Designing and Evaluating a Collaborative Writing Process with Gamification Elements: Toward a Framework for Gamifying Collaboration Processes

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Recommended Citation

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Transactions on Human-Computer Interaction

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Abstract:

In this study, we examine the influence that gamification elements have on collaboration processes in terms of whether they increase intention to continue to use the system based on meaningful engagement and hedonic motivation as well as outcome quality. Therefore, we review gamification models and principles for information systems and consolidate them in a preliminary framework. We then evaluate how one can supplement the collaboration process for collaborative story writing with gamification elements based on the framework. Additionally, we consider specific gamification elements to successfully accomplish the process. To do so, we conducted action design research in a common iterative structure. First, we observed and reflected on the analog collaborative writing process. Next, we derived design principles and remodeled and implemented the process via a Web application instantiation to evaluate them. In the evaluation, we identified the developed design principles' ability to reach higher hedonic motivation and meaningful engagement, which led to an enhanced intention to continue to use the system. Additionally, we found the potential to manage the shift toward digital collaboration processes that motivate people to participate and produce promising outcomes that do not vary much from outcomes in an analog setting.

Keywords: Gamification, Collaboration Processes, Collaborative Writing, Motivation, Engagement.

Shirley Gregor was the accepting senior editor for this paper.

1   Introduction

With growth in virtual collaboration (Curtis & Lawson, 2001; Johnson & Johnson, 1996; Richter, Heinrich, Stocker, & Schwabe, 2018) and social technologies such as blogs, wikis, forums and shared document editing tools, computer-supported cooperative work (CSCW) has gained a lot more attention and popularity (Storch, 2011; Suwantarathip & Wichadee, 2014). Research in this area has focused on enabling virtual teams to work together despite temporal or local constraints (Leimeister, 2014). Though collaboration research has shown that CSCW can produce better group outcomes in physical and in virtual team settings (Bittner & Leimeister, 2014; Bowers & Pharmer, 2000; Langan-Fox, Wilson, & Anglim, 2004; Simmert, Ebel, Peters, Bittner, & Leimeister, 2019; Tavanapour & Bittner, 2017; Wegge, Roth, Neubach, Schmidt, & Kanfer, 2008), one needs to consider various challenges in virtual settings (Leimeister, 2014). For instance, team members cannot easily establish social connections to other team members and grow together as a team (Leimeister, 2014). Technology helps virtual teams work together, but the team members depend on the technology for social connection. Thereby, a question arises about how to encourage satisfaction and creativity in a virtual environment to ensure people have a high intention to continue to use the supporting technology. Here, group participants' motives and motivation play a crucial role (Lowry, Gaskin, & Moody, 2015). Individuals require motivation. The Multimotive Information Systems Continuance Model (MISC) shows the dependencies between motives, satisfaction and performance. It considers the influence that hedonic, intrinsic, and extrinsic motivation have on performance (Bhattacherjee & Premkumar, 2004; Lowry et al., 2015). In the information systems (IS) context (e.g., knowledge management systems), researchers have found that such motivation positively impacts work (Friedrich, Becker, Kramer, Wirth, & Schneider, 2020). However, recent research has called attention to hedonic motivation's transitory nature in information systems (Suh, Cheung, Ahuja, & Wagner, 2017) and unveiled the importance of meaningful engagement to enhance individuals' intention to continue to use information systems (Liu, Santhanam, & Webster, 2017; Suh et al., 2017). Thus, high hedonic motivation only has short-term effects on users' satisfaction and performance (e.g., temporary joy) and, with that, on users' system usage. Meaningful engagement, on the other hand, connects users' experience with the work context's instrumental outcome (i.e., users gain meaning in using a system depending on their individual or work-related goals) (Liu et al., 2017; Lowry et al., 2015). This so-called dual outcome principle points out that "enhanced experiential outcomes coupled with high levels of instrumental outcomes result in meaningful engagement" (Liu et al., 2017). Thereby, using an information system results in experiential work outcomes such as flow, enjoyment, and attention, while instrumental outcomes depend on an information system's work context (Liu et al., 2017).

To encourage people to want to use systems, one can use several possible solutions, such as chatbots (Brandtzaeg & Følstad, 2018), social networks (Lowry et al., 2015), or gamification (Darejeh & Salim, 2016; Lowry et al., 2015; Steffens et al., 2014). In this study, we consider gamification as a promising approach to encourage people to continue to use digital collaboration processes. According to Vanduhe, Nat, and Hasan (2020), "the activation of direct intrinsic behavior is one of the most vital features of gamification" (Vanduhe et al., 2020). Furthermore, as gamification involves using "game design elements in *non-game contexts*" (Deterding, Khaled, Nacke, & Dixon, 2011, emphasis added) such as in education, workplace, healthcare, or software (Darejeh & Salim, 2016), it is compatible with meaningful engagement because, in contrast to normal games, a system with game elements typically does not focus on entertainment and fun but on a more serious goal or outcome (Deterding et al., 2011). Thus, gamified systems should focus on gamification design's dual outcomes. According to Suh et al. (2017), meaningful engagement arises especially through aesthetic experience, which refers to "a state of mind in which a person feels a sense of meaning and more deeply understands the essence of the experienced events" (Suh et al., 2017). Aesthetic experience strongly complements the better-known flow experience, which refers to deep engagement. Deep engagement itself encourages hedonic motivation and leads users to temporarily immerse themselves in a system (Suh et al., 2017). Given that aesthetics constitutes a key influential factor in whether people intend to continue to use a gamified system, many researchers ground their work on Hunicke, Le Blanc, and Zubek's (2004) mechanics, dynamics, aesthetics (MDA) framework (Liu et al., 2017; Lounis, Doukidis, Papastamatiou, & Doukoulos, 2016; Thiebes, Lins, & Basten, 2014; Tseng & Sun, 2017). As such, in respect to collaboration processes, Lounis et al. (2016) used the MDA model to create the so-called "Q-Tales ecosystem" with gamification elements to help authors co-create interactive e-books (Lounis et al., 2016). However, researchers have recently identified a gap in knowledge about designing and integrating gamification elements according to appropriate motivation and gamification models and principles for IS in collaboration processes (Briggs, Kolfschoten, & de Vreede, Albrecht, & Lukosch, 2010; Richter et al., 2018; Seeber et al., 2020). Accordingly, with this study, we

contribute to the literature by developing a preliminary framework for gamifying collaboration processes. We conducted action design research to design the processes underlying the framework. In particular, we considered digital collaborative writing (i.e., writing in group work) (Debs, 1991; Forman, 1991). As collaborative writing exemplifies a collaboration process, one also needs to consider interdisciplinary collaboration issues such as satisfaction, creativity, and effective technology use (Lowry et al., 2015). With this, we also address whether one can apply gamification to collaborative writing environments. Specifically, we examine two research questions (RQ):

RQ1: How can one gamify digital collaboration processes in order to encourage users to intend to continue to use them?

RQ2: How can one supplement a collaborative writing process with gamification elements to increase users' motivation to use, help them meaningfully engage with, and help them successfully accomplish such processes?

To support collaborative writing, we designed a dedicated collaboration process via collaboration engineering and implemented it on a Web platform. Collaboration engineering refers to an approach to develop and perform collaboration processes that practitioners conduct to accomplish recurring high-value tasks (Kolfschoten & de Vreede, 2009). The collaboration process we developed enables the practitioners to collaborate creatively in writing a story.

This paper proceeds as follows: in Section 2, we provide a theoretical background for the study and discuss relevant work. We also build on that foundation to create a preliminary framework for gamifying collaboration processes. In Section 3, we describe and elaborate on the research method that we adopted (i.e., action design research). In Section 4, we discuss how we implemented our research method over two cycles. After the first cycle, we established meta-requirements and derived design principles from them that aligned with our preliminary framework. After the second cycle, we evaluated the design principles through interviewing experts and assessing the created stories' quality. In Section 5, we examine our findings. Finally, in Section 6, we discuss our study's contributions and conclude the paper.

2   Theoretical Background

2.1   Motivation through Gamification in Software Collaboration Teams

As Deterding et al. (2011) have noted, gamification refers to using "*game design elements* in non-game contexts" (p. 2, emphasis added). Gamification research has considered game design elements at various abstraction levels, such as interface design patterns, game design patterns, design principles or heuristics, conceptual models of game design units, and game design methods (Deterding et al., 2011). Marczak et al. (2015) and Steffens et al. (2014) examined the impact that gamification elements have on software collaboration teams. They investigated essential factors that impact collaboration output's quality and focused on opportunities that gamification provides to motivate a collaboration team to reach its goals. Therefore, they developed a gamification activity framework that matches appropriate gamification elements to desired behaviors in software collaboration teams (Marczak et al., 2015; Steffens et al., 2014). Nevertheless, some researchers have criticized efforts to use gamification elements to improve individuals' motivation (especially extrinsic motivation). For instance, Meske, Brockmann, Wilms, and Stieglitz (2016) criticized the trend to use gamification elements in social software—a "trend in which gamification solutions majorly focus on rewarding quantitative improvement of work activities, neglecting qualitative performance" (Meske et al., 2016). Gamification elements such as points, leaderboards, levels, or badges, which developers design and implement to increase users' extrinsic motivation, will eventually decrease their intrinsic motivation (Meske et al., 2016). Thereby, they refer to the "overjustification effect" (DeCharms, 1968), which addresses the phenomenon of a secondary extrinsic motivation that affects users' primary intrinsic motivation. As these extrinsic elements draw on basic human needs such as success or status, users will likely follow any instruction to do any task just to satisfy these needs. However, elements that promote extrinsic motivation consider only the quantity of users' actions, not their quality. Consequently, users try to do as many tasks as possible at a great speed to reach a high quantitative measurement and success. In this way, they tend to disregard quality. Hence, hedonic motivation ensures users retain that quality by making them feel satisfied with their actions. If they enjoy what they do, they will put more effort into it and, thus, achieve greater task quality. To foster hedonic motivation, Meske et al. (2016) emphasized that users require interesting challenges and called on researchers to identify new appropriate strategies and gamification elements (Meske et al., 2016). Hence,

most research on gamification has focused on identifying and analyzing gamification strategies and elements in specific contexts to trigger and enhance the different kinds of motivation. With this study, we contribute to the literature with a preliminary framework including gamification elements, principles, and outcomes of a gamified collaboration process. Therefore, we consider relevant concepts about motivation and meaningful engagement (Hunicke et al., 2004; Liu et al., 2017; Lowry et al., 2015; Suh et al., 2017) to enhance individuals' intention to continue to use an information system. We instantiate a gamified collaborative writing process to exemplify how one can use the preliminary framework.

2.2   Theory: Multimotive Information Systems Continuance Model (MISC)

Considering that individuals require motivation to participate in collaboration processes (Lowry et al., 2015) and that "mixed-motive situations" derive from conflicting interests in groups (Forman, 1991), MISC posits that different expectations and motivations influence individuals' satisfaction in choosing whether to continue to use an information system in a specific context. Thus, MISC focuses on individuals and their attitude towards a system, its processes, and its performance. Among other things, MISC focuses on the influence that individuals' hedonic, intrinsic, and extrinsic underlying motivations have on their performance (Lowry et al., 2015) and, thus, on the outcome that emerges when one uses information systems to conduct a process. For instance, gamification covers several intrinsic and hedonic components, such as engagement, participation, and motivation (Vanduhe et al., 2020). Therefore, gamification elements can impact individuals' hedonic motivation and performance. In accordance with the MISC, we consider gamification elements in the collaboration process we designed and developed to help individuals reach better outcomes by triggering their hedonic motivation.
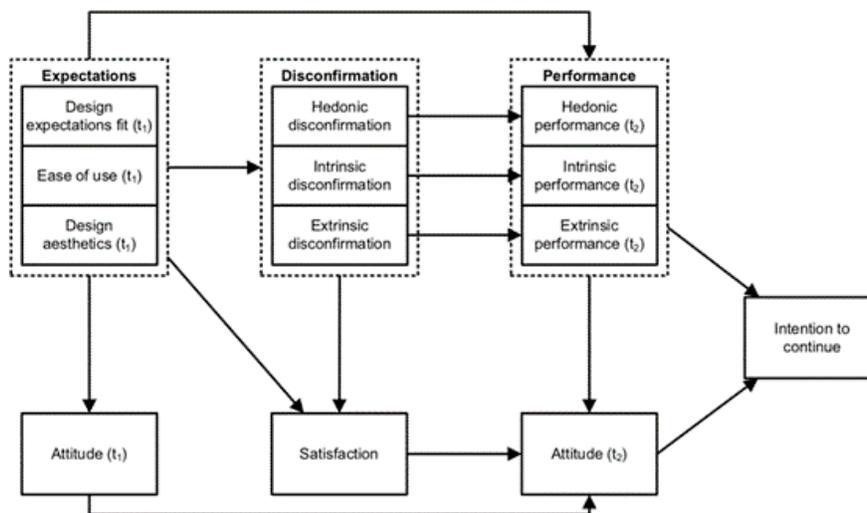

Figure 1. The MISC (Lowry et al., 2015)

2.3   Theory: Meaningful Engagement

Hunicke et al.'s (2004) mechanics, dynamics, aesthetics (MDA) framework serves as a foundation for much research on practical and theoretical implications in the gamification area (Hunicke et al., 2004; Liu et al., 2017; Lounis et al., 2016; Thiebes et al., 2014; Tseng & Sun, 2017). It decomposes games into three components: 1) rules, 2) system, and 3) fun. Accordingly, it establishes three corresponding elements for design: 1) mechanics, 2) dynamics, and 3) aesthetics (Figure 2).

As the MDA framework advocates games "as systems that build behavior via interaction" (Hunicke et al., 2004), it supports designers, researchers, and scholars in understanding, designing, and analyzing gamified systems' dynamic behavior and their outcomes. Consequently, it allows these actors to control for both behavior and outcomes (Hunicke et al., 2004). As such, several principles and models for gamification in information systems initially focus on the behaviors and outcomes (i.e., the aesthetics) that one seeks to produce. The mechanics and dynamics equate to any gamification element, affordance, or

principle that one designs to produce the desired aesthetics. In fact, Suh et al. (2017) established a model that focuses on users' aesthetic experience as a key influencing factor in whether they intend to continue using information systems (Suh et al., 2017). Additionally, they determined three dimensions to define aesthetic experience (meaning, self-expansion, and active discovery) that correspond to elements in the taxonomy of the MDA framework: sensation, fantasy, narrative, challenge, fellowship, discover, expression, and submission (Hunicke et al., 2004; Suh et al., 2017). To facilitate an aesthetic experience, they considered the following common gamification affordances in gamified information systems: status, competition, and self-expression. Suh et al. (2017) confirmed that these affordances positively impact the aesthetic experience, especially on meaning, which ensures a balance between the self and an object (Suh et al., 2017). We represent the dependencies between gamification affordances, user engagement, and IS continuance in Figure 3. The figure also includes the flow experience for deep engagement, which aesthetic experience and its meaningful engagement do not supersede but rather strongly complement.

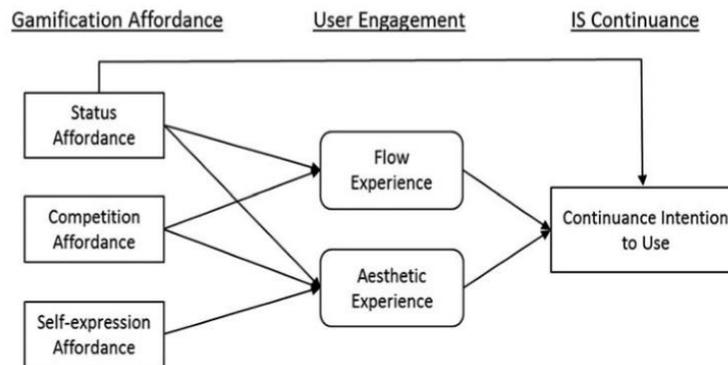**Figure 2. The MDA Framework (Hunicke et al., 2004)**

Figure 3. Aesthetic Experience (Suh et al., 2017)

Shifting to focus more on meaning and meaningful engagement with gamified systems, Liu et al. (2017) developed a framework for designing and researching gamified systems that established the dual outcome principle for meaningful engagement (see Figure 4).
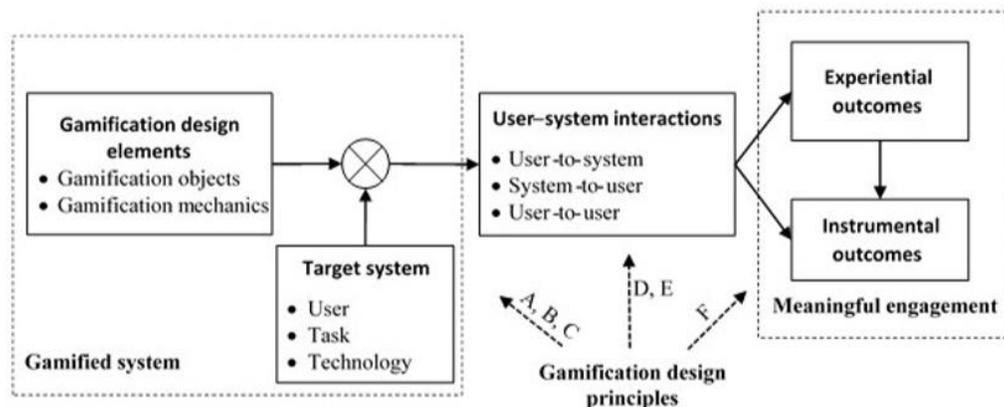

Figure 4. Framework for Designing and Researching Gamified Systems (Liu et al., 2017)

The dual outcome principle notes that "enhanced experiential outcomes coupled with high levels of instrumental outcomes result in meaningful engagement" (Liu et al., 2017, p. 1025). Thereby, experiential outcomes include flow, enjoyment, and attention, while instrumental outcomes depend on an information system's work context (Liu 2017).

2.4 Preliminary Framework for Gamifying Collaboration Processes

As a foundation of our work, we integrated the previous theories, frameworks, and models into a preliminary framework for gamifying collaboration processes in order to encourage users to intend to continue to use them (RQ1). Tseng and Sun (2017) have already integrated the MDA framework with Liu et al.'s framework for designing and research gamified systems. Thus, we can regard gamified systems that involve gamification elements as the mechanics. In terms of dynamics, we then talk about interactions between users and systems. Ultimately, the desired outcome equates to aesthetics (here, meaningful engagement) (Tseng & Sun, 2017). To further elaborate on meaningful engagement, we also integrate Suh et al.'s (2017) work with Liu et al.'s (2017) framework. Therefore, we define meaningful engagement (Liu et al., 2017) in a way that corresponds with how Suh et al. (2017) define aesthetic experience. Thus, meaningful engagement represents IS users' sensory and cognitive experiences. It also represents their efforts to understand and relate to using a system, which gives it meaning. On the one hand, meaningful engagement will lead to an enhanced intention to continue to use the information system. On the other side, underlying mechanics and dynamics (here, gamification elements and design principles for interaction) will foster meaningful engagement.

Subsequently, we used the MDA framework to segment our preliminary framework and correlate the segments to the domain of digital collaboration processes. We then integrated Suh et al.'s (2017), Liu et al.'s (2017), and Tseng and Sun's (2017) work to fill the framework with the elements from their work and examples. Furthermore, as we also consider gamification elements to trigger individuals' hedonic motivation and, thus, improve their better performance and intention to continue to use according to the MISC, we extended the segment for the intended outcome. Thus, we abstracted aesthetics to user engagement that involves both aesthetic and flow experience. Thereby, we covered meaningful engagement with the aesthetic experience and deep engagement (which includes hedonic motivation) with the flow experience. Overall, our framework considers several abstraction levels (Deterding et al., 2011): the mechanics segment about gamification elements in collaboration processes covers interface and game design patterns, and the dynamics segment about gamification principles for collaboration process interactions covers design principles and heuristics. Also, with the MDA framework as exemplifying conceptual models of game design units, we address a further abstraction level.

Thus, overall, our preliminary framework comprises four parts (see Table 1):

1. **Segments:** we took the game elements from the MDA framework to segment our framework into mechanics, dynamics, and user engagement. The latter involves not only aesthetics but also flow experience.

2. **Digital collaboration processes:** we align and shift the framework's focus to digital collaboration processes (i.e., gamification elements in collaboration processes for mechanics, gamification principles for collaboration-process interactions for dynamics, and the intended outcomes of the gamified collaboration processes for user engagement).

3. **Elements:** each segment involves elements that one needs to consider when gamifying a collaboration process: gamification objects (mechanics), user-system interactions (dynamics), and meaningful engagement (user engagement). For dynamics, we also distinguish between gameful and playful interactions based on Tseng and Sun (2017). Regarding user engagement, we include both meaningful engagement (aesthetic experience) and deep engagement (flow experience).

4. **Examples:** for each element, we provide examples that we extracted from the relevant research we examined (e.g., status, competition, and self-expression for gamification affordances; exploration, creation, pretending for playful interactions; and experiential and instrumental outcomes for meaningful engagement). The way one perceives an element differs depending on the segment.

Table 1. Preliminary Framework for Gamifying Collaboration Processes

Gamification elements in collaboration processes		
Mechanics	Gamification affordances (Suh et al., 2017)	Status, competition, self-expression, etc.
	Gamification objects (Liu et al., 2017)	Items, characters, visual assets, etc.
	Gamification mechanics (Liu et al., 2017)	Rules
Gamification principles for collaboration process interactions		
Dynamics	User-system-interactions (Liu et al., 2017)	User-to-system, system-to-user, user-to-user
	Gameful interactions (Tseng & Sun, 2017)	Competition, cooperation
	Playful interactions (Tseng & Sun, 2017)	Exploration, creation, pretending
Intended outcomes of the gamified collaboration processes		
User engagement (aesthetic/flow experience)	Meaningful engagement (aesthetic experience) (Hunicke et al., 2004; Liu et al., 2017; Suh et al., 2017; Tseng & Sun, 2017)	Experiential outcomes: sensory and cognitive experiences (sensation, fantasy, narrative, challenge, fellowship, discovery, expression, submission, meaning, self-expansion), attachment to outcome, attachment to system
		Instrumental outcomes: functional, related to work context, prolonged use, increased use, increased
	Deep engagement (flow experience) (Liu et al., 2017; Lowry et al., 2015; Suh et al., 2017; Tseng & Sun, 2017)	Hedonic motivation
Continuance intention to use gamified digital collaboration processes		

3   Research Method

We conducted action design research (ADR) to identify collaborative writing process parts that we could suitably supplement with gamification elements. ADR follows a common iterative structure (Löffler et al., 2009; Wilde & Hess, 2007). Moreover, ADR emphasizes cooperation between action and research (Löffler et al., 2009; Sein et al., 2011; Wilde & Hess, 2007) by combining design science research and action research (Sein et al., 2011). We proceeded through the four stages in the ADR method that Sein et al. (2011) define twice: 1) problem formulation; 2) building, intervention, and evaluation (BIE); 3) reflection and learning; and 4) formalization of learning (see Figure 5). We formulate the problem in Section 1 and establish an action plan in this section.
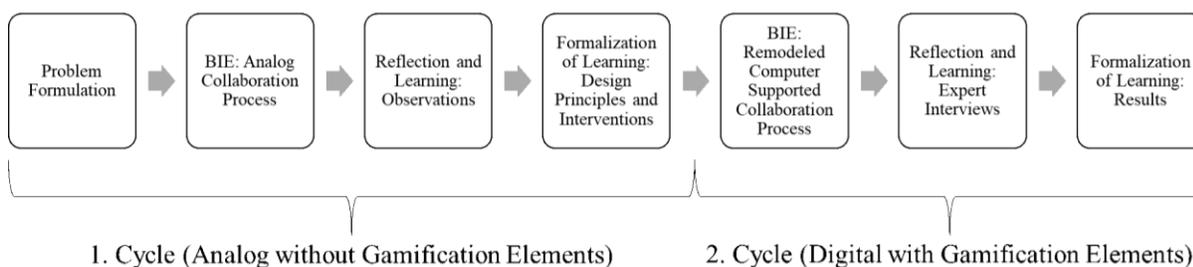
Figure 5. The Action Design Research Structure

We designed the collaboration process and implemented a platform to run the collaboration process in an iterative manner and in accordance with ADR. We display the different components in the evaluation phase in Table 2. From the table, one can see that we used four different methods (simulation, walkthrough, expert evaluation, and pilot study) to evaluate the collaboration process and the IT artifact we implemented.

The simulation checks for consistency and contains a step-by-step analysis that the collaboration engineer conducts to identify missing process steps. For the expert evaluation, one consults a collaboration process expert to analyze the efficiency of each building block in the collaboration process to

detect deficits. In a walkthrough, one executes the process with the problem owner and a practitioner (Kolfschoten & de Vreede, 2009). We conducted the preliminary study with the implemented collaboration process with five groups that contained three to five participants each to validate its quality. We used the participants' feedback to improve and shape the collaboration process before we conducted the first research cycle in this study. We conducted the pilot study in the first cycle in an analog setting to observe and to capture important insights to execute the digital gamified collaboration process in the second cycle (see Table 2). The pilot studies in both cycles comprised two groups that contained five participants each. All participants who participated in the second cycle also participated in the first cycle.

Table 2. Research Object and Phases

	Preliminary study	**First cycle**	**Second cycle**
Artifact	Digital collaboration process via the IT artifact without gamification elements	Analog collaboration process without gamification elements	Digital collaboration process via the IT artifact with gamification elements
Goal	Validate the process's quality	Identify parts of the collaboration process that we could supplement with gamification elements	Evaluate the implementation of the interventions and, with that, the design principles
Evaluation	For each phase: simulation, expert evaluation, walkthrough, and pilot study		
Participants	Five groups of three to five participants	Two groups that contained five participants each	

BIE: analog collaboration process: based on comments we obtained from users from surveying them after the preliminary study (see Table 2), we found that they could not comprehend the process and that it lacked creativity and did not encourage motivation. Hence, we began the first ADR cycle by observing the problem in practice (Löffler et al., 2009; Sein et al., 2011). Therefore, we formed two groups that contained five practitioners each to execute the process analogously.

Reflection and learning: observations: when conducting each process, one observes practitioners' behavior, their interactions with each other and the process, and their nonverbal communication. With these observations, we could detect parts of the process that gamification elements could enrich (Briggs & de Vreede, 2009). In addition, we used the qualitative think-aloud method (Charters, 2009) to better access the practitioners' thoughts. Ultimately, Charters (2009) highlights the need for "triangulation" to validate how one interprets think-aloud remarks. To do so, we used videotaping and notes (Charters, 2003).

Formalization of learning: design principles and interventions: based on the observations, one can develop interventions to improve the collaboration process. These interventions involve fundamental process fragments that one can supplement with gamification elements and preliminary ideas about which elements to choose. Hence, interventions in ADR rather tend to represent various courses of action to reach one's intended design goals (Löffler et al., 2009; Sein et al., 2011).

BIE: remodeled computer supported collaboration process: after identifying and determining specific courses of action, one then redesigns the research object, which enables the ADR approach's iterative nature. One can then observe the anticipated and unanticipated effects that the interventions have in the second cycle (Löffler et al., 2009; Sein et al., 2011).

Reflection and learning: expert interviews: Koch and Gross (2006) point out that, for one to successfully apply a new process, users need to accept it. Thus, they emphasize that one should involve the target group in the development process in an iterative manner. Accordingly, they propose that one not only observe the target group but also use semi-structured interviews (Koch & Gross, 2006). As opposed to surveys, with interviews, one can amplify and elaborate on experts' replies and avoid and correct any misunderstandings. To ensure we obtained qualitatively rich insights from the semi-structured interviews, we aligned how we prepared the interviews with Meuser and Nagel's (1991) work and used guidelines to conduct them. The exact way in which one designs interview guidelines depends on the interventions one implements in the previous phase (Meuser & Nagel, 1991). Additionally, based on the MISC and the influence that the hedonic component has on users' satisfaction, we also measured satisfaction with the process and satisfaction with the outcome (Bhattacherjee & Premkumar, 2004; Briggs, Kolfschoten, de Vreede, Lukosch, & Albrecht, 2013; Lowry et al., 2015). Eventually, the guideline supports comparability. Meuser and Nagel (1991) call this approach a thematic comparison, which does not focus on analyzing single individuals but on extracting, merging, and collocating typical expressions throughout all interviews (Meuser & Nagel, 1991).

Formalization of learning: results: finally, one reconstructs, interprets, and systematizes the analyzed empirical data from the interviews; puts it into context; and links it to theories and consequences (Meuser & Nagel, 1991). In our context, we planned to generate design principles for hedonic motivation and a high-quality collaborative writing process rather than theories.

4   Action Design Research Implementation

In this section, we discuss how we performed the ADR as we describe in Section 3.

4.1   Building, Intervention, and Evaluation (Cycle 1)

To represent a collaboration process, Kolfschoten and de Vreede (2009) introduced the facilitation process model (FPM). We display the FML that represents the collaborative writing process (Kolfschoten & de Vreede, 2009) in the first cycle on the left in Figure 6. The FPM clearly visualizes the activities and their logical flow by including directed arrows, decisions, activity names, step numbers, durations, collaboration patterns, and ThinkLet names (Kolfschoten & de Vreede, 2009). The collaboration patterns constitute activity patterns that Briggs and de Vreede (2009) have identified in the collaboration engineering context. One can assign each activity in a collaboration process one of six patterns: generate, reduce, clarify, organize, evaluate, and consensus building (Briggs & de Vreede, 2009). From a more detailed perspective, ThinkLets allow one to specify the collaboration patterns that describe an elementary group process from a facilitator's perspective (Briggs & de Vreede, 2009).

We executed the collaborative writing process in the first cycle as follows: we first prepared for the process by gathering practitioners, presenting the process to them, and equipping them with pens, paper, and cards. The process began with brainstorming to collect words for the story. In this brainstorming activity, the practitioners write down words and put them together in one stack. Subsequently, we shuffle the cards and deal them randomly to the practitioners. As each practitioner holds cards with predefined words, the iterative part of the process begins: the first practitioner needs to review their words and find a suitable one to extend the story. After the practitioner plays a card, creates a sentence, and adds it to the story, the other practitioners can either claim or not claim. In case a word from their cards appears in the present sentence, they can claim, play the card with the word, and continue with the next iterative round. Otherwise, the next practitioner in line has a turn and continues. Whenever a practitioner plays a card, the practitioner must draw a new one from the stack. As soon as practitioners play all cards they have and cannot draw a new card due to an empty stack, the process ends with a complete story.

We used presentation slides to describe the process to the practitioners (first cycle according to Table 2). We captured the process (see Figure 6, left) on video. We condensed our observations into three categories according to Table 3. We chose the categories based on the similar comprehensive observations in both groups.

Table 3. Observations of the First Cycle involving the Analog Collaboration Process

|	
Genre	The practitioners collected and used categories to brainstorm and give the story a specific direction. Though they sometimes struggled to use a word in a new sentence, they mostly had fun with the words they chose. Practitioners had a low probability to claim their own words due to a diverse collection of words in the brainstorming activity. The practitioners expressed disappointment about not having matching words to claim. Nevertheless, they had fun writing new sentences and usually commented and laughed about them. While eventually reflecting on the story at the end of the process, although they laughed, they felt more dissatisfied about a random ending and random sentences since the story lacked meaning.
Winning	The practitioners disagreed on the process's goals. Some wanted to discard their cards as fast as possible and win the process as an individual. Others placed most importance on the story's quality (i.e., on writing a good, coherent, and meaningful story with a good ending). Consequently, some practitioners helped others by sharing ideas on how to continue the story. No matter the goal, the practitioners worked together in a dynamic and concentrated way. However, when they read and reflected on the story, they felt ashamed and considered their story meaningless. Thus, they asked for feedback and showed strong interest in other groups and their stories. They wanted to compete against them by comparing time and quality of the story.
Deflections	When one practitioner needed more time to think about a new sentence and write it down, the others tended to get impatient and made the practitioner hurry or start a conversation about both process-related and independent topics. When practitioners presented a new sentence, they usually commented about it and sometimes drifted into talking about that sentence or the selected word.

4.2 Reflection and Learning (Cycle 1)

After consolidating the observations into three categories, we developed interventions (**I**) from the reflections (**R**) to improve the process and address research question RQ2 (see Table 4). To do so, we consulted the FPM (see Figure 6, left). By using Steffens et al.'s (2014) framework, we considered further interventions. Moreover, we identified aspects of the original process that succeeded and aspects that we could improve. Thus, we determined meta-requirements (**MR**) from these observations. We used them to derive case-specific interventions and generalized design principles (**DP**) according to Chandra et al. (2015) (see Section 4.3).

<p align="center">Table 4. Reflections and Interventions</p>

Genre	**R1:** The "prepare" activity in the collaborative writing process ensures its theme and consistency (MR1). The original process did not elaborate on this activity well. Consequently, the story missed a golden thread and the practitioners considered it anything but meaningful (MR2).
	I1: Steffens et al. (2014) suggest including an epic meaning in processes that lack challenges, purpose, or clear goals. The epic meaning creates a convenient environment by giving the process a special narrative (Steffens et al., 2014). In this way, it represents the story's genre.
	R2: Due to the diversity of collected words in the brainstorming activity, practitioners would not likely claim (MR3). However, the practitioners perceived the opportunity to claim as positive and useful to keep up with the process (MR4).
	I2: In order to increase the probability that practitioners could claim, we refer to Steffens et al. (2014), who describe the game element of "virality and community collaboration". This element encourages cooperation among practitioners and helps them find efficient ways to achieve the group goal.
Winning	**R3:** The original process ended with a complete story. The practitioners felt dissatisfaction (MR5). The collaborative writing process should have a corresponding goal that the practitioners focus on achieving during the process (MR6). As the practitioners had various views on the goal of the process, it is not enough to end the process with a complete story (MR7).
	I3: Although the practitioners argued about the process's goals, they had one thing in common: their interest in the other groups. Though they mostly expressed dissatisfaction with their own stories, they wanted them to at least exceed the other groups' stories in quality. Thus, one should announce a competition between the groups beforehand. By doing so, individuals rally around one goal: winning against other groups. In addition, it might guarantee that groups create better quality stories. Though one might consider the "group competition" element an extrinsic motivation, it would not negatively impact the process's quality as only the most qualitative story wins (Steffens et al., 2014).
	R4: The practitioners tended to look back at the written sentences and eventually the complete story. They did not hesitate to share their own opinions and discuss the words they chose, the story content they desired, future sentences, and so on. Participants need to appreciate one another's ideas and perspectives (MR8) while still focusing on achieving a common goal (MR9).
	I4: A lack of feedback among team members can impede collaboration processes, which one can solve by integrating "points". In connection with the "no relationship between members" issue, a shared group score can encourage members to build relationships with one another (Steffens et al. 2014).
	R5: Although the team has a common shared group goal, each practitioner writes separate sentences (MR10) and strives to achieve an individual goal. In this game, that individual goal comprises contributing valuable sentences to the story that include one predefined word and that the other team members recognize and appreciate.
	I5: Steffens at al. (2014) note that lack of perception of work in progress can be an issue. Hence, they suggest a "progression" game element to monitor individuals' achievements. It is possible to link each sentence to one of the practitioners and assess the value they provided by color-coding individuals' contributions.
Deflections	**R6:** Amending the activity "write sentence" can prevent deflections. Coming up with a sentence and writing it down can take a lot of time (MR12), which either leads to or is caused by deflections (MR13). Consequently, practitioners may lose focus of the process, which will decrease the story's quality.
	I6: Steffens et al. (2014) consider including a time "countdown" to deal with excessive workload or, for our collaborative writing process, with an excessive use of time (i.e., to prevent the practitioners from spending too much time on writing a sentence). Such a countdown will avoid any kind of impatience from the other practitioners.
	R7: Practitioners appeared to find it difficult to use all predefined words (MR14). Consequently, most practitioners lost their motivation towards the end of the process. Some practitioners also appeared excited about formulating the end of the story (MR15), but, therefore, the team needed to coordinate all left words.
	I7: Steffens et al. (2014) suggest the "ownership" game element. This element will help practitioners bear responsibility for the story and, thus, foster a qualitatively valuable outcome. By choosing the end of the story more freely and independently, the practitioners might feel more pressured to make the story a good one.

4.3   Formalization of Learning (Cycle 1)

At this point, we used the developed interventions to remodel the collaboration process. We display the remodeled collaboration process in Figure 6 (right). We present the amendments in bold.
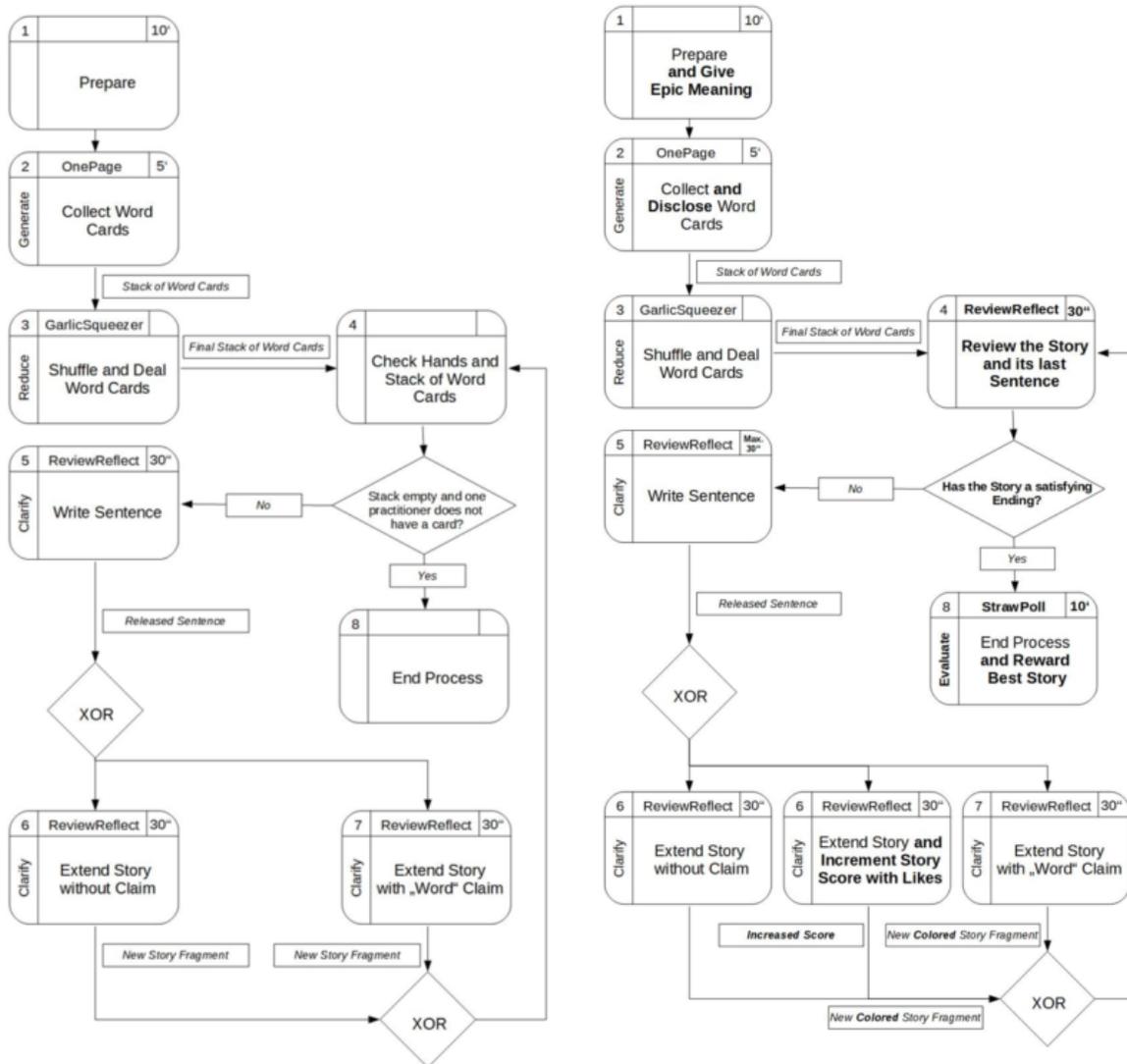
Figure 6. FPMs of the Analog (Left) and the Remodeled Collaboration Process (Right)

Based on the collected meta-requirements, we generalized and developed corresponding design principles (DP) according to Chandra, Seidel, and Gregor (2015) for platform designers and developers. Furthermore, we aligned and built on our preliminary framework for gamifying collaboration processes. We now emphasize the framework's segments: mechanics (M), dynamics (D), meaningful engagement (AE), and deep engagement (FE).

4.3.1   Genre

MR1: Go through a profound preparation before process start.

MR2: Follow a golden thread.

DP1: Include an epic meaning to highlight and set clear group goals to help groups achieve better outcomes.

The epic meaning gives meaning to the process and a genre to the story. Therefore, it enables practitioners to delve into a narrative, which triggers hedonic motivation and, with it, deep engagement

(FE). Also, by predefining the genre, one can create meaningful engagement by providing practitioners with a sensory experience through fantasy and narrative (AE) and ensuring they stick to the genre (D). In this way, they can achieve a better outcome (AE). Apart from the presets, appealing visual assets foster epic meaning (M).

MR3: Use the collected words in a collaborative way.

MR4: Keep up with the process while not writing a sentence.

DP2: Ensure that everyone can see all content that they initially collected and need to consider to create the outcome.

This element serves as a complement to the epic meaning and helps practitioners understand the genre in a similar way. By sharing information (D), practitioners encourage fellowship (AE). Therefore, we offered each participant a feature to share their input in advance and another one to see and use the collected content for the outcome (M).

4.3.2 Winning

MR5: Focus on the story's quality.

MR6: Focus on achieving a meaningful goal.

MR7: Perform as a team.

DP3: Enhance the team's focus towards producing a quality outcome by including a group competition at a higher level and highlight the group setting's purpose and goal.

The competition element builds on the desire to win and creates a sensory challenge experience (AE) for practitioners. As only the best story will receive rewards (M), this element ensures that practitioners focus on quality and the instrumental outcome (AE). Additionally, having a competition between groups will strengthen the goal alignment in a group and the gameful interactions (D).

MR8: Appreciate group members' ideas and perspectives.

MR9: Foster group awareness.

DP4: Include feedback, rating, and veto mechanisms for the groups to change and adjust the content they contribute to shape and improve the group outcome iteratively.

This element focuses on meaningful engagement by recognizing and associating the individual contributions with the outcome (AE). Similar to the competition element, this element focuses on contribution quality and group awareness (i.e., gameful user-to-user interactions (D)). To enable these mechanisms, one needs to offer visual items to participants that they can use to either give feedback and ratings or to receive and disclose feedback and ratings (M).

MR10: Perceive the work in progress.

MR11: Recognize individuals' contributions.

DP5: Include visual mechanisms to highlight any group members' contribution to recognize individuals' efforts and outline the group's progress by appreciating contributions.

Highlighting the individual contributions with visual mechanisms (M) focuses on triggering experiential outcomes (AE). In this way, it resembles the status and self-expression affordances (M) that encourage a sense of self-progress. Thus, practitioners can identify with the story and its progress and the group will recognize their contributions (D).

4.3.3 Deflections

MR12: Enable a dynamic process.

MR13: Avoid impatience and deflections.

DP6: Include an appropriate time constraint to provide practitioners with the right amount of time (i.e., with an amount of time that others accept and that prevents impatience in a group-oriented dynamic) to produce quality content.

One can use time pressure (D) to individually motivate and challenge (AE) the practitioners. While writing, the practitioners need to align to the time limit that a visual countdown provides (M), which ensures they dynamically and actively work towards the goal (D).

MR14: Coordinate and align all predefined words.

MR15: Bear responsibility.

DP7: Provide the practitioners with ownership over the produced outcome to raise the perceived level of responsibility.

By giving the practitioners ownership over the story (M), they can better attach and identify with the outcome (AE). Furthermore, they feel responsible for their interactions and creations (D). This element focuses on hedonically motivating them (FE) and ensures they focus on the functional outcome's quality (AE).

Before implementing and executing the remodeled process in a Web application, we conducted an evaluation with an expert who eventually agreed to the interventions we developed (see Table 2 and Figure 6). After the implementation, we conducted a walkthrough with practitioners over the Web interface (see Figure 7, left) before we conducted the second cycle.

4.4   Building, Intervention, and Evaluation (Cycle 2)

After we formalized the preliminary design principles and the consequent interventions to increase the practitioners' hedonic motivation, their meaningful engagement, and story quality, we implemented the interventions in a Web application. Figure 7 (left) shows the main page of the Web application. We conducted the core iterative part of the process on that page. One can see that we implemented three design principles: a green like button with the number of counts in the "action panel" (DP4), individually colored sentences in "the story" (DP5), and a 30-second countdown in the wait button in the "action panel" (DP6).

We implemented the epic meaning (DP1) through a pop-up that introduces the topic (i.e., writing a fairytale) and the process rules (see Figure 7, right). Right before the process begins, the participants brainstorm and collect words to include in the story. At this stage, everyone can see all initially collected words (see Figure 8) (DP2).

Participants could not see the two remaining design principles that we implemented. That is, we announced the group competition (DP3) before the process began and assigned ownership to them by enabling them to end the process freely and independently (DP7).

We executed the remodeled process in a pilot study with two groups that contained five participants each using the Web application. It proceeded without any obstructive problems that concerned technology and functional process elements.
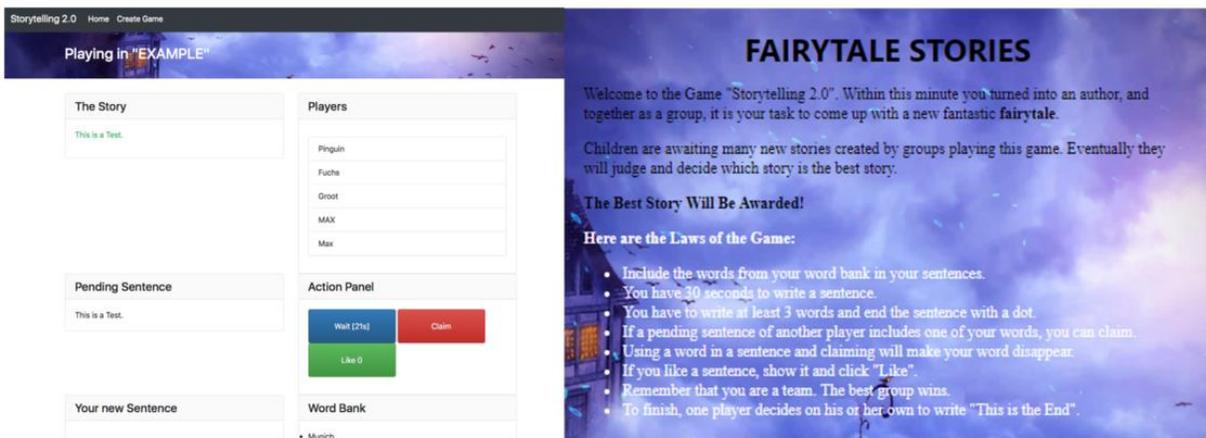
Figure 7. Screenshot of the Web Application: Main Page (Left), Epic Meaning Pop-up (Right)
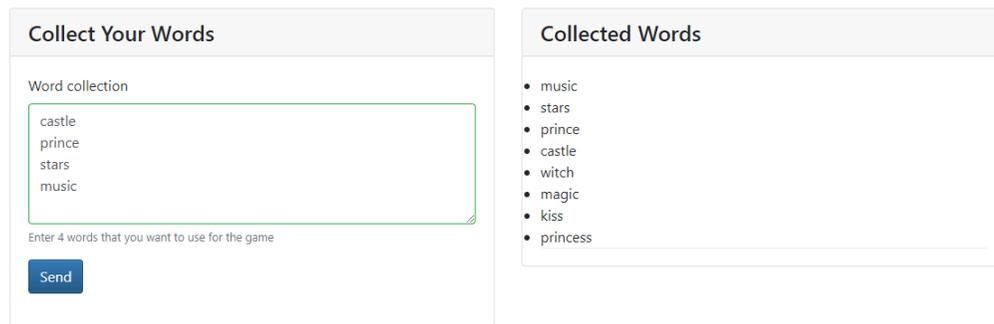
Figure 8. Screenshot of the Web Application: Collected Words Brainstorming

4.5   Reflection and Learning (Cycle 2)

For the evaluation, we interviewed the practitioners. By participating in both cycles (see Table 2), they constituted process experts in our research. Since we used guidelines to conduct the interviews, we asked rather abstract questions that focused on the individual interventions (see Appendix A). In doing so, we could evaluate the intended effects by comparing them to the perceived effects. Following the thematic comparison approach (Meuser & Nagel, 1991), we used interview transcripts to consolidate and differentiate the experts' (E) replies to several categories that covered interview guideline questions. We discuss the categories below.

Epic meaning: only one expert preferred not to have a predefined topic (E1). The others considered it quite helpful to write a story: it simplified the start of the process (E3) and gave an approximate direction for a golden thread (E2, E4, E5, E6, E7, E8, E10). Thus, they also found it easier to collect words and use them in the same context (E8, E9, E10). Still, some experts found it problematic as they had different perspectives and ideas about one topic (E4, E6, E7).

Disclosure of collected words: the experts found disclosing the collected words useful to plan and establish the story's direction beforehand (E1, E2, E3, E7, E8, E10) and to support others during the process (E5, E10). Still, one expert did not recognize any effect (E6). Another expert stated that, while groups could use it effectively, their group did not do so (E9).

Group competition: the sentiment about a group competition varied possibly due to participants' different characters and attitudes. While competition and its perceived meaningfulness and severity motivated some participants (E2, E5, E7, E9), competition did not stimulate others at all (E1, E3, E4, E6, E8, E10). As intrinsic motivation, fun, and creativity already drove these individuals, the extrinsic motivation did not have any effect on them (E1, E3, E4, E8, E10).

Like button: only three experts considered this button a good and funny feature for both positive affirmation and staying concentrated while waiting (E4, E6, E9). However, most experts considered it unnecessary (E1, E2, E3, E5, E7, E8, E10). Some found it pointless not having any consequences after liking a sentence (E3, E5, E8). Hence, some experts suggested alternatives, such as integrating a scoring system (E5).

Color assignment: except for one expert who did not recognize it (E1), the color assignment appealed to all the other experts (E2, E5, E8, E9, E10). They found it helpful to match sentences to practitioners (E2, E3, E4, E5, E7, E8, E9, E10), see everyone's turn, and prepare their own next sentence (E4, E6, E7, E9). Furthermore, they found that it allowed them to view the story overall (E5, E6, E7, E8, E10).

Countdown: except for one expert who found the countdown too long (E1), the other experts requested more time for the countdown. They said that 30 seconds put too much pressure on them (E2, E3, E5, E7, E8, E9, E10) and, thus, decreased output quality (E4, E6, E8). Nevertheless, all experts agreed that a countdown itself constituted a good and meaningful idea that can help make the process more dynamic and help practitioners avoid impatience (E1, E2, E3, E4, E5, E6, E7, E8, E9, E10). Two experts also made suggestions about how to adjust the countdown, such as using different timeframes to promote concentration (E6) or including penalties for not sticking to the timeframe (E10).

Free end of process: most experts favored choosing when the process ended of their own accord (E1, E2, E3, E4, E5, E9, E10) in order to create a worthy and nice ending rather than an endless story with a

sudden end (E2). Furthermore, they found choosing their own ending easier (E5), more pleasant, and not forced, which resulted in a better quality story (E8). Eventually, they stated that "it is our story" (E3), "we know better when the story should find an end than an application" (E10), and "I liked it because we could determine it" (E10).

Satisfaction: the experts expressed satisfaction with the process, how we conducted it, and their involvement in it (E1, E2, E3, E4, E5, E6, E7, E9, E10). They expressed finding it "fun" (E1, E6, E7, E9), "cool" (E5, E6), and "very interesting" (E7, E9). As such, it seems it encouraged hedonic motivation as we intended. However, though some experts considered their produced story funny (E1, E7), most considered it meaningless (E2, E3, E6, E9). Nevertheless, they blamed their teammates and the initial word collection for the resulting dissatisfaction rather than the actual process (E2, E5, E8, E9, E10)

In a final step, external unbiased judges to assess the created stories using criteria for qualitatively valuable stories that we established before. We took the first measures from Rhodes (1961): level of creativity and novelty (Rhodes, 1961). In addition, Dean, Hendler, Rodgers, and Santanen (2006) define dimensions and subdimensions for idea quality that we used to assess the stories' quality: workability, relevance, and specificity. We aligned the assessment questions to these dimensions and calculated the average result for each dimension (Dean et al., 2006). The ratings ranged from very low/bad (1) to very high/good (7). We chose this scale based on Johns (2005) to avoid the data becoming less accurate with fewer than five and higher than seven scale points (DeVellis, 2003). We chose seven-point Likert scales to ensure several judges could evaluate the stories in detail (Johns, 2010; Likert 1932). In total, 29 judges participated. We demonstrate the results in Table 5.

Table 5. Results from Assessing the Stories' Quality

	Cycle 1		Cycle 2	
	Story 1	Story 2	Story 3	Story 4
Level of novelty	3.62	4.34	3.83	4.07
Level of creativity	3.76	4.86	3.72	4.72
Specificity	4.05	3.24	3.57	4.19
Workability	4.29	3.55	3.66	4.12
Relevance	3.83	3.28	3.41	4.28
Sum	19.55	19.27	18.19	21.38
Overall sum in each cycle	38.82		39.57	

4.6   Reflection and Learning (Cycle 2)

Examining the results, we can see that the stories did not vary that much in quality. Even though participants created the best-rated story in the second cycle, they also created the worst-rated story in the second cycle. The criteria measurement values varied from story to story, which may imply that executing the collaboration process does not differ depending on whether participants do so digitally or in an analog meeting setting. Participants' satisfaction with the outcome similarly reflects this interpretation. Nevertheless, participants viewed the digital process and the Web application positively and even showed higher hedonic motivation and engagement compared to the analog setting. Hence, in accordance with our preliminary framework (see RQ1 and Table 1), we covered various intended outcomes and experiences by using several gamification elements (see RQ2, Table 6, and Figure 6).

Table 6. Gamification Elements that Supplement the Collaborative Writing Process (RQ2)

DP	Gamification element	Collaborative writing process phase
1	Epic meaning	Preparation and introduction of the process
2	Disclosure of collected words	Preparation and idea generation for the process
3	Group competition	Higher level for several group processes
4	Like button	Reactions to process contributions
5	Color assignment	Highlighting process contributions
6	Countdown	Limiting the time of process contributions
7	Free end of process	End of the process

Thus, these elements could trigger individuals' hedonic motivation and meaningful engagement to become more satisfied with the process and increase their intention to continue to use the artifact. Still, the digital process did not achieve a better outcome compared to the analog setting (Bhattacherjee & Premkumar, 2004; Lowry et al., 2015).

5 Discussion

Overall, we formulated seven design principles and 15 meta-requirements based on observing participants in the first cycle and reflecting on their activities and comments. We further categorized these design principles and meta-requirements into three categories: genre, winning, and deflections. We found that we could successfully implement the seven design principles into an instantiated digital collaborative writing process and, thereby, encourage higher hedonic motivation and meaningful engagement to increase participants' satisfaction and their intention to continue to use the digital collaborative writing process. The evaluation indicated that an epic meaning (DP1) can help participants at the start of the process to stay on topic. Still, participants may find it difficult to clearly predefine the topic as some probably have different perspectives and interpretations, which could lead to discrepancies in a team. Participants perceived the disclosure of the collected includable content (in this case, the collected words) (DP2) as supporting collaboration in the team. However, just like the epic meaning, its usefulness depends on the individual participants. The evaluation showed that, while some participants felt motivated write a qualitatively valuable story, others saw more fun in the process. Thus, some participants did not take the process seriously, which caused dissatisfaction in the team. We also recognized a difference of opinion in the group competition (DP3). While the group competition motivated some participants, it did not affect others at all. This finding emphasizes the need to address both deep engagement with hedonic motivation and meaningful engagement. Only three experts (E4, E6, E9) found the Like button (I4), which we implemented for participants to appreciate ideas and foster group awareness, suitable. As such, it seems space exists for a more suitable intervention design to better meet DP4. Some participants suggested a scoring system. Such a system could enrich the like button's meaning and simultaneously increase participants' motivation and engagement. Nevertheless, the evaluation indicated that highlighting the individuals' contribution (DP5) and assignment of ownership (DP7) successfully nurtured motivation and engagement. These DPs helped the participants to identify themselves with their own story. At last, participants received the idea of a countdown (DP6) well. The evaluation proved that it fulfilled the meta-requirements to enable a dynamic process and to avoid impatience and deflections. On the other hand, the evaluation revealed that the countdown lacked quality due to the time limit. Thus, one needs to give participants enough time to come up with qualitatively valuable contributions. Further suggestions included varying the timeframe for each new contribution and including penalties for not sticking to the timeframe.

All in all, we respond to our research questions by providing a preliminary framework for gamifying collaboration processes to increase individuals' intention to continue to use a system (RQ1) and by specifically applying gamification to a collaborative writing process underlying the preliminary framework (RQ2). The developed design principles increased participants' hedonic motivation and meaningful engagement. They had fun and took pleasure in the process while understanding what it meant and working toward its functional outcome. We found that we could encourage satisfaction and creativity even in a virtual environment by designing and implementing systems that bind, engage, and motivate contributors to participate and produce promising outcomes that do not vary that much from outcomes in a classical co-located setting.

Despite our findings, as with any study, ours has several limitations. First, each story noticeably differed from the others in content, structure, writing style, and so on. Thus, to better verify the design principles we implemented, one would need more stories and, thus, more participants. Second, one should carefully consider the participants they select and the type of story one has them write. For the instantiated process at hand, we randomly selected practitioners and asked them to write a fairytale. This choice might have raised and encouraged a discrepancy in the group as each participant could have viewed and understood the predefined topic in a different way. In a narrow sense, the participants did not have any connection to either the other participants or the process/topic.

6   Conclusion and Contribution

This study serves as a starting point for further research on collaborative writing processes. In gamifying a collaborative writing process via a Web application, we found that the developed design principles succeeded in increasing participants' hedonic motivation and meaningful engagement. Overall, this paper contributes to research on gamification, digital collaboration processes, and collaborative writing. Moreover, the study provides prescriptive knowledge (Gregor & Hevner, 2013) toward a "theory of design and action" (Gregor, 2006) with a collaboration process, MRs, and corresponding DPs and a preliminary framework for gamifying collaboration processes. Following Steffens et al. (2014), who declared that gamification has a positive impact on collaborative software development processes, we connected established gamification elements with a collaborative writing process. In doing so, we adjusted elements to suit the exemplary process and evaluated them regarding their impact on the process. Eventually, we established and evaluated seven design principles to foster hedonic motivation and meaningful engagement toward a qualitatively valuable outcome. In doing so, we built on our preliminary framework for gamifying collaboration processes. Practically speaking, practitioners may use this framework as guideline for gamifying their collaboration processes. Theoretically speaking, researchers may use this framework to understand, design, and analyze gamified digital collaboration processes. Additionally, we call on future research to extend the framework with other complementary models, principles, and theories on an abstract level and to evaluate more specific elements that fit into the framework (e.g. gamification elements and affordances). Furthermore, research needs to test the DPs for their applicability to other collaborative writing practices, such as wikis, blogs, and forums. Future research may also test whether the framework applies to other collaboration process scenarios, which may lead to new design principles (e.g., for gamified human-AI collaboration).

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Appendix: Interview Guideline

Satisfaction

1. How satisfied were you with the process, the conduction, and your involvement?
2. How satisfied were you with the story outcome of the process?

Difficulty

1. How difficult was it to understand the process and its goals?
2. How difficult did you perceive the web-application tool?

Interventions

1. How did you perceive the predefinition of an epic meaning?
2. How did you perceive the disclosure of the collected word cards?
3. What effect did the group competition have on you and your contributions?
4. How did you perceive the "like" button?
5. How did you perceive the color assignment to the individual practitioners?
6. How did you perceive the countdown element?
7. How did you perceive the fact, that you can end the process freely and independently?

Feedback

1. Do you have any remarks, wishes, improvement suggestions etc.?
2. Did you miss any functionalities, elements or possibilities?
3. What would you do differently in the digital solution?
4. Do you have any more feedback?

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Transactions on Human – Computer Interaction