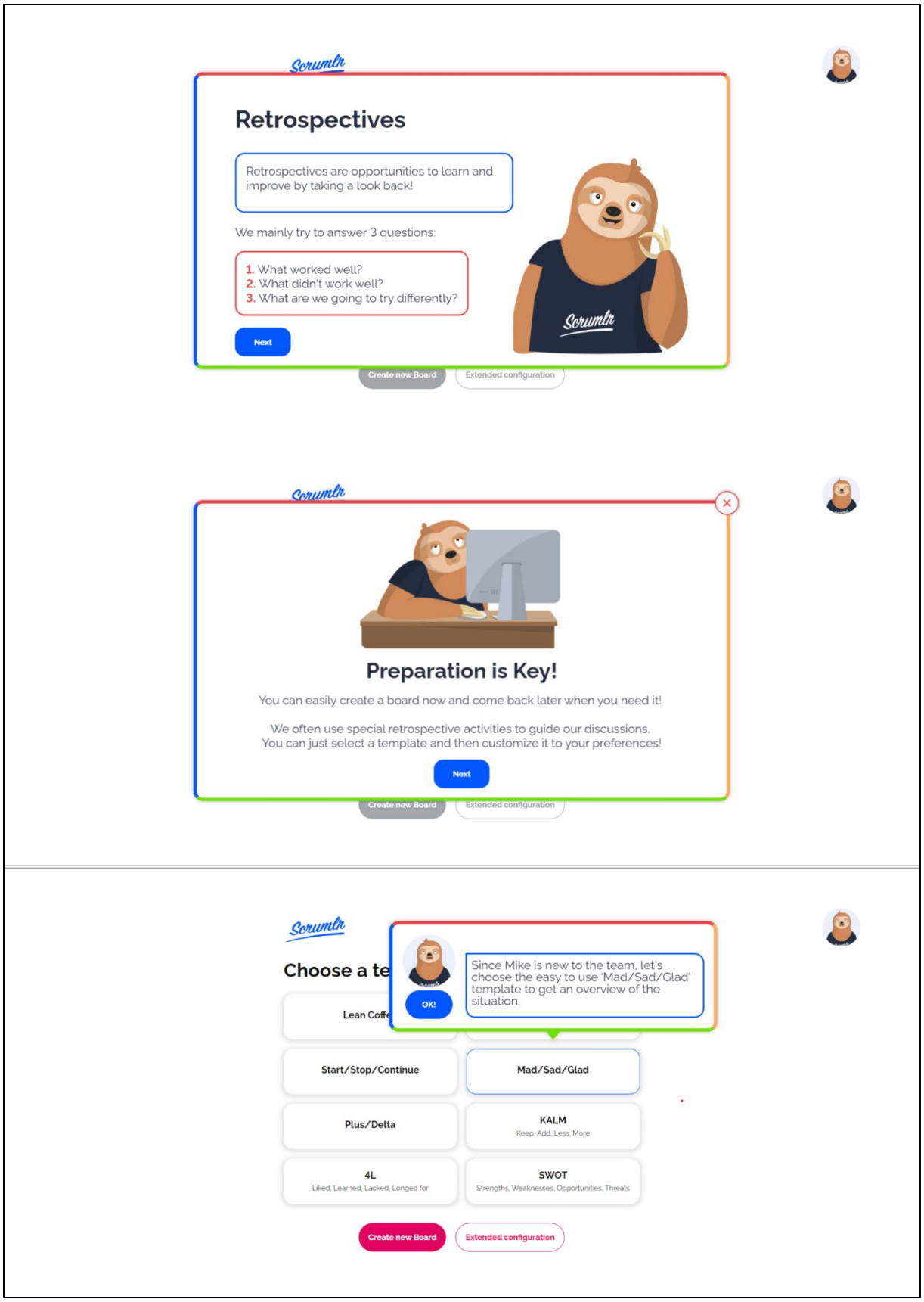


Figure 21: User Onboarding A – Create new Board

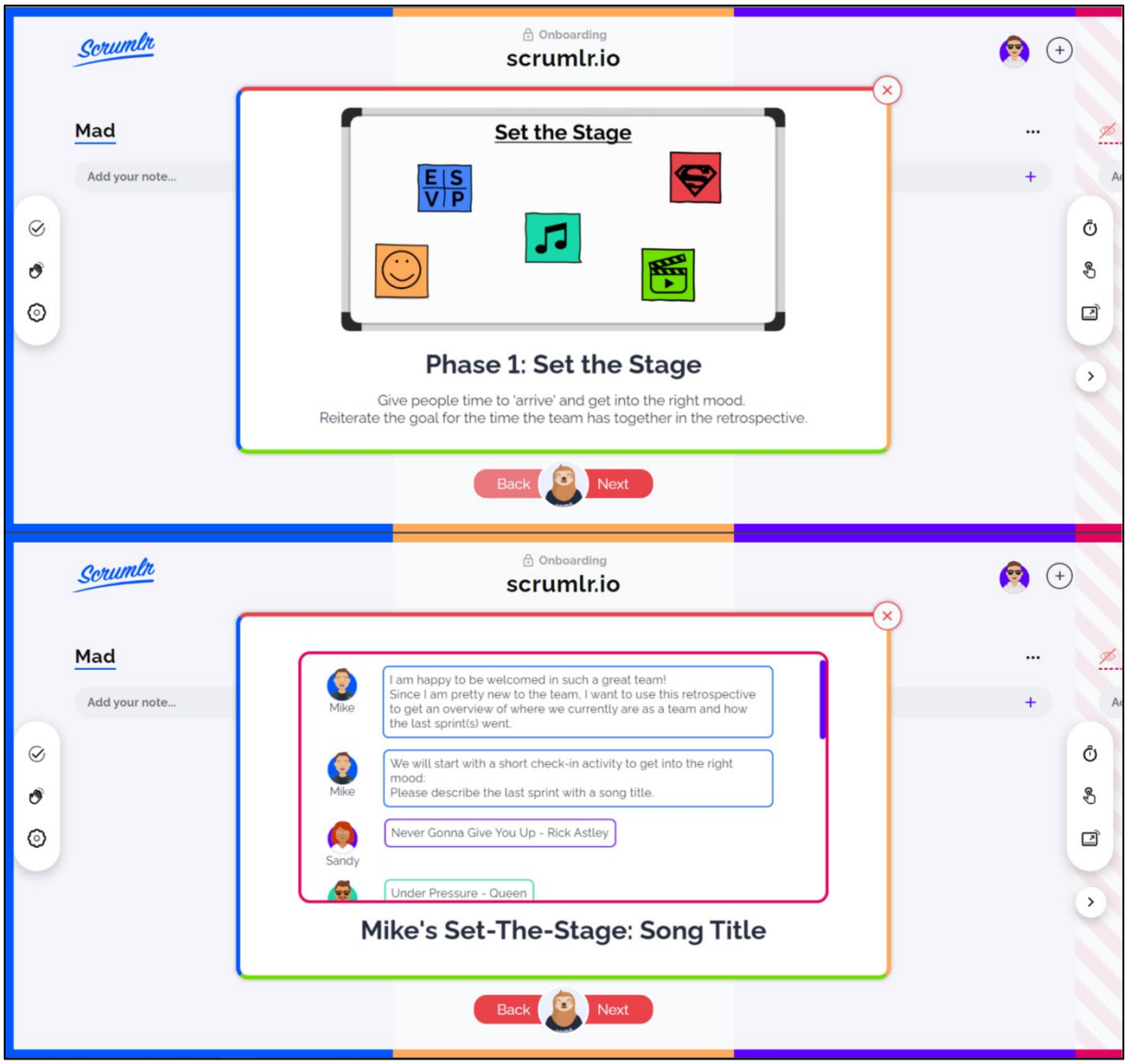


Figure 22: User Onboarding A – Set the Stage

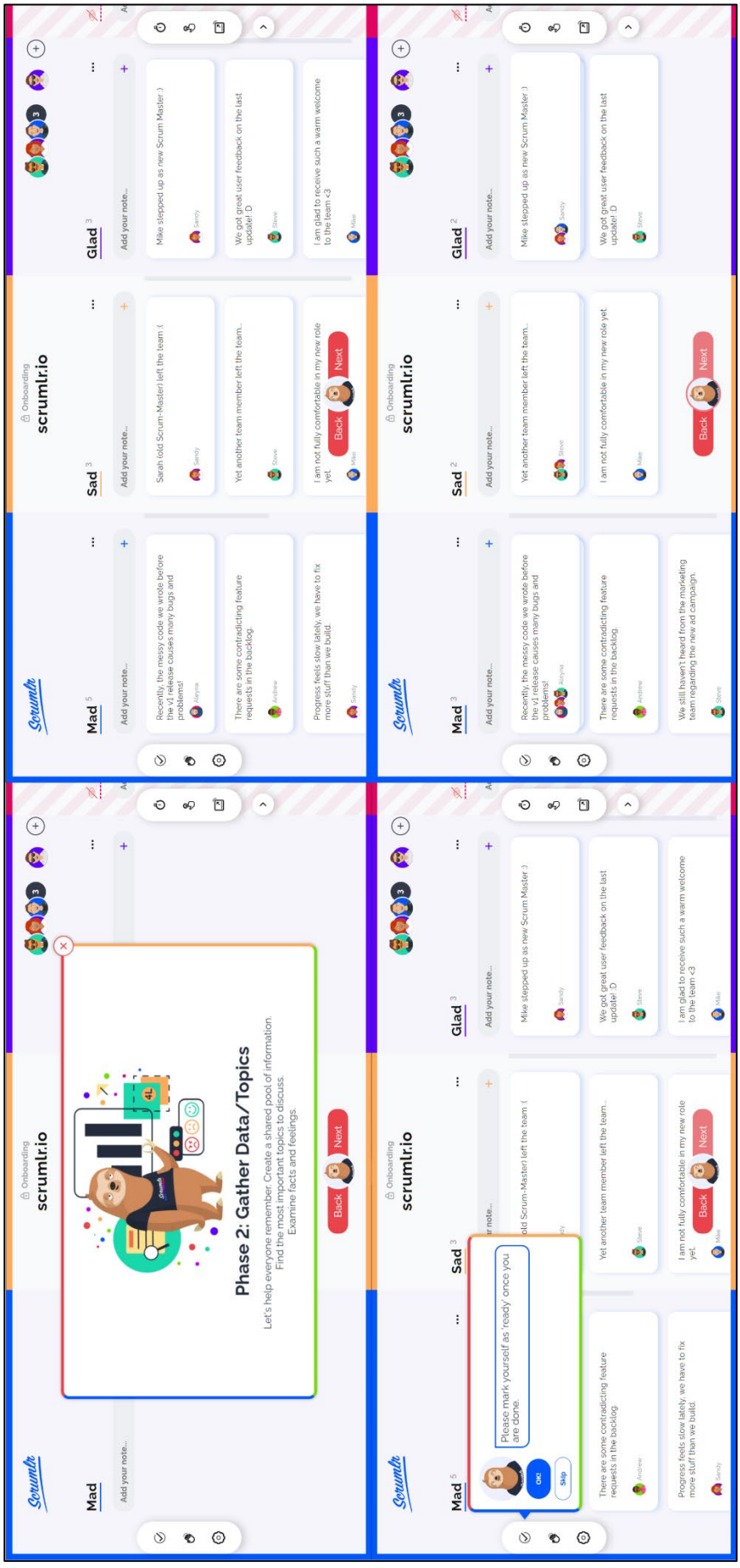


Figure 23: User Onboarding A – Gather Data

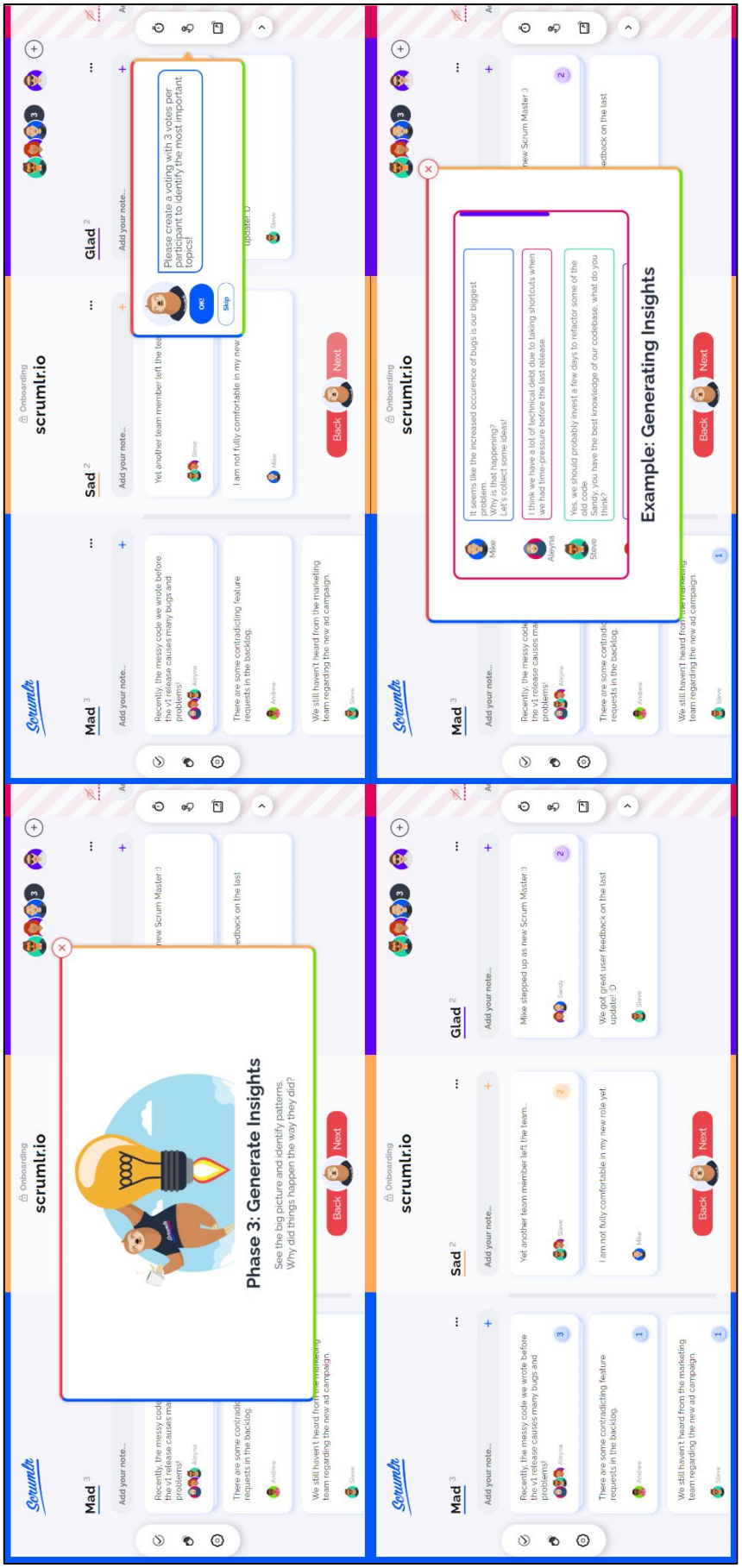


Figure 24: User Onboarding A – Generate Insights

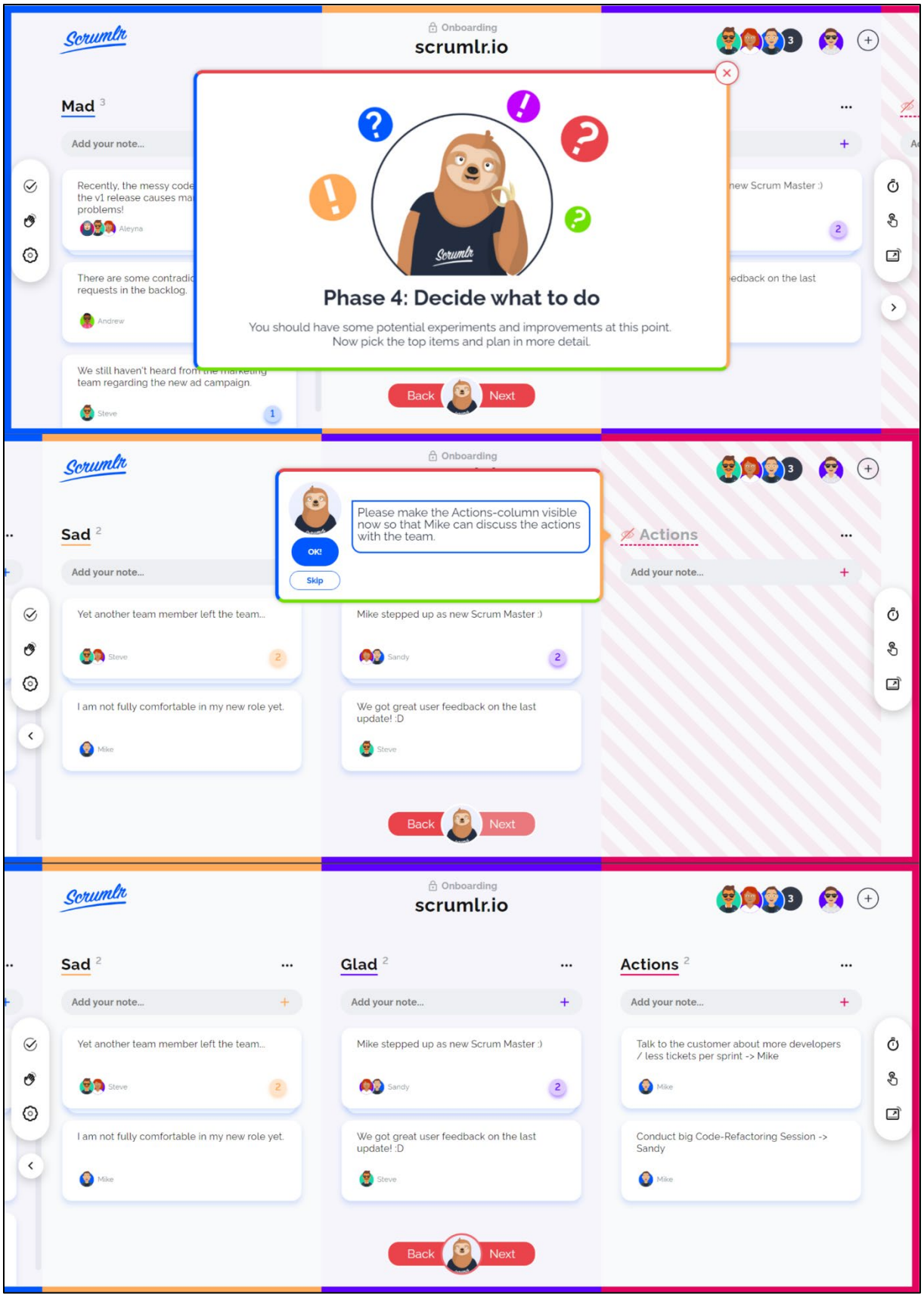


Figure 25: User Onboarding A – Decide What to Do

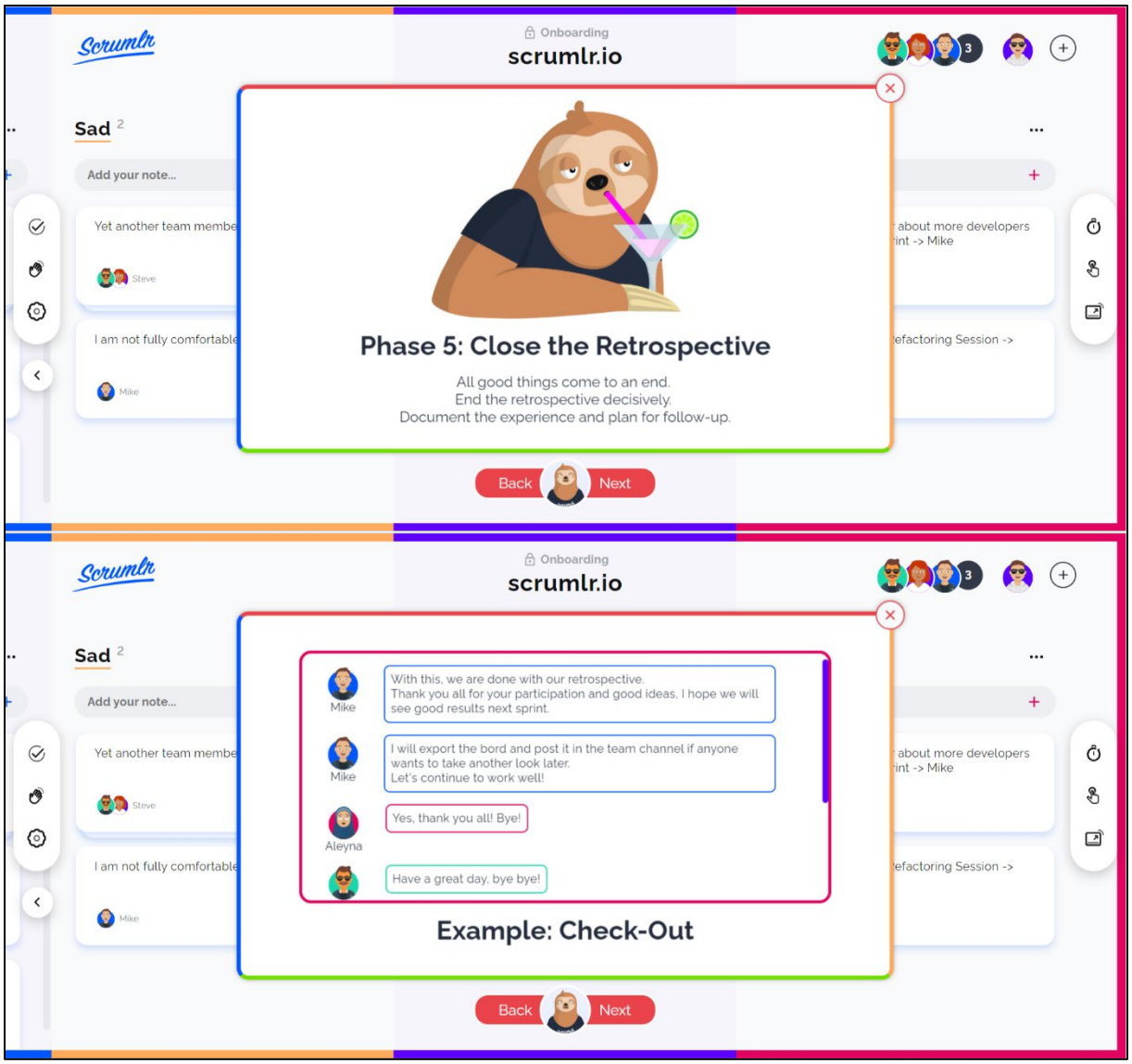


Figure 26: User Onboarding A – Close the Retrospective

B. Onboarding B – Onboarding without Narrative

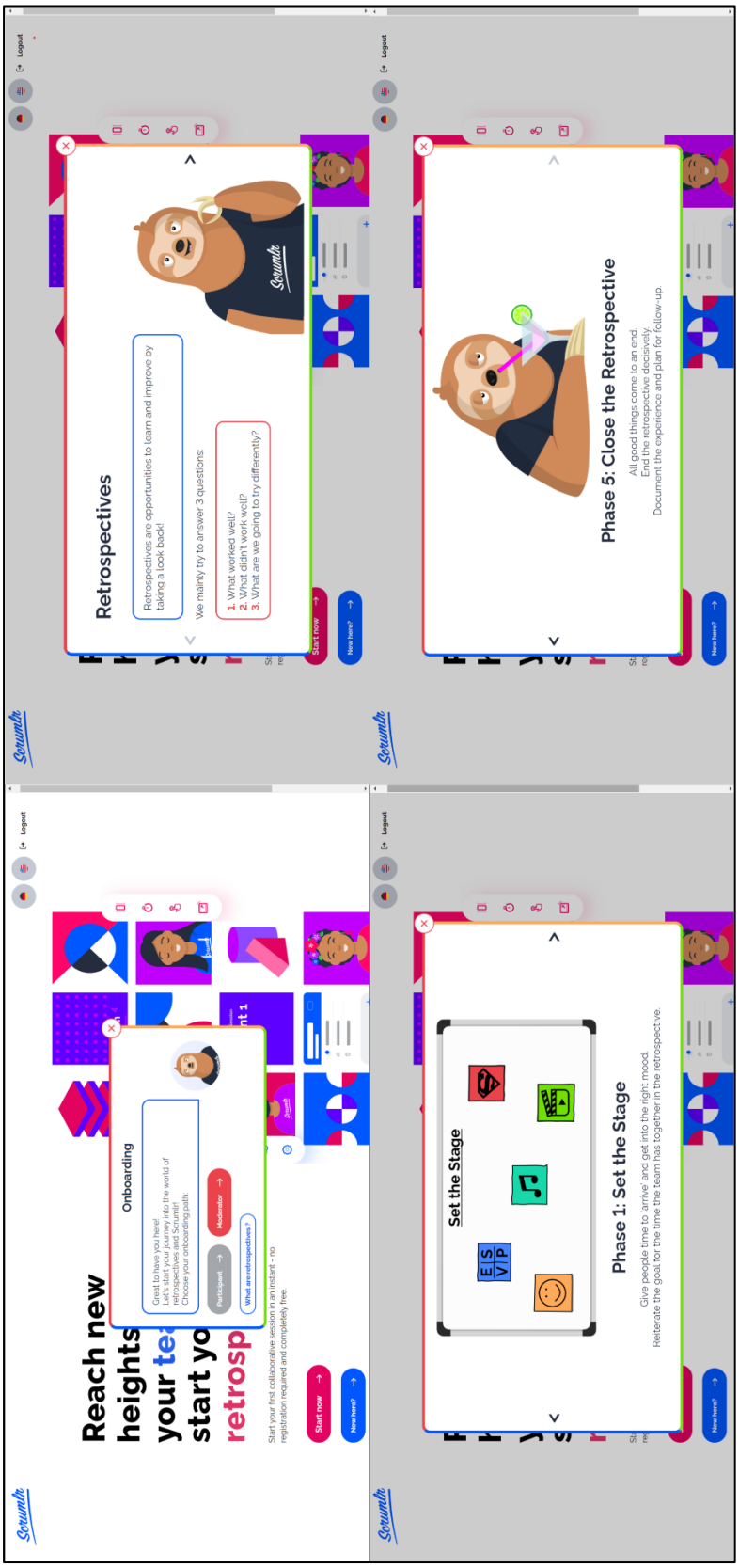


Figure 27: User Onboarding B – Optional Retrospective Explanation

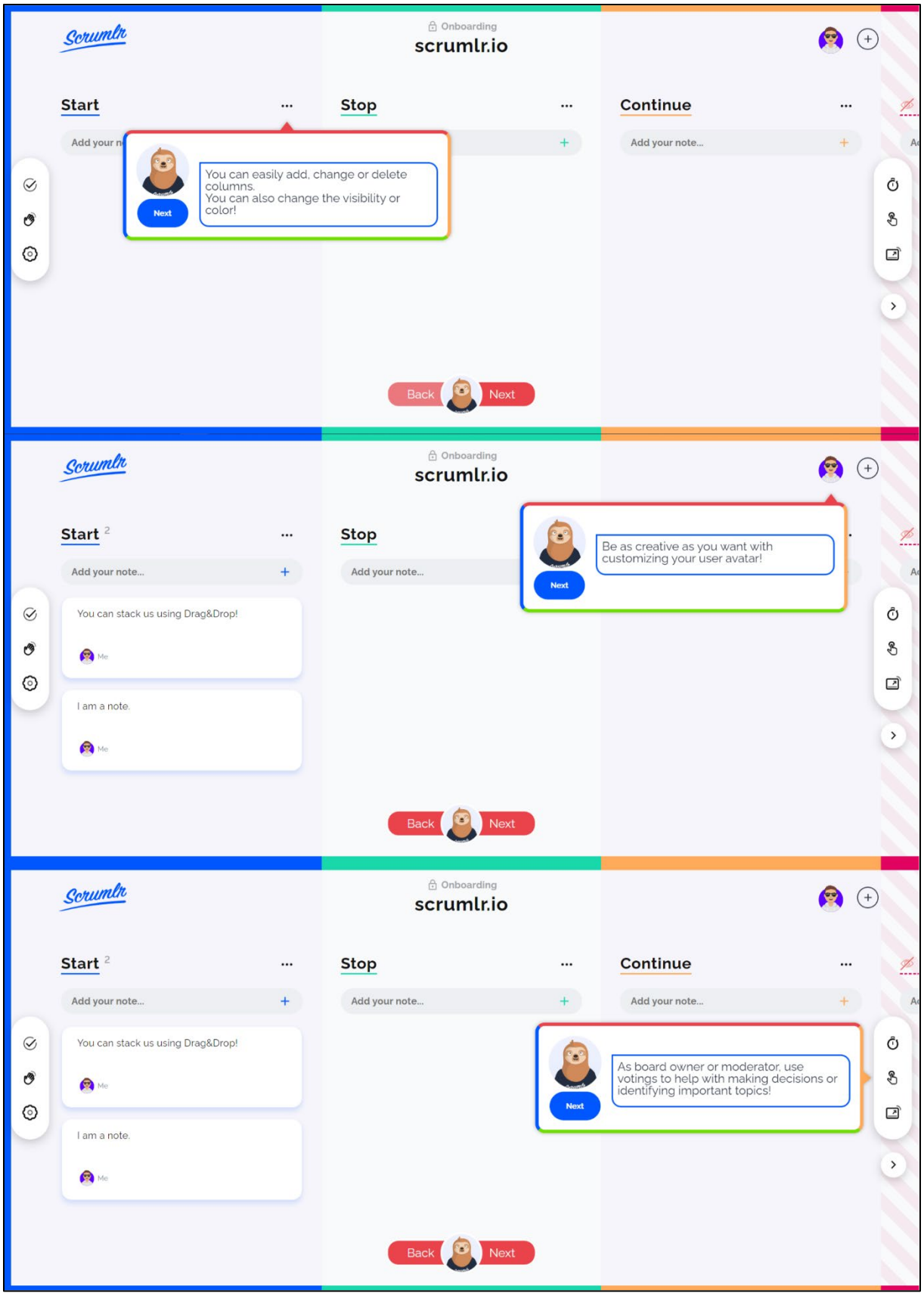


Figure 28: User Onboarding B – Tooltip Examples

C. Pilot Study - Survey

Table 10: Survey - Survey Items for grouping Participants

Construct	Survey Item	Measurement Scale
Age	• What is your age?	Multiple Choice (<20; 20-30; 31-50; 51-65; >65)
Retrospective Familiarity	• I am familiar with agile retrospectives.	Seven Point Likert-Scale
Scrumlr Experience	• I have used Scrumlr.io before. • I have moderated a session in Scrumlr.io before.	Multiple Choice (Yes / No)
Onboarding Version	• Choose either A, B, or C	Multiple Choice (A / B / C)

Table 11: Survey - Participant Instructions for the different Onboarding Versions

Onboarding Version	***Please follow the instructions below:***
A	1. Open the following link in a new tab: *Scrumlr.io* 2. Once on the homepage of the Scrumlr application, click on the button 'New here?'. 3. Complete the user onboarding for 'moderators'. 4. After finishing the user onboarding, come back here and go to the next section of the survey.
B	
C	1. Open the following link in a new tab: Scrumlr.io 2. Set yourself a timer of 3-5 minutes and explore the application Scrumlr. 3. Come back here once you are done and go to the next section.

Table 12: Survey - Tested Constructs with Question Items and References (in-order)

Construct	Questions	Measurement Scale	References
Learning Outcomes	1. What are (agile) retrospectives? 2. Which questions do retrospectives try to answer? 3. Which of these phases do commonly exist in an (agile) retrospective?	Multiple Choice	Self-developed
Perceived Ease of Learning	1. I learned to use Scrumlr.io quickly. 2. I easily remember how to use Scrumlr.io. 3. It is easy to learn to use Scrumlr.io.	Seven Point Likert-Scale	Lund, 2001, p. 4
Perceived Usefulness	1. Using Scrumlr.io improves my performance in my job. 2. Using Scrumlr.io in my job increases my productivity. 3. Using Scrumlr.io enhances my effectiveness in my job. 4. I find Scrumlr.io to be useful in my job.	Seven Point Likert-Scale	Venkatesh, 2000, p. 360; Venkatesh & Davis, 2000, p. 201

Perceived Ease of Use	1. My interaction with Scrumlr.io is clear and understandable. 2. Interacting with Scrumlr.io does not require a lot of my mental effort. 3. I find Scrumlr.io to be easy to use. 4. I find it easy to get Scrumlr.io to do what I want.	Seven Point Likert-Scale	Venkatesh, 2000, p. 360; Venkatesh & Davis, 2000, p. 201
System Use Enjoyment	1. I find using Scrumlr.io to be enjoyable. 2. The actual process of using Scrumlr.io is pleasant. 3. I have fun using Scrumlr.io.	Seven Point Likert-Scale	Venkatesh, 2000, pp. 360-361
Intention to Use	1. Assuming I have access to the system (Scrumlr.io), I intend to use it. 2. Given I have access to the system (Scrumlr.io), I predict that I would use it.	Seven Point Likert-Scale	Venkatesh, 2000, p. 360; Venkatesh & Davis, 2000, p. 201

Table 13: Survey – Seven Point Likert-Scale Legend (Venkatesh & Davis, 2000, p. 201)

Likert Scale Value	Description
1	Strongly Disagree
2	Moderately Disagree
3	Somewhat Disagree
4	Neutral
5	Somewhat Agree
6	Moderately Agree
7	Strongly Agree

Table 14: Survey - Answer options and grading of the construct 'learning outcomes'

Question	Answer Options	Points
What are (agile) retrospectives?	A look back at work items that were completed during the last Sprint	-1
	A daily inspect & adapt meeting for the developers of the scrum team.	-1
	An opportunity to learn and improve as a team by taking a look back.	***+1***
	The process of planning the work for the next work period.	-1
	An opportunity to call out individuals that caused problems during the las work period.	-1
Which questions do retrospectives try to answer?	*What worked well?*	***+1***
	What did not work well?	***+1***
	What are we going to try differently?	***+1***
	How many features did we implement?	-1
	What features should be implemented next?	-1
	Who made the biggest mistakes?	-1
	Who are we going to hire?	-1
Which of these phases do commonly exist in an (agile) retrospective?	*Set the Stage.*	***+1***
	Gather Data / Topics.	***+1***
	Generate Insights.	***+1***

	Decide what to do.	***+1***
	Close the Retrospective.	***+1***
	Find the problem makers.	-1
	Remove technical debt / refactor old code.	-1
	Decide on the next work items.	-1
	Interview new developers.	-1
	Distribute the work.	-1

D. Results

Descriptive Statistics

Dependent Variable: Learning Outcomes

Choose either A, B, or C:	Mean	Std. Deviation	N
Narrative Onboarding	7,09	2,023	11
Onboarding Without Narrative	6,00	2,449	11
No Onboarding	5,25	1,581	8
Total	6,20	2,156	30

Dependent Variable: Intention to Use

Choose either A, B, or C:	Mean	Std. Deviation	N
Narrative Onboarding	5,8182	1,14614	11
Onboarding Without Narrative	5,7273	1,03353	11
No Onboarding	4,8125	1,41263	8
Total	5,5167	1,22110	30

Dependent Variable: Perceived Ease of Learning

Choose either A, B, or C:	Mean	Std. Deviation	N
Narrative Onboarding	6,3636	,37873	11
Onboarding Without Narrative	5,5758	,70065	11
No Onboarding	5,5000	,99203	8
Total	5,8444	,78654	30

Dependent Variable: Perceived Usefulness

Choose either A, B, or C:	Mean	Std. Deviation	N
Narrative Onboarding	5,5000	,78262	11
Onboarding Without Narrative	4,8864	1,06867	11
No Onboarding	4,8750	,75593	8
Total	5,1083	,91370	30

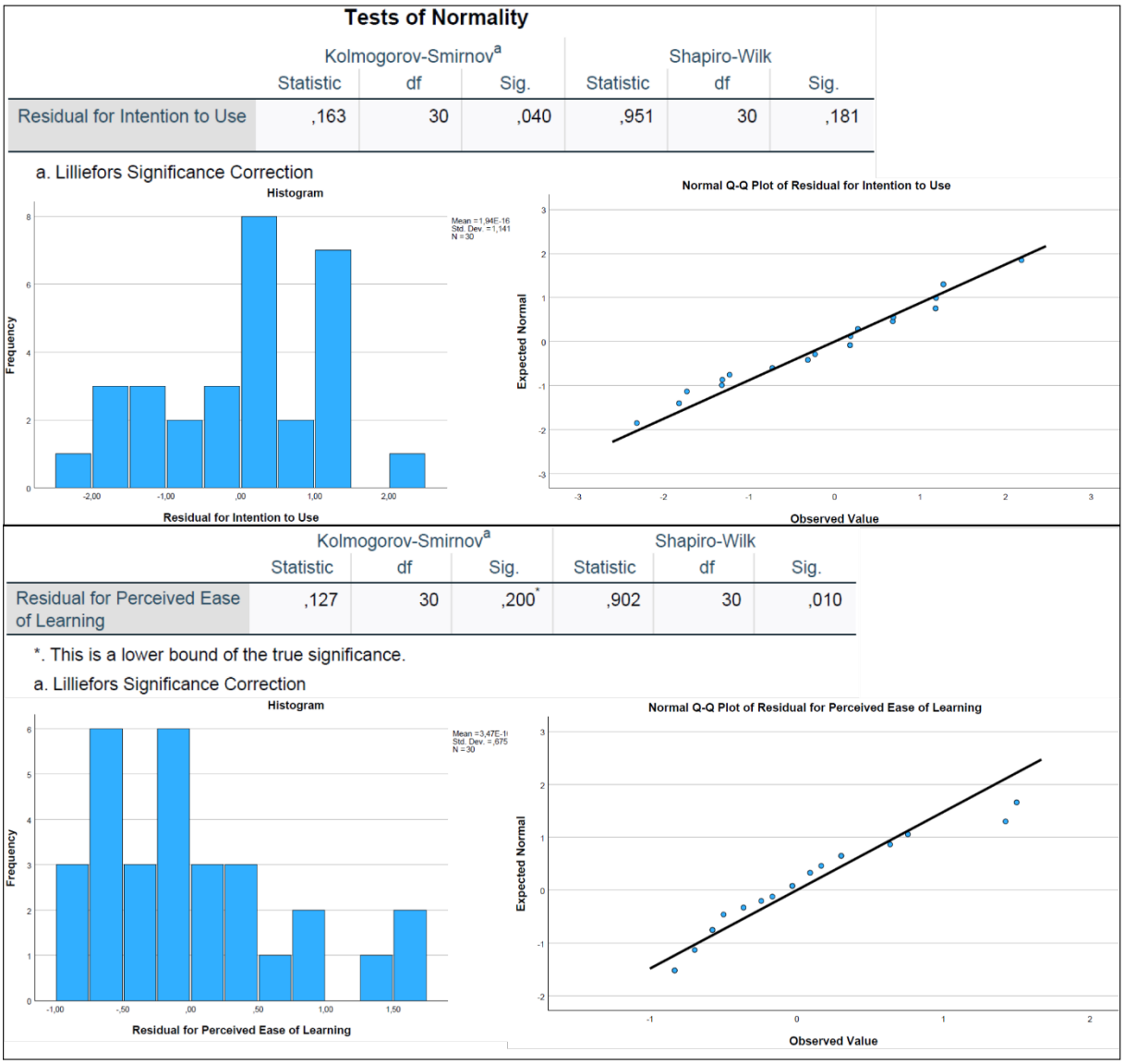
Dependent Variable: Perceived Ease of Use

Choose either A, B, or C:	Mean	Std. Deviation	N
Narrative Onboarding	6,4318	,25226	11
Onboarding Without Narrative	5,7727	,70227	11
No Onboarding	5,3125	,95197	8
Total	5,8917	,78697	30

Dependent Variable: System Use Enjoyment

Choose either A, B, or C:	Mean	Std. Deviation	N
Narrative Onboarding	6,4848	,70496	11
Onboarding Without Narrative	5,5152	,94708	11
No Onboarding	5,0833	,86831	8
Total	5,7556	1,00548	30

Figure 29: Results – Descriptive Statistics for Onboarding A, B, C



Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for Intention to Use	,163	30	,040	,951	30	,181

a. Lilliefors Significance Correction

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for Perceived Ease of Learning	,127	30	,200*	,902	30	,010

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Figure 30: Results – ANOVA failed Tests for Normal Distribution of Residuals

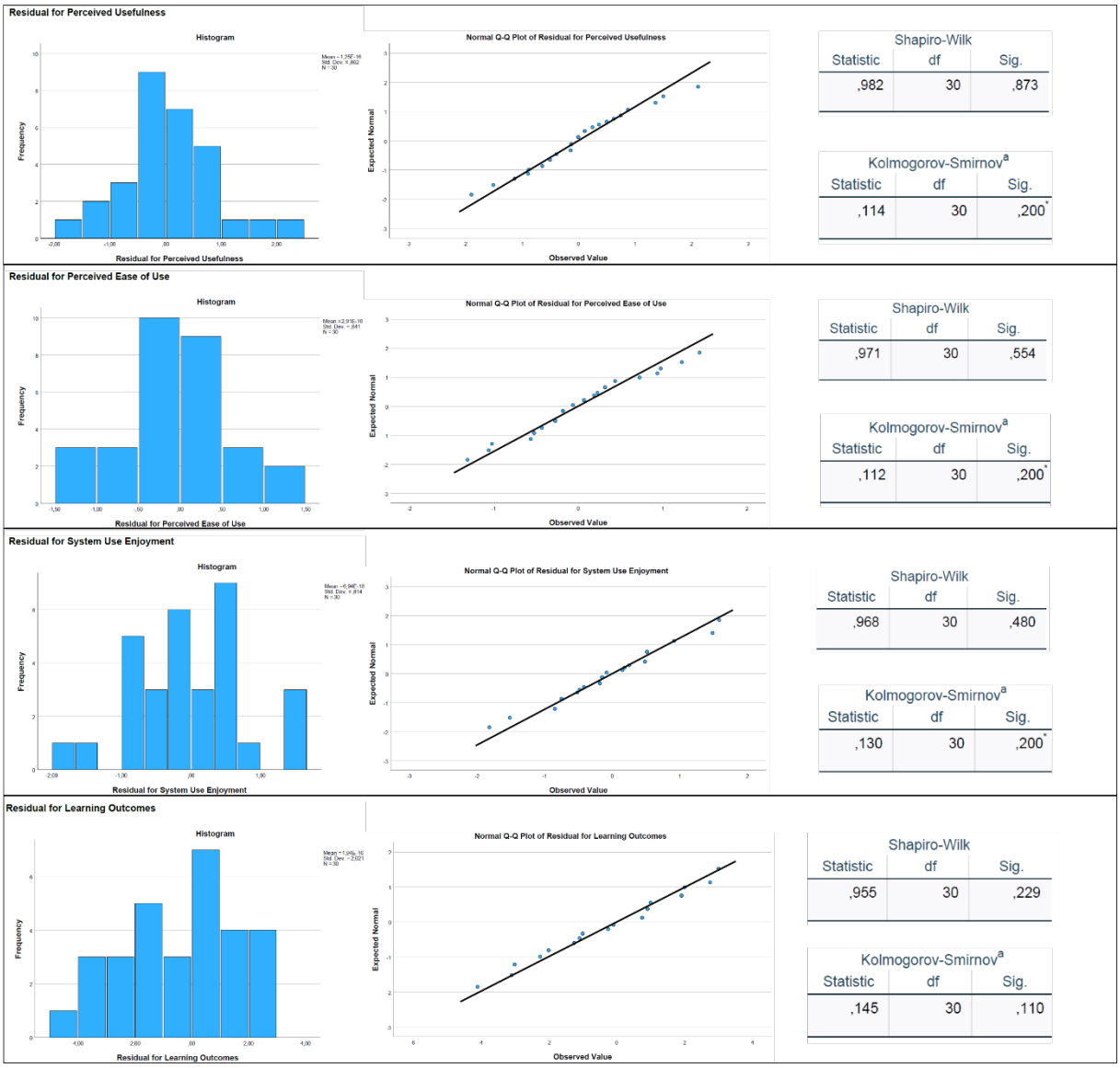


Figure 31: Results – ANOVA successful Tests for Normal Distribution of Residuals

Tests of Between-Subjects Effects

Dependent Variable: Learning Outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	16,391[a]	2	8,195	1,869	,174	,122
Intercept	1096,379	1	1096,379	250,000	<,001	,903
ABC	16,391	2	8,195	1,869	,174	,122
Error	118,409	27	4,386			
Total	1288,000	30				
Corrected Total	134,800	29				

a. R Squared = ,122 (Adjusted R Squared = ,057)

Dependent Variable: Intention to Use

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5,455[a]	2	2,727	1,949	,162	,126
Intercept	872,121	1	872,121	623,159	<,001	,958
ABC	5,455	2	2,727	1,949	,162	,126
Error	37,787	27	1,400			
Total	956,250	30				
Corrected Total	43,242	29				

a. R Squared = ,126 (Adjusted R Squared = ,061)

Dependent Variable: Perceived Ease of Learning

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4,708[a]	2	2,354	4,804	,016	,262
Intercept	991,247	1	991,247	2022,597	<,001	,987
ABC	4,708	2	2,354	4,804	,016	,262
Error	13,232	27	,490			
Total	1042,667	30				
Corrected Total	17,941	29				

a. R Squared = ,262 (Adjusted R Squared = ,208)

Dependent Variable: Perceived Usefulness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2,665[a]	2	1,332	1,670	,207	,110
Intercept	759,112	1	759,112	951,292	<,001	,972
ABC	2,665	2	1,332	1,670	,207	,110
Error	21,545	27	,798			
Total	807,063	30				
Corrected Total	24,210	29				

a. R Squared = ,110 (Adjusted R Squared = ,044)

Dependent Variable: System Use Enjoyment

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10,101[a]	2	5,051	7,096	,003	,345
Intercept	951,183	1	951,183	1336,406	<,001	,980
ABC	10,101	2	5,051	7,096	,003	,345
Error	19,217	27	,712			
Total	1023,111	30				
Corrected Total	29,319	29				

a. R Squared = ,345 (Adjusted R Squared = ,296)

Figure 32: Results – ANOVA Tests of Between-Subjects Effects for Onboarding A, B, C

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	2,188	2	27	,132
	Based on Median	,938	2	27	,404
	Based on Median and with adjusted df	,938	2	23,706	,406
	Based on trimmed mean	2,165	2	27	,134

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Learning Outcomes

b. Design: Intercept + ABC

		Levene Statistic	df1	df2	Sig.
Intention to Use	Based on Mean	,260	2	27	,773
	Based on Median	,310	2	27	,736
	Based on Median and with adjusted df	,310	2	25,802	,736
	Based on trimmed mean	,267	2	27	,768

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Intention to Use

b. Design: Intercept + ABC

		Levene Statistic	df1	df2	Sig.
Perceived Ease of Learning	Based on Mean	4,409	2	27	,022
	Based on Median	2,380	2	27	,112
	Based on Median and with adjusted df	2,380	2	18,269	,121
	Based on trimmed mean	4,026	2	27	,030

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Perceived Ease of Learning

b. Design: Intercept + ABC

Dependent Variables	Methods	Levene Statistic	df1	df2	Sig.
Perceived Ease of Use	Based on Mean	6,052	2	27	,007
	Based on Median	3,726	2	27	,037
	Based on Median and with adjusted df	3,726	2	18,497	,044
	Based on trimmed mean	5,963	2	27	,007

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Perceived Ease of Use

b. Design: Intercept + ABC

		Levene Statistic	df1	df2	Sig.
Perceived Usefulness	Based on Mean	,317	2	27	,731
	Based on Median	,282	2	27	,757
	Based on Median and with adjusted df	,282	2	23,112	,757
	Based on trimmed mean	,311	2	27	,736

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Perceived Usefulness

b. Design: Intercept + ABC

Dependent Variables	Methods	Levene Statistic	df1	df2	Sig.
System Use Enjoyment	Based on Mean	,713	2	27	,499
	Based on Median	,549	2	27	,584
	Based on Median and with adjusted df	,549	2	26,704	,584
	Based on trimmed mean	,709	2	27	,501

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: System Use Enjoyment

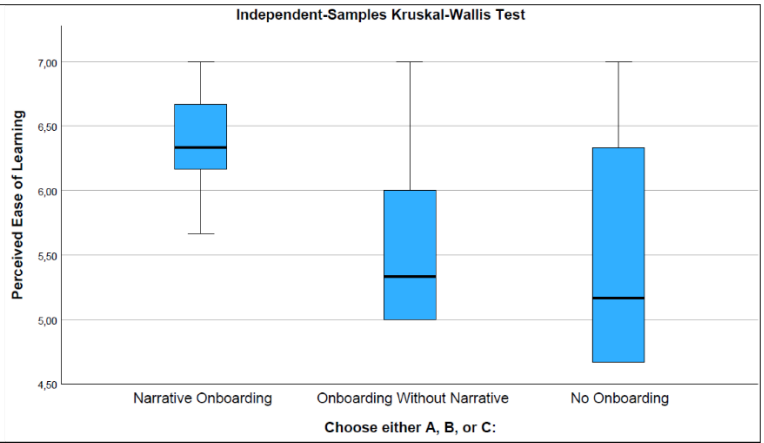
b. Design: Intercept + ABC

Figure 33: Results – ANOVA Levene Test for Onboarding A, B, C

Null Hypothesis	The distribution of Perceived Ease of Learning is the same across categories of Choose either A, B, or C:.
Test	Independent-Samples Kruskal-Wallis Test
Sig.[a,b]	,027
Decision	Reject the null hypothesis.

a. The significance level is ,050.

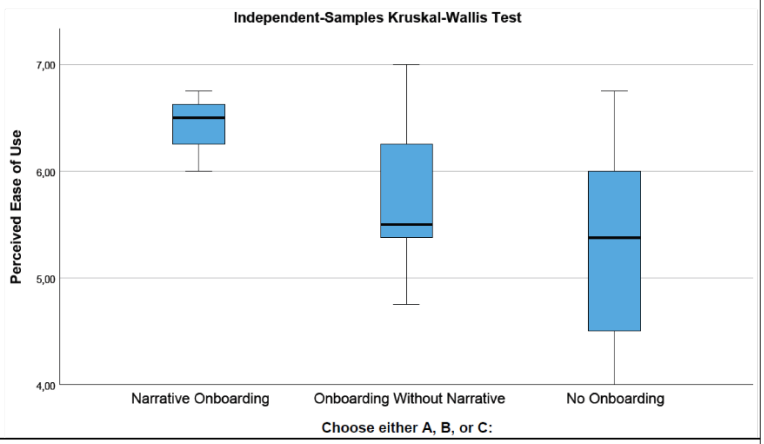
b. Asymptotic significance is displayed.



Null Hypothesis	The distribution of Perceived Ease of Use is the same across categories of Choose either A, B, or C:.
Test	Independent-Samples Kruskal-Wallis Test
Sig.[a,b]	,014
Decision	Reject the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.



Null Hypothesis	The distribution of Intention to Use is the same across categories of Choose either A, B, or C:.
Test	Independent-Samples Kruskal-Wallis Test
Sig.[a,b]	,221
Decision	Retain the null hypothesis.

a. The significance level is ,050.

b. Asymptotic significance is displayed.

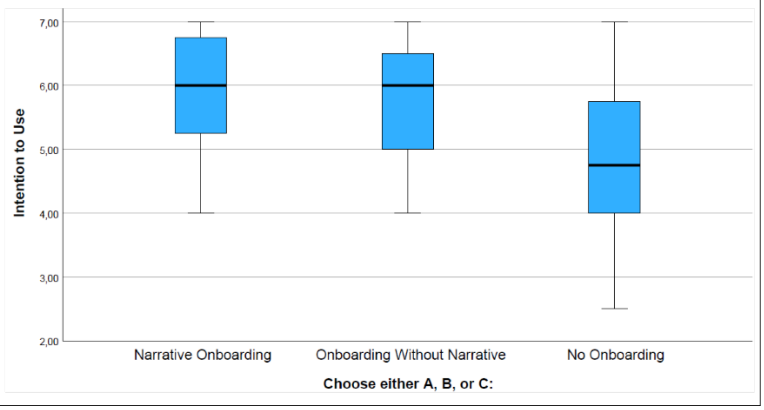


Figure 34: Results – Kruskal-Wallis-Test for constructs that fail ANOVA preconditions

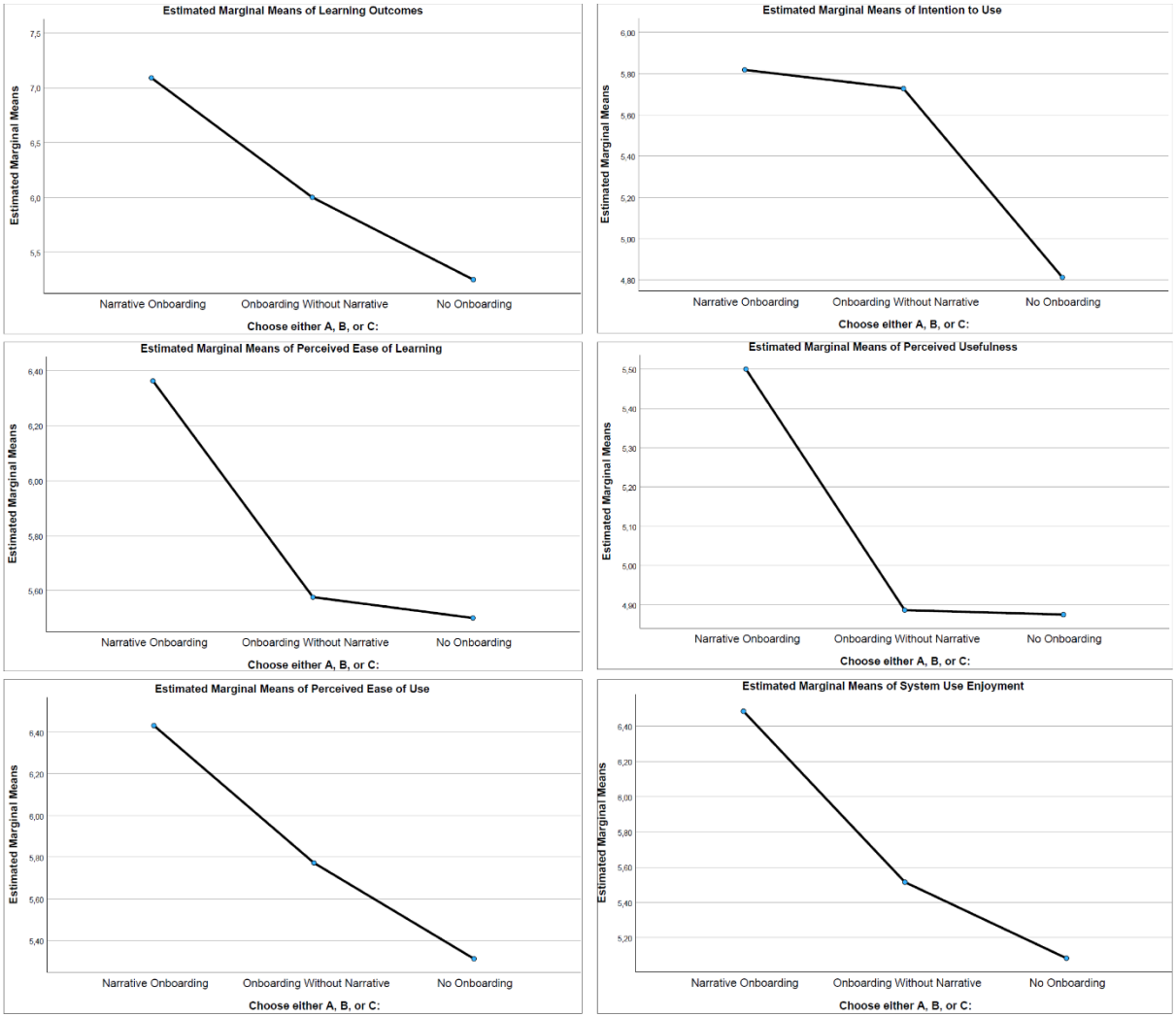


Figure 35: Results – Line Graphs of Construct Means of Onboarding A, B, C

Table 15: Results – Answers for Feedback Section of the Survey

Feedback Item	Answers	Version
What I liked the most:	That you have tasks to do so that you can remember what you did.	**A**
	The presentation was really nice and colorful.	
	not cluttered with unimportant features, simple design	
	The introduction to the application had a nice design and was really colorful. I also liked the avatars.	
	1. setting the stage before actually showing the different features. 2. showing where exactly the different buttons/modals are 3. reversibility of each step	
	sloth, appealing visual presentation	
	design of popup and interaction with stan. the examples in which I had to actively click on something or could directly apply what was explained, that's great for learning	
	- Stan the mascot - That I can click around in the introduction	

	- Real cards to use in the introduction	
	Good to go also back one explanation	**B**
	The introduction was nice, just two pop ups and I was ready to go.	
	Die Einführung hat zeitlich und inhaltlich einen passenden Umfang. Nicht zu kurz, nicht zu lang.	
	Cleanes Design und grundsätzlich einfache Bedienung. Die Bedienung wird erst komplexer wenn man "mehr" will	
	Plenty of templates to choose from and the fun avatars	**C**
	Appearence & design	
	The ability to explore the application on my own	
	Die graphische Benutzeroberfläche lädt zum ausprobieren ein	
	The design of the page looks good	
What I disliked the most:	I didn't find one of the popups that was pointing at the action column at first because that column was out of view on my screen.	**A**
	Intro was too long	
	When entering a session, there were a lot of subsequent pop ups which I first liked then I started to spam next because they hold me back of trying to learn scrumlr by myself	**B**
	Das Tutorial hebt sich farblich nicht wirklich von der Seite ab. Somit wirkte die Board-Übersicht (als Scrumlr-Neuling) zuerst etwas verwirrend und ich musste mich erst orientieren. Vorschlag: Die Seite im Hintergrund abdunkeln und somit das Tutorial hervorheben.	
	I could not abort the onboarding. That's quite annoying. I should be able to abort and resume the onboarding at any given time.	
	Action Buttons am linken Bildschirmrand suggerieren, dass das Aktionen sind die sich auf die linke Spalte und nicht auf das Generelle Board beziehen. Das Gleiche gilt für die Action Buttons am rechten Rand. Wieso nicht einfach alle zentral unten? So kennt man es aus meet uvvm. Es ist ungeschickt, dass das "fertig"-Häkchen nicht automatisch rausgenommen wird wenn man zum Beispiel ein Voting startet. So denkt der Moderator jemand ist fertig, dabei ist es nicht der Fall	
	Votes are not resetting after certain steps	**C**
	There was no explanation what the goal of the application was.	
	Many places to find features (left, right, top right corner, etc.)	
	Beim öffnen der Einstellungen (unten rechts) konnte ich anhand der Symbole nicht sofort erkennen welche aktion diese Ausführen.	
	I don't really know how to really make use of the app	
What I want to mention:	Could be less "childish". It doesn't look bad by any means but it's very colorful and it could be more discrete. It's for work after all and not a video game. (But that's just personal preference that could be solved by having different themes).	**A**
	Maybe it could have used a few less steps but it was still fine overall. I actually liked reading the example chat-boxes	
	- There are still some things missing, e.g., Presentation Mode	

	great work :)	
	After longer not using it, I have to search for the mark-as-done button. Also, sometimes team members do not know that they should mark themself as done.	
	A fade in / fade out animation would smooth up the Tutorial pop ups. But this should only be done when the amount of Pop ups is reduced	**B**
	An introductory page would have been helpful. The application is easy to understand, but it's missing an explanation of what its purpose is. Just what the goal of the application is and what it helps me to do would have been nice.	**C**
	Halllo :D	

E. What needs to be onboarded in Scrumlr?

Table 16: What should new participants and moderators know about Scrumlr?

Answers to: "*What should new users (participants and moderators) know about Scrumlr, to successfully participate in (or moderate) a retrospective in Scrumlr?"*	**Scrumlr Features**
Some users do not understand that they can stack notes by dragging them on top of another and they also do not understand they should mark themselves as ready when they are done. It is annoying when the timer keeps running but everyone is already done with voting or writing their notes. Moderators should be told that they can change the access right to the board. Always using boards without a password feels kind of unsafe.	Participants: - stack notes - mark as ready Moderators: - change access rights
Participants: • Show them that they can mark themselves as ready, they often forget that. Moderators: • Some moderators/board owners are not aware that they can customize the provided templates once they reach the board-view. • They should know how and when to create voting sessions and timers.	Participants: - mark as ready Moderators: - customize templates - create voting sessions - setting timers
What all participants should know when joining Scrumlr: 1. *Writing feedback into notes (and stacking similar notes) – then marking oneself as ready.* 2. *In voting sessions, voting on notes that one wants to talk about – then marking oneself as ready.* 3. *Discussing/Talking about notes with the most votes.* *Moderators:* 1. *Determine the goal of the session (e.g., was everyone content with the last sprint?)* 2. *Choosing one of the prepared templates (individual customization possible any time).* 3. *Starting a session (participants can write their feedback into notes) – setting a timer.* 4. *Identify and stack similar notes together with the participants.* 5. *Create a voting session – setting a timer.*	Participants: - write & stack notes - voting & mark as Ready Moderators: - choose & customize Templates - setting timers - stack notes - create voting session - presentation mode - document the results → general retrospective

6. *Discussing/Talking about notes with the most votes – presentation mode can be used for that.* 7. *The gained feedback serves the improvement and documentation of the team.*	process in Scrumlr
While there is usually a Scrum-Master that already knows how everything works, it would be good if the participants knew the basics of how retrospectives should be structured as well. Sometimes, a team does not have a Scrum expert, or the Scrum Master could be ill and, in these cases, retrospectives and other agile processes feel less productive. Especially moderators should know the whole process of selecting a template, inviting users, setting timers for discussions, stacking notes, creating voting sessions, and using the hidden action column to document decisions. Participants generally only need to know how to write and stack notes and that they should mark themselves as ready, especially when timers are used.	<u>Participants</u>: - write & stack notes - mark as ready <u>Moderators</u>: - choose templates - invite users - setting timers - create voting session - stack notes - hide & show columns → general retrospective process in Scrumlr

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Declaration about the Thesis

Ich versichere wahrheitsgemäß, die Arbeit selbstständig verfasst, alle benutzten Quellen und Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde sowie die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet zu haben.

Karlsruhe, den 1. August 2023 Daniel Hotze