

Design implications for the design of mobile apps used in dance practices

Inge Mengerink

Department of Industrial Design Engineering, University of Twente

Scientific Challenges in IDE

Dr. Armağan Karahanoğlu

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Abstract: Using mobile apps before, during and after sport practices becomes nowadays more common. However, not all apps on the market are easy to use and match with its users needs and wishes. This paper aims to list design implications which can be used in app design for dance practices wherein the focus lays on achieving user engagement. The paper consists of four main parts. Firstly, literature findings on different concepts of engagement will be provided. Secondly, research has been conducted on current apps on the market. Thirdly, interviews with choreographers and dancers have been conducted to be able to understand the practice. Lastly, a list of found design implications is presented. The result of this paper is a list of design implications which can help app designers when creating an app used for dance practices.

Keywords: Design implications, User engagement, Mobile user engagement, Social engagement, Dance practices, App design

1. Introduction

When practicing sports nowadays people often make use of a variety of (smartphone)applications. In dancing sport, a common difficulty is making choreographies. To help choreographers with their task, various apps have made their entrance onto the market. Examples of such apps are "*Formation: position creation*", "*Notetracks*" and "*Dancemaker*" ("Top 7 Apps Dance Teachers Must Have," 2022). However, these apps are not often used yet when looking at the download numbers ("Google Play Apps,"). A main reason for this is the fact that all apps are focussed on a single element important for making dance choreographies. For example, the app "*Formation: position creation*" can only be used for making and sharing dance formations ("Formation: Position creation,") where the app "*Dancemaker*" gives inspiration for a choreography, but it is not possible to save your choreographies ("Dancemaker,"). Choreographers would need to make use of a variety of apps at the same time to be able to cover all parts of making a choreography. Therefore, it seems that making use of pen and paper happens more often then making use of apps. Next to this, when looking at the reviews from, for example, "*Formation: position creation*" people are positive about the main function of the app (making formations), but would like to have added features such as the possibility to add notes or music files ("Formation: Position creation,"). At the same time dancers make use of apps to get information shared from the choreographers. Thus, apps should match with the dancers goals and motivations as well. The main problem is that current apps on the market seem to mismatch with their users' goals and motivations.

This paper aims to create implications for the design of apps used in dancing practices. With these implications new apps would match better with the users' goals and motivations, therefore help choreographers with their task of creating choreographies and help dancers with reviewing and learning the choreography. The literature about engagement will be used to measure users' satisfaction with current apps and dancing practices. To achieve this the paper addresses the following question: **What are the design implications for an app, used by choreographers and**

dancers in dance practices, to accomplish user engagement? Figure 1 gives an overview of the parts which will be addressed in this paper. First, the concept of engagement and its principals used for this research will be explained. Then, research is done about current apps in the market. Following that, choreographers and dancers are interviewed about their opinion and experiences with dance practices. Finally, the paper will be concluded with a set of design implications which can be used for the design of apps used in dancing practices.

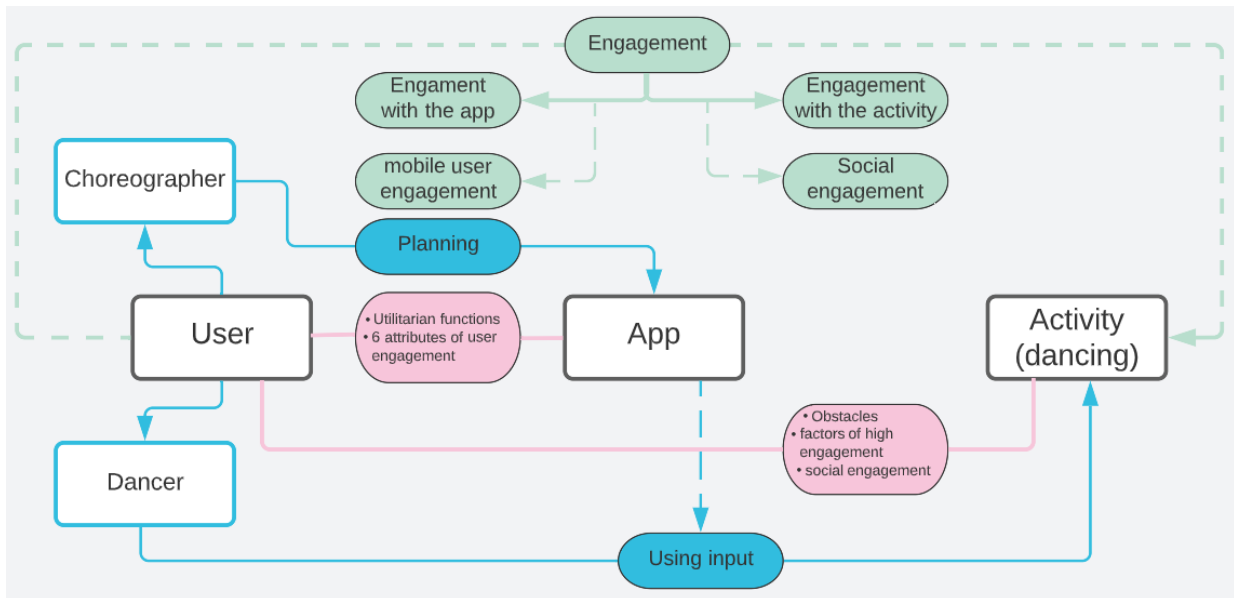


Figure 1: Overview use of apps in dance practices.

2. Engagement

We start with the main principle of engagement. Engagement is described as “a state of mind that someone must attain in order to enjoy a representation of an action” (McCullough, 1996). To reach this state of mind psychological and behavioral attributes of connection, interaction, participation, and involvement need to be included in the action (Johnston, 2018). The exact contents of these attributes depends on the context of the action and one’s perspective on engagement (Schafli, 2013). Therefore, the exact definition of engagement also depends on these two factors. However, it can be stated that engagement is a psychological state rather than a dispositional trait (Schafli, 2013), meaning that the mental condition on that moment is more important than the persons’ characteristics.

2.1 User engagement

One of the most prominent components of engagement is user engagement (UE). User engagement can be described as the “emotional, cognitive and behavioural connection that exists, at any point in time and possibly over time, between a user and a resource” (Attfield, Kazai, Lalmas, & Piwowarski, 2011). More simply said, the interaction between a user and the contextually dependent system facilitates an engaging experience (Anniek W. Eigenraam, 2018; Carpenter, 2019; Heather L. O'Brien, 2008; Lehmann, Lalmas, Yom-Tov, & Dupret, 2012; Sutcliffe, 2016). The components of user engagement can be described in different ways. Benyon (2005) talks about the key elements of user engagement in relation with the PACT (People, Activities, Contexts and Technologies) principle. He states that identity, adaptivity, narrative, immersion and flow are the most important components of engagement. These elements can be used to describe engagement, but they are already focussing a lot on digital systems and contexts. A more general approach according to components of user

engagement is given by Mounia Lalmas (2014). The authors discovered seven attributes as important components of engagement. These are: focussed attention (a state in which the user is concentrated on a specific target for any period of time); affect (the emotions experienced during interaction); aesthetic appeal (the sensory and visual appeal of an interface); endurability (engaging experiences are memorable and worth repeating); novelty (surprising, unfamiliar or unexpected features); richness and control (growth potential and the extent to which it is achievable) and; trust, reputation, and expectation (reliance and assumptions of a system). Heather L. O'Brien (2008) also adds "feedback" to this list of components, because users want to have information about the actions that have occurred and the results that have been achieved. These elements can be divided into the perceived quality of the system (aesthetic appeal; novelty; richness and control) and psychological and behavioral outcomes of interacting with the system (focussed attention; affect; endurability; trust, reputation and expectation; feedback) (Oh, Bellur, & Sundar, 2018). This list of components describes how user engagement can be divided. All elements can be separately researched and, in the end, combined.

2.2 App engagement

A form of user engagement is mobile user engagement (MUE). Mobile user engagement occurs when users interact with a mobile device to gather experiences that give value and satisfaction (Attield et al., 2011; Kim & Baek, 2018; Wu, Jiang, Liu, & Ma, 2020; Young Hoon Kim, 2013). Users can have various reasons for using an app on their mobile device. In this paper, the focus lies on the purpose of creating and sharing choreographies, so the group of apps can be named "task-oriented apps". For "task-oriented apps" usability and utility are the most important factors, because they are the basic elements for providing an inherent operation and or activation of these apps (Sutcliffe, 2010; Young Hoon Kim, 2013). This also means that the functional aspects of the apps are more important for the user than the pleasure aspects (María Leticia Santos-Vijande, 2022). Most of the components of user engagement (section 2.1) are also applicable in MUE. However they will be operationalized differently than in non-mobile UE (O'Brien, Absar, & Halbert, 2013; Oh et al., 2018). For example, focussed attention in MUE is limited to brief periods of interaction with the app, because users must also attend to the physical environment. In non-mobile UE, users are able to interact with the system for longer periods of time, because they already are in the physical world. The components of UE which can be used in a mobile environment are: focussed attention; felt involvement (self reported arousal or interest); perceived usability (affective reactions and cognitive appraisal of the experience); novelty; aesthetic appeal and endurability (Heather L. O'Brien, 2009; O'Brien et al., 2013). Utilitarian functions will be added to this list, because, as said above, in task-oriented apps usability and utility are the key factors for such an app.

One of the components is aesthetic appeal. This will, later in the paper, be reviewed using UX/UI trends ("The 10 latest UX trends (User Experience Design)," ; Erdem, 2021; Verma, 2021). A detailed list of these trends can be found in appendix 1. It is important to mention that the design of a mobile app shall be depending on the usability and not the other way around ("Mobile App Design: usability and user experience,"). This is in line with the statement that utilitarian functions are the most important for task-oriented apps.

2.3 Engagement with dance

Dancing as a form of exercise has been found to have a positive effect on a person's mood and subjective wellbeing (Byrka & Ryczko, 2018; Weinberg & Joseph, 2017). Especially dancing together with others leads to a better wellbeing (Stinson, 1997). Therefore, this social component of dance increases the social engagement. The definition of social engagement holds that "it is a collective

state of engagement that can be represented in behavioral forms, cognitive forms, and affective forms and it is an outcome of a dynamic socially situated system'' (Johnston, 2018). In other words, social engagement occurs when people interact with each other leading to an engaging experience. For social engagement extrinsic motivations, such as group participation, is the key component (Carpenter, 2019; Johnston, 2018). Without these, interaction between people is not a possibility.

Next to the social part in dancing practices, there is also a non-social part in dance where engagement can occur. This consists of five obstacles for engagement and five factors of high engagement (table 1) and is created by Bond & Stinson (2007). The obstacles are negative feelings which can occur during dance practices. It decreases the engagement by the dancer. The factors of high engagement are feelings which increase the dance engagement, because the dancer gets into a positive mood. Therefore, these obstacles and factors can be used to analyse engagement during dance practices.

The obstacles and factors of engagement together determine if a dancer gets into flow. Flow is described as ''being so involved in an activity that nothing else seems to matter'' (Heather L. O'Brien, 2008; Lazzaro, 2004; Nakamura & Csikszentmihalyi, 2014; Sutcliffe, 2010). For example, when a dancer executes a choreography which difficulty is in line with the dancer's skill level, a dancer can get the feeling of flow. However, when the skill of the dancer is much higher than the difficulty level of the choreography the dancer can get bored. So, being in flow leads to a higher engagement with the activity.

Table 1: Obstacles of engagement and factors of high engagement.

Obstacles of engagement	
It is too hard or too easy	The skill level needed for the choreography is either too high or too low.
I am afraid	Being afraid for the opinion of other people about your performance.
I am not good enough	Anxiety is created, because dancers fear they will not achieve their goals. This can prevent them from even trying.
It does not matter how hard I try	A dancer's best efforts are not enough to reach their goals. This can also be due to limiting factors, such as physical constrains.
I am trying too hard	The desire to improve leads to a decrease in enjoyment and makes the dancer less successful.
Factors of high engagement	
I get serious	Focus is needed to execute a choreography in the right way. Also, patience is needed for this.
I love to dance	Emotional connection to dance evokes total commitment.
I love a challenge	Challenge is a motivator, so the higher the challenge the higher the motivation.
It is like I am my own boss – I set my own standards	Dancers have a feeling of autonomy and a sense of control, because they choose themselves what they do.
I am good at it	The satisfaction of meeting personal standards creates a positive self-assessment and leads to confidence.

2.4 Conclusions

From the literature it became clear that engagement is described as a user's state of mind which should be reached to fully enjoy an action. In the context of this research the action can be described as using the app or dancing. To analyse if engagement is present when performing the actions

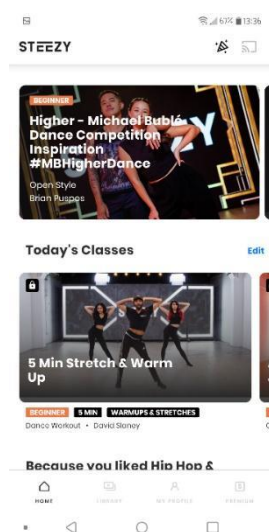
various components have been found per action. For using the app, these are: utilitarian functions; focussed attention; felt involvement; perceived usability; novelty; aesthetic appeal and durability. For the activity of dancing these are the five obstacles, factors of high engagement and the concept of social engagement. Still missing is the relation to practice, so in the next section the found components will be used to analyse current apps on the market.

3. Apps on the market

In this section, I will describe the research I carried out on current apps on the market. Five apps have been reviewed according to the literature of section 2 and reviews written by its users. The complete research can be found in appendix 2. Whereas this section gives a concise summary.

3.1 Selected apps

For this research five apps have been chosen according to three requirements. First, the apps should be downloadable on android smartphones, because it was not possible to get all information, such as screenshots and number of downloads, from IOS apps due to the lack of an IOS smartphone. Second, the apps should not completely overlap in functionality, so if there is already one app used for creating formations another app with the exact same functionality shall not be picked. Lastly, in the remaining list the most downloaded apps used for dance practices were chosen. The number of app downloads was at least 10.000 to make sure that enough reviews were available. For this sorting process two different sites stating popular dancing apps were used in combination with the google play store, which was sorted on most downloaded. ("11 Of The Best Dance Teaching Apps For Teachers," 2021; "Google Play Apps," ; "List of Apps for Dance Choreography, "). In the end the five apps listed below were chosen for the research.

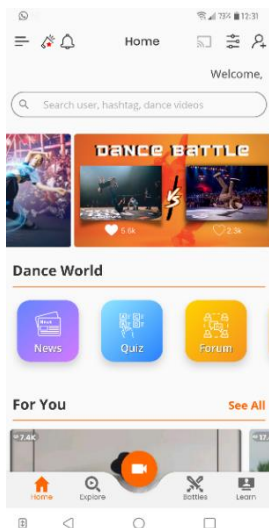


Steezy – Learn How To Dance

The app Steezy is used only by dancers. Choreographers can not use this app for uploading their own materials. Users can follow dance tutorials on various levels and join a dance party with others. It is also possible to make a planning of tutorials you want to follow. The screenshot shows the home screen where tutorials can be chosen (figure 2).

This app has been downloaded over 500.000 times and has a total of 626.000 reviews ("STEEZY - Learn How To Dance, ").

Figure 2: Screenshot of Steezy.



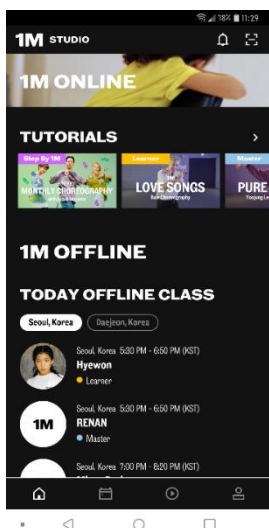
Danssup: Global Dance Platform

The app can be used to learn to dance, share your dances online with others, watch dance battles and play games with the subject of dance.

Choreographers can use the app to upload their own dance lessons. There is also a forum where users can chat with each other. The screenshot shows the home screen where the user can choose between the different functions (figure 3).

This app has been downloaded over 100.000 times and has total of 718 reviews ("Danssup: Global Dance Platform,").

Figure 3: Screenshot of Danssup.

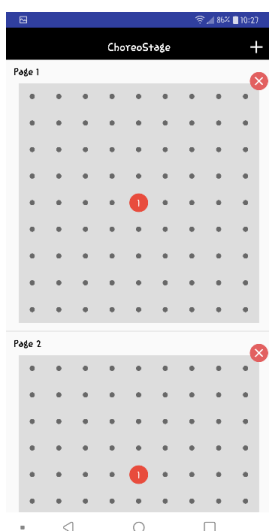


1MILLION Dace Studio

Choreographers can use this app to make an online classroom. Videos can be uploaded and dance lessons can be planned using a calendar function. For dancers it is possible to join the classroom and see all the material uploaded in one place. The calendar function is used to see when the next dance lesson will take place. Dancers can also choose to take dance lessons given by other, international choreographers. The screenshot shows the home screen where the user can choose between the classes and tutorials (figure 4).

This app has been downloaded over 50.000 times and has total of 477 reviews ("1MILLION Dance Studio,").

Figure 4: Screenshot of 1MILLION Dance Studio.



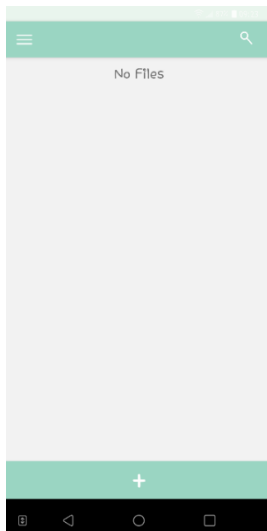
ChoreoStage

This app will mostly be used by the choreographer for planning and making formations (the positions dancers are staying) for a choreography.

Formations can be created by adding the dots and adding clarifying notes. The dancers can make use of it by viewing the formations made by the choreographer. The screenshot shows the home screen where different pages can be selected (figure 5).

This app has been downloaded over 10.000 times and has a total of 41 reviews ("ChoreoStage,").

Figure 5: Screenshot of ChoreoStage.



Audio Note

This app will mostly be used by the choreographer for planning and making a choreography. The user can write notes on chosen time stamps, for example which movements need to be executed. The dancers can make use of it by viewing the notes made by the choreographer. The screenshot shows the home screen before any files are added (figure 6).

This app has been downloaded over 10.000 times and has a total of 63 reviews ("Audio Note,").

Figure 6: Screenshot of Audio Note.

3.2 Analysis of the apps

The five apps listed above have been reviewed using the literature of section 2. In this section seven components of app engagement and three components of engagement with dance were listed. For every component of the list, it has been described if the apps do include some of its features and how these can be seen or experienced.

To be able to describe the presence of the features all apps were downloaded and used for at least thirty minutes, depending on the complexity of the app. Apps with low complexity (e.g., Audio Note) were tested for thirty minutes while apps with high complexity (e.g., Danssup) were used for almost three hours. The height of complexity was mainly depended on the number of functions an app could perform, because all functions should be used at least once to be able to describe the app according to the components found in section 2.

Next to reviewing the apps according to the literature I also looked at the reviews written by its users, because these people (mostly) used the apps for a longer period of time. Things I could not analyse with literature (e.g., functionality over time) were addressed within the reviews.

Some of the apps had a large number of reviews in the app store meaning that it would take too much time to review them all within the time allotted to this research. Therefore, it was chosen to filter on reviews placed in the last year (from September 2021 on) for apps with more than two hundred reviews. This time stamp was chosen, because apps could have been updated in the past years, making reviews of more than one year ago less meaningful. Next to this, only reviews related to one or more of the aspects from table 2 were used for this research.

3.3 Results

Following the steps described above two sets of results were created. One describing the analysis according to literature and one describing the reviews written by users of the apps.

3.3.1 Results comparison with literature

Table 2 gives an overview of the findings acquired within the first part of the app research, so a comparison between the literature of section 2 and the five current apps on the market. In the table per feature (e.g., utilitarian functions or obstacles) it is described whether these are presented within the apps and if so, where this is visible. These features were determined using the literature of section 2. Descriptions can be found in sections 2.2 and 2.3.

Table 2: Results of comparison apps with literature

	STEEZY	Danssup	1MILLION Dance Studio	ChoreoStage	AudioNote
App engagement					
Utilitarian functions	Dancers can follow tutorials with various difficulty levels (beginner, intermediate, advanced) and broadcast these to television. A planning can be made by combining/arranging different tutorials. By joining parties choreographies can be performed together. The premium function unlocks more tutorials.	Users can follow/upload tutorials and dance videos. Shared videos can be seen on the explore page where comments can be placed. Extra functions on the app are the dance battle, the quiz page, a forum, blog page, events page, job search and news page. A leader board shows the most watched and liked dancers of the week.	Lessons materials can be shared and viewed in an online classroom. Lesson planning can be done with a calendar feature. Users can join open classrooms to follow lessons from professional dancers.	Choreographers can create formations using numbered dots. These can be giving a colour and name. Clarifying notes can be added. It is not possible to save projects, only export them. Pages can be copy/pasted.	Users can record audio or import audio and make notes at chosen time stamps. Files can be shared via messenger or mail.
Focused attention	Browsing tutorials page and following tutorials get users to focus.	<i>For the choreographer:</i> building a Guru page and uploading tutorials. <i>For the dancer:</i> following tutorials, browsing on the tutorial or explore page, watching a battle or playing a quiz.	<i>For the choreographer:</i> uploading materials and planning lessons. <i>For the dancer:</i> watching material from private or open classrooms and browsing the tutorials page.	Dragging the dots to create formations and writing clarifying notes.	Searching for the right time stamps to make notes and writing the notes.
Felt involvement	Users have interaction with each other when joining parties. Screens will be shared, so you can "facetime" with others while dancing.	Using the forum, leaving reviews on tutorials or choreographers, giving likes and reactions on shared dances and voting in dance battles.	There is no direct interaction. Choreographers can upload material which students/dancers can view and use for practice.	Not present. The app is just for storing and combining data.	Not present. The app is just for storing and combining data.

Perceived usability	Dancers can choose their tutorials based on their interests and skill levels. Information, such as your skill level and favourite dance genres are asked to create a personalized homepage.	<p><i>For the choreographer:</i> uploading tutorials and getting good reviews.</p> <p><i>For the dancer:</i> learning and showing dances.</p> <p><i>For both:</i> watching dance battles and playing the quizzes.</p>	<p><i>For the choreographer:</i> All materials can be shared in one environment, including the lesson planning.</p> <p><i>For the dancer:</i> All materials are in one place, including lesson planning and skills can be deepened by open tutorials.</p>	Usable for the purpose of making choreographies with clarifying notes, but not possible to store projects.	Usable for the purpose of writing notes on certain time stamps and sharing the files with, for example, the dancers.
Novelty	New tutorials are added regularly. Users get a notification if new content they may found interesting is uploaded.	New tutorials are added regularly. Users get a notification if new content from someone followed is uploaded. Quizzes and the leader board are constantly updated.	New tutorials are added regularly. Users get a notification before their lesson starts or if new content is uploaded.	Not present. New content will not be uploaded and the app does not work with notifications.	Not present. New content will not be uploaded and the app does not work with notifications.
Aesthetic appeal	The onboarding page is quite busy, because a video is playing at high speed. The interface design is minimalistic with black, white, grey and blue as accent colour. Rounded corners are used to create a feeling of safety. A bottom navigation bar is added with four functions (home, library, profile and premium). Short	The onboarding pages explain the main functionalities of the app with the use of pictures. The app interface is calm with mostly white and orange as accent colour. Rounded corners are used for a feeling of safety. A bottom navigation bar is added with five functions (home, explore, share, battles and learn).	The design is minimalistic and in dark mode. Accent colours are used to indicate the different levels of tutorials. The onboarding page asks to create an account or sign in. The app makes use of rounded corners for creating a feeling of safety. A bottom navigation bar is added with four functions (home, calendar, tutorials	The onboarding page is very simplistic. However, it was not clear that the word "Start" was a button. The design of the app is minimalistic and coherent. buttons and text boxes have rounded corners and the colours are basic (mostly black and white) accent colours are used for the numbered circles	There is no onboarding page in the app. There is no real consistency throughout the interface design (sharp and round corners are used together, soft and harsh colours are used together, some buttons have shadows (record button) while others do not (play button)).

	videos are placed at tutorial pages to give an example of the lesson.	Gamification elements (spinning wheel and leader board) are added.	and profile). bold typography is used to highlight important aspects.	(standing for the dancers).	
Endurability	New content is added frequently to the app. Notifications of a users' planning are sent.	New content is added frequently to the app. Notifications of interesting videos are sent. The spinning wheel gets higher prices when logging in daily.	New content is added frequently to the app. Notifications of a users' planning are sent.	Pure for functionality users could want to use it again. However, some functions are missing and no elements of felt involvement and novelty are included.	Pure for functionality users could want to use it again. However, no elements of felt involvement and novelty are included.
Dance engagement					
Obstacles	Tutorials can be too hard or too easy, decreasing the users' motivation. Dancers can be afraid to join parties, because they can feel ashamed in front of others.	Tutorials can be too hard or too easy, decreasing the users' motivation. Getting few likes or comments on shared videos creates the feeling of being not good enough.	Tutorials can be too hard or too easy, decreasing the users' motivation.	Not present. <i>The app is used for storing and organizing data, so does relate with the activity of dancing itself.</i>	Not present. <i>The app is used for storing and organizing data, so does relate with the activity of dancing itself.</i>
Factors of high engagement	Users can choose a difficulty for the tutorials (easy, intermediate, advance). This contributes to two values: loving a challenge and setting own standards.	Users can choose a difficulty for the tutorials (easy, intermediate, advance). This contributes to two values: loving a challenge and setting own standards.	Users can choose a difficulty for the tutorials (easy, intermediate, advance). This contributes to two values: loving a challenge and setting own standards.	Not present. <i>The app is used for storing and organizing data, so does relate with the activity of dancing itself.</i>	Not present. <i>The app is used for storing and organizing data, so does relate with the activity of dancing itself.</i>
Social engagement	Users can join a party with each other and dance together, so having interaction.	users can chat with each other and like/comment on videos, so having interaction.	There is no direct interaction. Users get a notification if material is uploaded in classrooms.	Not present. <i>The app is used for storing and organizing data, so does relate with the activity of dancing itself.</i>	Not present. <i>The app is used for storing and organizing data, so does relate with the activity of dancing itself.</i>

In the app “*Danssup*” gamification elements are used to make the app more attractive to the user. Gamification is the use of video-game mechanics and elements in non-game contexts to enhance user engagement and performance (Bitrián, Buil, & Catalán, 2021; Darejeh & Salim, 2016; Edney et al., 2019). In “*Danssup*” this is included via the spinning wheel the user has to turn every day for in game prizes and the leader board of most liked dancers and choreographers which is updated every week. The use of gamification elements can benefit to the amount of user engagement, but designers have to be careful with it. The pitfall is that the app could become too childish for the users’ goals or that it looks more like a game than, in this case, a learning app.

3.3.2 Reviews of the current users

Table 3 gives an overview of the findings acquired within the second part of the app research, so reviews written by the current users of the five apps. In the table per app a summary is given from the written reviews. The full reviews (with date and number of stars) can also be found in appendix 2.

Table 3: Results of app reviews.

Steezy	Most users are positive about the app functionalities when they are working properly. There is a wide variety of styles available on different levels of difficulty. The content is of high quality and is updated regularly. Some functions do not work properly (broadcasting, freezing videos, filtering system) which cause frustration and disappointment by the users. The engagement of the app will be lowered, because of these lacking functionalities. Also, visually impaired people can not really use the app at this moment, because of these bugs.
Danssup	Most users are very positive about the app. A lot of different functions are integrated and most importantly, it is possible to follow dance tutorials on various levels and dance styles. A choreographer is able to grow and get a broader network. Dancers can learn and increase skills. Less favoured was the use of coins. These coins are gained for free by spinning the wheel and playing the quizzes and can then be used for unlocking tutorials. Some users found it annoying to first collect these coins, while others found the game element of added value.
1Million Dance Studio	People use this app mostly for home-schooling. Obstacles preventing these people to go to offline classes are mostly anxiety and being not good enough. With this app it is possible to learn and practice dancing at home, so it is not needed to go to an offline dance studio. However, a lot of people say to have problems with creating an account or logging in, so it is not possible to even use the app. These people are disappointed in the app and therefore do not want to use it anymore, even if logging in will become possible to them.
ChoreoStage	Users are mostly positive about the functionality of the app (it is simple and to the point), but the fact that there is no option to save your projects comes back in almost all reviews. It is an important feature which is missing, and this can be seen at the stars which are given to the app. These are low (mostly one or two stars), because the missing saving feature stands in the way of the functionality of the app.
Audio Note	Users are variably positive. The simplicity and functionality of the app is seen as the strong point. However, on the other hand a lot of users seem to have problems with the data storage inside the app. Added files cannot be found or are completely removed from the app. One user

	suggested an extra feature as a solution to this problem: when it would be possible to store your files online (e.g., via an account) you would have a backup and can open it on more devices.
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3.4 Discussions

In this section the same apps were analysed in diverse ways. where in the first part (comparison with literature) the approach was completely theoretical in the second part (reviews of current users) practice supported the information stated in table 2. In the reviews it became clear that people tend to write a review most often when something about the app is not functioning well or they feel annoyed. They describe in detail which part is not working or what they find annoying. On the other hand, when an app is functioning well and the user is satisfied by it reviews are less elaborate.

Looking at table 2 a few things can be added which are extracted from the analysis of the reviews. Firstly, missing or not working functions cause frustration and disappointment by users. This could be seen with different apps. For example, saving projects was not possible (*ChoreoStage*) or the freezing function did not work (*Steezy*).

Secondly, adaption for impaired users should be integrated rightly. Users get frustrated when apps state they are adapted for impaired people, but they can still not use it properly. For instance, the adaption for visual impaired within *Steezy*, which does not really help.

Lastly, as already stated in section 3.3.1 app designers should be careful with the integration of gamification elements. In *Danssup* people found it annoying there was a "coin-system" integrated. Needing coins to unlock tutorials worsened the main function of the app, namely learning new choreographies by following tutorials.

Until now, the executed research is mostly theoretical (except from the written reviews). Still missing is a solid connection to the practice, because people will use these apps during dancing activities. To get a better view of the practices in which these apps are used interviews were conducted with both choreographers and dancers. This is described in the next section.

4. Interview findings

In this section, I will provide the results of interviews which have been held with both choreographers and dancers. The questions were focussed on the participants experiences within dance practices. The interviewing method was chosen, because it is not possible to evaluate engagement by observing task completion (Attfield et al., 2011). Self-reporting measures, the category which includes interviews, are not as objective as observing measures, but they offer a convenient means of assessing a users perspective of an experience (Heather L. O'Brien, 2009; Lehmann et al., 2012; Mounia Lalmas, 2014).

4.1 Participants

Interviews have been conducted with two choreographers (C1 and C2) and three dancers (D1, D2 and D3). It was chosen to interview both user types, because the choreographer can use apps for planning and creating choreographies, while the dancer can use apps for input when dancing (watching tutorials, reviewing notes).

4.2 Research plan

I talked to the choreographers and dancers after their writing/dancing sessions at the location which they used to make choreographies or dance. Mostly, these were sports centres, but once it was at a

participants home. This was done with three reasons in mind. Firstly, the participants would feel comfortable, because they were familiar with the surroundings. Secondly, if participants made use of certain tools before, during or after dance practices they would be able to show me these tools. Lastly, the participants just finished their task (writing a choreography or dancing), so their thoughts about the task would be easily accessible.

The interview questions used for this research (appendix 3) can be divided into two sets of questions. The first set is used during interviews with choreographers and the second set is used during interviews with dancers. The questions are comparable for both sets, because then coherent information on the same subjects could be gathered. A set of semi-structured questions is separated into two parts. It was chosen to do a semi-structured interview, because then it is possible to ask the participants why they give a certain answer. In the first part, participants are asked about their current experiences with the activity (e.g., which tools do you use?; Do you feel absorbed in the task/moment?). After the first part, the five apps researched in section 3 are shown to the participant with a short explanation about the app's functionalities. The questions in the second part ask the participant if he/she would like to make use of one of the shown apps and if these apps would make the activity more fun.

The interviews were recorded using voice recorder. This gave me the freedom to have a conversation with the participants without having to write down every given answer. All participants gave spoken consent to the recording (at the beginning of the recording). It was agreed upon that the recordings would be used for the purpose for this research only and would be deleted within three months after the interview.

4.3 Analysis

The recordings of the interviews were written out to be able to analyse them. It was chosen to put all answers per question together, so all questions got five answers (two from choreographers and three from dancers). Within this structure it was possible to see similarities between the answers. These were marked with a colour code. In the end, it was visible by which questions similarities were present and which questions presented only different answers. The next step was to filter the answers on relevance for this research. Not all answers given could be used due to several reasons (e.g., straying from the subject or not given an answer to the asked question). These "non-usable" answers were also given a colour code. By analysing the coded answers per question, the findings presented in the next section could be found.

4.4 Findings

The main findings, important for this research, are presented below.

The participants were asked which tools they used within their practice. Here it already became clear that current apps on the market include not all functions which would be wished by both choreographers and dancers: *"I still use pen and paper when creating choreographies (...) otherwise, I have to use at least five different apps to get all the functions I want"* (C1), *"Our lesson tutorials are shared with the app 'Danssup', the music is shared via 'WhatsApp' and the lessons are planned using 'Google Calendar'. I often miss new information due to all the notifications"* (D2). Therefore, after showing the apps only one choreographer and dancer would like to try some of those apps (mostly favoured was "Danssup" and "1MILLION Dance Studio"). One of the choreographers (C2) did use an app to create and share tutorials with her pupils ("Coach's Eye), but that app was taken out of

practice. She had been searching for a replacement, but could not find one that suited all of her needs.

Choreographers as well as dancers seemed to forget time during practice. They were completely involved in their activity: *"I want to write just one minute of dance and end up writing the full four and a half minute"* (C2), *"Just wanting to dance for 15 minutes and ending up dancing for an hour is not that rare"* (D3). It can be said that the participants experienced flow during the practices. This is also confirmed by the positive feelings they experienced after practice: *"I mostly feel victory when finished (...) it gives motivation to start on the next choreo"* (C2), *"I feel satisfied after a dance session. I am completely broken, but the feeling of joy makes totally up for it"* (D1), *"It charges your mind to lose yourself in dance (...) Afterwards, I am ready to start serious work again"* (D3).

The "fun" part about dancing practices was for the choreographers to come up with new combinations and positions: *"Inventing new combinations of movements is the most fun part for me"* (C1), *"To come up with things that have never been done before is fantastic (...) the fun is in creating things"* (C2). For dancers, the fun was mostly about the social aspect of dance. Being with others and performing together was given as the most valuable aspect of dance: *"Between practice we talk and laugh with each other. For me that's fun"* (D1), *"The feeling just before a performance, when we are all nervous (...) afterwards we see the fun of it, because we all had the same feeling"*.

4.5 Discussions

In this section interviews were held with both choreographers and dancers to get a view of the practice in which apps are used. The findings described in the section 4.4 both confirm the research done in section 3 and add new information. The new information is more related to the practice in which the apps are used and is presented below.

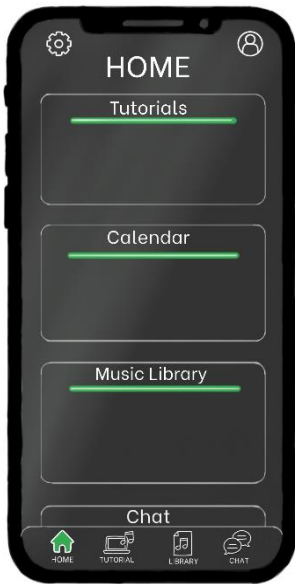
Table 2 (section 3.3.1) can be expanded by information gotten from the interviews by the following aspects. Firstly, Functionalities of the apps should match with all needs of the user. The participants did not like to use apps, because there was not one app with all functionalities they wanted combined.

Secondly, social interaction is seen as the most valuable aspect of dance seen from a dancer's perspective. Apps should support social interaction, ideally in person (offline), but otherwise digital.

Sections 2 and 3 focused (mostly) on the theoretical part of the apps and engagement in dance practices. Section 4 has added a connection with the practice itself through the use of interviews. With the information gathered in sections 2, 3 and 4 it is possible to create a list of design implications for the design of apps used in dance practices. This list is presented in the next section.

5. Design implications

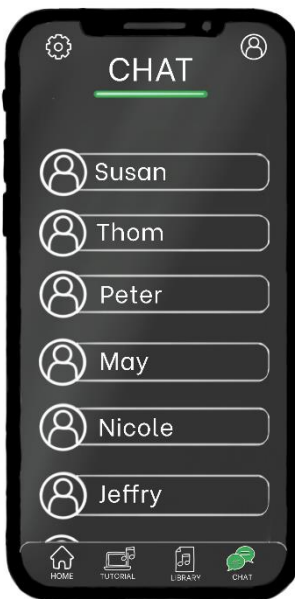
In the last two sections information was gathered by research. With this information it is possible to create a list of seven design implications useful for app designers when creating an app which will be used in dance practices. Interface examples are made to illustrate the stated implications. In the end, when following these implications apps would be engaging for the users before, during and after dance.



1. Functionality is well worked out and matching with the goals of the user.

From all sections it became clear that the utilitarian functions of the app were the most important. The functions should match with the goals and wishes from the user, e.g., a user wants to plan dancing lessons within the app, so a calendar function should be available. The most wanted functions for users are: following/uploading materials, calendar, music library and social interaction (sections 3.3.2 and 4.4). Next to the presence of certain functions, they also need to work properly. When functions do not work as they should users get frustrated and will remove the app from their telephone. For instance, as could be seen in section 3.3.2, when the logging in function does not work, user will not keep using the app even if it is fixed. Figure 7 shows an example interface with the users most wanted functions.

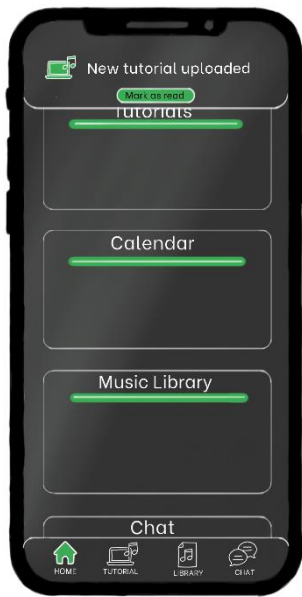
Figure 7: Functionality in app design.



2. Extra functions are added to create felt involvement.

Users want to have interaction with others while dancing (section 4.4). In an online environment this will work a bit different, because physical interaction is not possible. However, there are various options for including social interaction in apps. Examples from current apps are a chatting forum (*Danssup*) and the option to join dance parties (*Steezy*) (section 3.3.2). When there is a possibility to interact with others app users can share their stories and performances with each other. As was stated in section 2.3 social engagement is one of the most important forms of engagement present in design practices. Figure 8 shows a simple form of social interaction within app design in the form of a chat function.

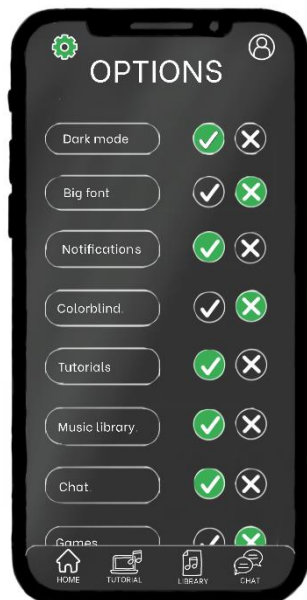
Figure 8: felt involvement in app design.



3. Extra functions are added to create novelty.

Novelty results in endurance (section 2.2). When new content is uploaded regularly, and users are made aware of it, they will be coming back to the app (section 3.3.1). The easiest way to make users aware when new content is uploaded, is by making use of notifications. An example is given in figure 9. Another option could be to let the user know that every week at the same time (e.g., Friday 14:00) new content will be uploaded on the app. The drawback from the second option is that there needs to be an adherence to a schedule.

Figure 9: novelty in app design.



4. Give users the option to personalize the app.

The option to personalize gives users a sense of control and benefits to the perceived usability (sections 2.2 and 3.3.2). Not all users are similar, so different users have different wishes. For example, one user wants to get notifications when new content is uploaded (see point 3, novelty) while another user gets stressed from these notifications and prefers to visit the app at the same time everyday to look if new content was uploaded that day. To satisfy all these different needs and wishes, including a personalization menu as shown in figure 10 could be integrated. Users could choose if they want certain functions, for example, dark mode, on or off. The apps get more personal and therefore benefit to the perceived usability.

Figure 10: Personalization in app design.

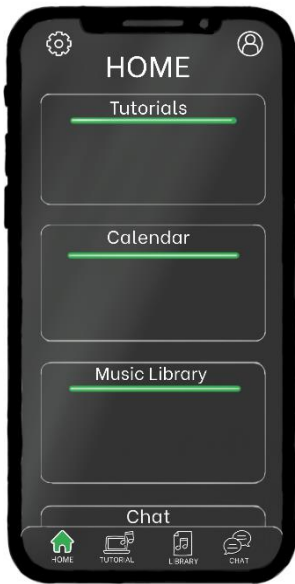


Figure 11: UX/UI trends in app design.

5. Interface design is following the current UX/UI trends (aesthetic appeal).

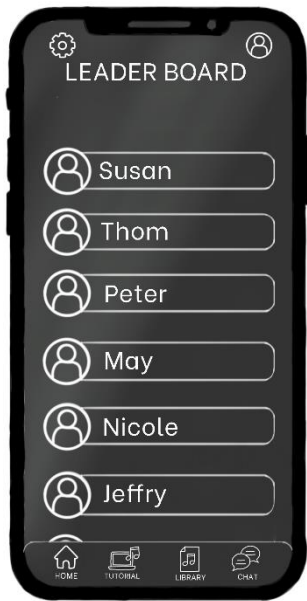
Apps which look appealing to the user are easier in use (sections 2.2, 3.3.1 and 3.3.2). This contributes to a higher user engagement. The complete list of UX/UI trends (appendix 1) consists of a lot of elements which could never all be integrated in one app. Therefore, choices need to be made. However, three trends are always good to implement into app interfaces. Rounded corners give users a feeling of safety, simple interfaces are clearly understandable and a bottom navigation bar helps the user to easily navigate through the app. These elements are also implemented in the example interface on the left (figure 11).



Figure 12: Adaption for impaired users in app design.

6. Adaption for impaired users should be integrated rightly.

From the app reviews (section 3.3.2) it became clear that some apps offer adaptations for impaired users (e.g., *Steezy* has interface options for visually impaired people). However, the functions are not functioning well, resulting in the fact that impaired users still are not able to use the app properly. This stands in line with guideline 1 about functionality. There are quite some impaired people who like to dance and probably also would like to make use of apps used in dance practices. In app design these user groups should not be forgotten. Integrations which could be made are, for example the use of bigger font (figure 12) or the option to listen to the context which is displayed on the screen. These adaptations could also be used by, for example elderly people who are no longer able to read small fonts.



7. Be careful with the integration of gamification elements.

From literature (section 3.3.1) as well as the reviews (section 3.3.2) it became clear that integrating gamification elements in app design should be done carefully. As stated in the reviews of *Danssup* the spinning wheel with the coin system was experienced as an annoying feature, because the app started to look more like a game than a learning platform. On the other hand, the leader board was experienced as a positive function. Users were motivated to practice, because there was a change to reach the leader board (figure 13). As a conclusion, it is possible to integrate gamification elements in serious apps, but carefulness is needed. The main function of the app should not be changed into a gaming function.

Figure 13: Gamification elements in app design.

6. Discussion

The goal of this paper was to find an answer on the research question **“What are the design implications for an app, used by choreographers and dancers in dance practices, to accomplish user engagement?”**. Throughout the paper different methods (comparison with literature, review comparison and interviews) are used to create an answer to this question. As a result, section 5 shows a list of design implications which should be followed by app designers working on an app used for dance practices.

This paper started with figure 1, an overview showing the usage of apps in dance practices. As an answer to the research question a list of seven design implications is created and explained in section 5. These seven implications have been placed in the overview of figure 1. This results in figure 14 shown below. The yellow numbered circles stand for the design implications.

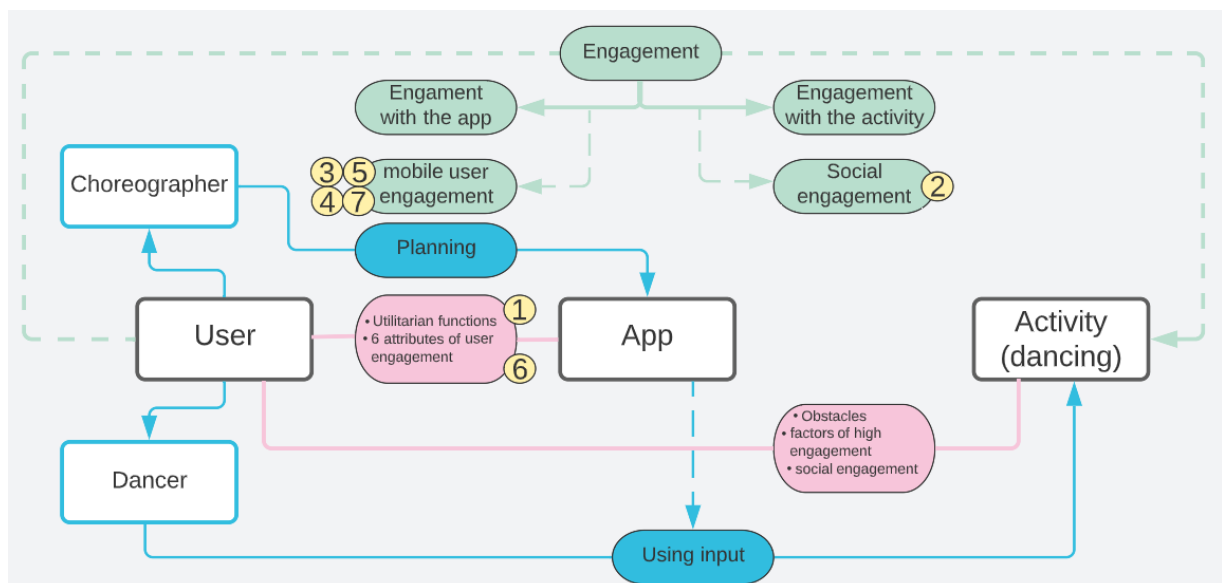


Figure 14: Design implications placed in overview use of apps in dance practices.

It can be seen that implications 1 (functionality) and 6 (adaption for impaired users) are placed between "user" and "app". This is done, because both implications are focused on the relation between these two components.

Implication 2 (felt involvement) is placed at "social engagement". Implication 2 focuses on interaction between users. This is within the concept of social engagement. Therefore, implication 2 is placed with this component.

Implications 3 (novelty), 4 (personalization), 5 (UX/UI trends) and 7 (gamification) are placed next to "mobile user engagement". This is due to the fact that all these implications refer to the app interface in the sense of its features or design. Therefore, these implications are set next to this component.

The implications presented in section 5 are not set requirements. As it already says, these are implications and therefore can be used to create more detailed requirements for the design of a specific app. App designers should keep these implications in mind while designing, but it is not intended to stick closely to them. There is still free interpretation possible from the designers' side when implementing the implications.

6.1 Limitations

There are some limitations to this research. The apps used for this research were selected on downloadable for android smartphones due to the lack of an IOS device. This means that a large number of apps have been left out of this research. This will influence on the end result, because some often-downloaded apps are not included.

Also, a small sample of dancers (3) and choreographers (2) was interviewed during this research. It is likely that some important answers are missing due to this small sample size. When more people will be interviewed a higher variety in used tools (and especially apps) would show up. This could influence the concluded total experience with dancing apps, because it was not remarkably high in this sample.

6.2 Further research

To further evaluate the implications as presented in section 5 it is needed to both integrate IOS and android apps in the literature research and to work with a higher sample size during interviews. Besides that, when new apps have been designed using the stated implications these need to be tested on user engagement as has been done with current apps within this paper.

7. Conclusion

This paper provides a set of seven design implications which can be used to create apps for dancing practices in such a way that user engagement will be achieved by its users. Further research should be done about the inclusion of IOS apps. These should be researched to either verify or improve the found implications. Also, a greater sample size should be interviewed to get a more complete view of the apps which are already used in practice. Finally, there needs to be done research into the practice of these implications when used while designing. New apps designed following these implications should be tested on user engagement.

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Appendix 1: Detailed list of UX/UI trends

The following table (table I) lists all current UX/UI trends as been stated by Erdem (2021), Yeeply (n.d.) and Verma (2021).

Table I: list of current UX/UI trends.

Dark mode	Neomorphism design
Bold typography	Smooth gradients
AR and VR	Touchless interactions
Simple page design	Frictionless authentication
Minimalistic design	Responsive design
Bottom navigation bar	One accent colour
Animations	3D design
Onboarding page	Empty state design
UX writing	Round corners
Round corners	Personalized experience
Artificial intelligence	Voice User Interface
Micro-animations	

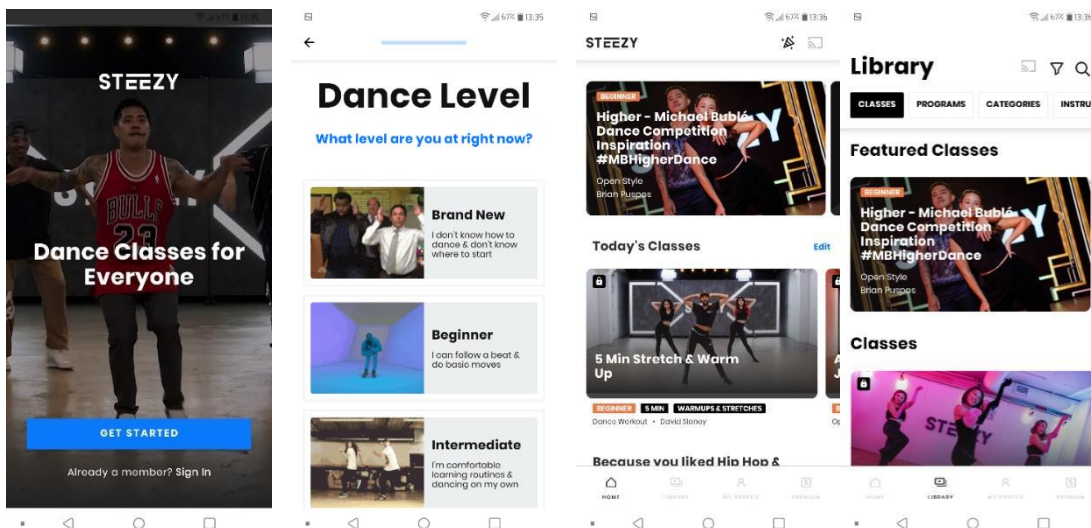
Appendix 2: Total app analysis

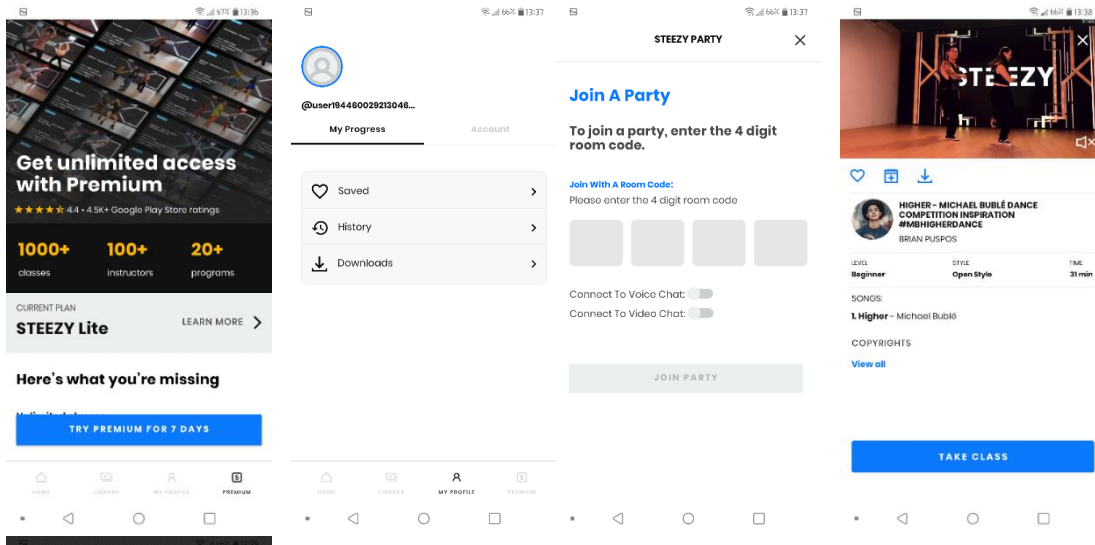
The complete app analysis used for section 3 can be found from here on.

STEEZY – Learn How To Dance

(500K+ downloads, 62.600 reviews)

This app is used by dancers only. Choreographers can not use this app for uploading their own videos. Users can follow dance tutorials on various levels and join a dance party with others. It also possible to make a planning of tutorials you want to follow.





STEEZY

Figure 1: onboarding page first time, questions creating account, home page, library, option to choose for premium, profile, join a party, tutorial, onboarding page after first time

App engagement (mobile user engagement)

- Utilitarian functions
 - o Dancers can follow tutorials on this app with various difficulty levels (beginner, intermediate, advanced) it is possible to broadcast these tutorials for smartphone to television for a better view. A planning can be made by combining/arranging different tutorials, so the user knows what he/she wants to do on a day. It is possible to join parties with other dances to perform your choreographies together. With the premium functions unlocked even more tutorials can be accessed.
- Focused attention
 - o Browsing the home page can use the attention of the user and of course following the tutorials takes focused attention to be able to copy the movements. Not a lot of focused attention is asked by other functionalities
- Felt involvement
 - o People can have interaction with each other when joining parties. Screens will be shared, so you can “facetime” with others while dancing. Other than that, the app does not provide interacting elements.
- Perceived usability

- Dancers can choose their tutorials based on their interests and skill levels. Learning new choreographies and skills is probably the main goal of the users, so the usability will be high
- Novelty
 - In the app new tutorials are added regularly, so this new content can be explored by the users. Also, users will get a notification new content they may find interesting is being upload, so they can watch it as one of the first people.
- Aesthetic appeal
 - The onboarding page when opening the app for the first time is quite busy. A video is playing at high speed when you are asked to sign in or make an account. It would be better if there would be just a background image instead of a video. When creating the account information, such as your skill level and favourite dance genres are asked to create a better home page with tutorials. The interface design is minimalistic with black, white, grey colours. Blue is used as an accent colour and most colour comes from the pictures and videos on the interface. Rounded corners are used to create a feeling of safety. Also, a bottom navigation bar is added with four functions (home, library, profile and premium). This makes it easy to navigate through the app. Premium will not be used that many, so it would have also be a good possibility to replace that function with the join party function. To make the interface interesting short video parts are repeated when looking at a tutorial page to give a better view of the lesson.
- Endurability
 - New content is added frequently to the app, so this triggers users to again take a look and, for example, start browsing the tutorials page or exploring page.

Dance engagement

- Obstacles
 - Tutorials can be too hard or too easy, decreasing the users' motivation. Next to this, users can be afraid to join parties, because they can feel ashamed in front of others, because of e.g., their skills are not good enough or they do not remember the choreography.
- Factors of high engagement
 - This app can contribute to higher engagement while dancing by some of its features. It is possible for the user to choose a difficulty when following online tutorials (easy, intermediate, advance). This contributes to two values of high engagement within dance: loving a challenge and setting own standards. The dancer can choose for him/herself on which level he/she wants to follow a tutorial. When liking a challenge, choosing for a higher level can be challenging and therefore engaging. When the level is too high, own standards can be set by saying that the max level of the tutorials should not be higher than e.g., intermediate. This can then lead to being in the state of flow. When the skills and challenge of the dancer are in balance, this leads to flow and flow is one of the main components of engagement.
- Social engagement
 - There is also social engagement within the app. One of the main reasons to start dancing is because of social reasons. Within the app users can join a party with each other and dance together, this will lead to the fact that users will start to engage.

Reviews

Table II: reviews of STEEZY.

Review	Date	Stars (1-5)
The instructors and classes are fabulous... However, the functions of the app itself need a lot of improvement. I paid for the year as a birthday present to myself, and I've barely used it... Mainly because I've been trying to find a way to successfully cast to a bigger screen. I'm visually impaired, can see pretty well with corrective lenses but it was pretty impossible to get into the choreo when I'm squinting at my phone to see what's going on. Make casting easy, and I'll give it another try	May 26, 2022	2
Doesn't always work with Chromecast :(Was looking forward to trying Steezy for years and I finally got myself the annual subscription. Unfortunately, the app gets buggy with Chromecast so I couldn't cast several of the classes to any our TVs here at home. I've tried on two different Chromecast connections and both are buggy. I really hope this gets fixed because I absolutely love Steezy's content.	June 19, 2022	3
First of all, the app and website are great from a functionality perspective, which I am sure is difficult to get right for online video platforms. The content, though, is extremely high quality and there always is more to try, whether it is a new move, style, or just getting a good workout. Learning by video can actually be very helpful since I never get something the first time through. I just replay the videos as needed! Love it. Definitely worth the price.	September 18, 2021	5
The program is outstanding between the wide variety of styles, ability to create your own schedule, tips and lectures to learn more about becoming a better dancer beyond learning series of moves. I've found the instruction to be very high quality as well The online community for STEEZY is equally incredible with support, tips, and challenges. The only reason I didn't give 5 stars is that there are some technical issues or bugs with the party feature and schedules.	November 10 2021	4
Loving the "intro to style" program options to get you started! This takes the intimidation out of wanting to try a new style. The instructors have been great so far. I like being able to track my progress and see what classes I've taken already. I had one freezing issue during class, but I never figured out if it was my connection or the app. It remains a mystery!	January 17, 2022	5
Honestly, great content that gets added to and improved weekly. I will probably email in some feedback, but a couple of app related feedback comments: 1) this app frequently crashes. Every other video, the app becomes unresponsive and has to be force shut down. 2) some of the screens aren't optimized for landscape view, such as the main "7 days of Steezy screen" 3) the webcam feature where you can see yourself dancing next to the video is not available in the app version for some reason	April 19, 2022	3
Easy to use, but filters keeping showing wrong types. I filter for routine but results shows skills. Extremely frustrating when I'm looking for things in specific. I've uninstalled and reinstalled the app, but still having same issues will not download until app is fixed and	January 21, 2022	2

will most likely cancel trial subscription if not fixed before the end of my trial subscription		
-------------------------------------------------------------------------------------------------	--	--

Looking at the reviews most users are positive about the app functionalities when they are working properly. There is a wide variety of styles available on different levels of difficulty. The content is of high quality and is updated regularly. Some functions do not work properly (broadcasting, freezing videos, filtering system) which cause frustration and disappointment by the users. The engagement of the app will be lowered, because of these lacking functionalities. Also, visually impaired people can not really use the app at this moment, because of these bugs.

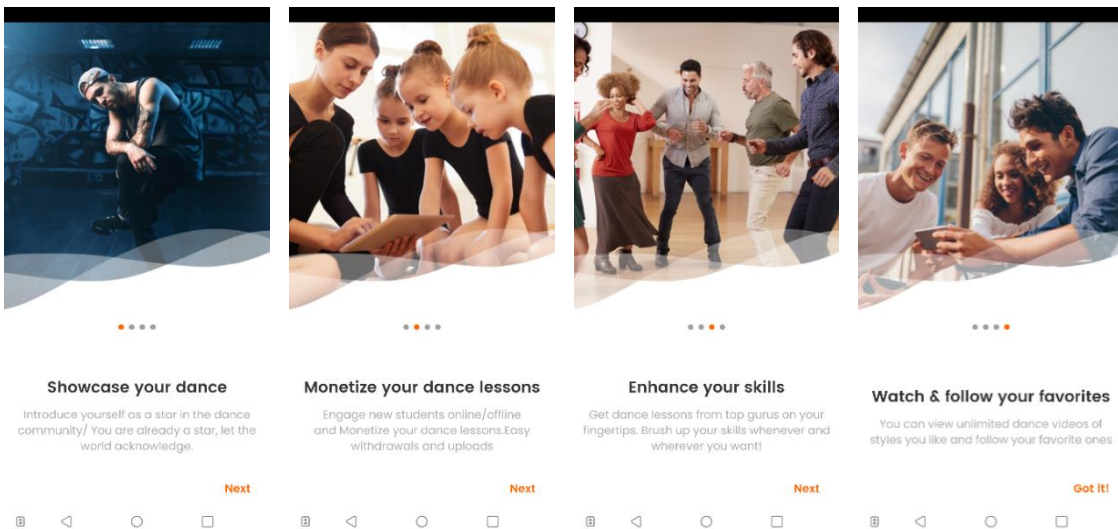
Conclusion

STEEZY is an app used by dancers only. Choreographers can not use this app for uploading their own videos. Users can follow dance tutorials on various levels and join a dance party with others. It also possible to make a planning of tutorials you want to follow. There can be accomplish more user engagement when bugs are fixed. The high number of bugs in the app decreases the user satisfaction and therefore engagement. However, the concept and basic functions of the app in combination with the interface design are in theory engaging.

Danssup: Global Dance Platform

(100K+ downloads, 718 reviews)

The app can be used to learn dancing, put your dances online, watch dance battles and for playing games about dance. Choreographers can use the app to upload their own dance lessons. There is also a forum where users can chat with each other.



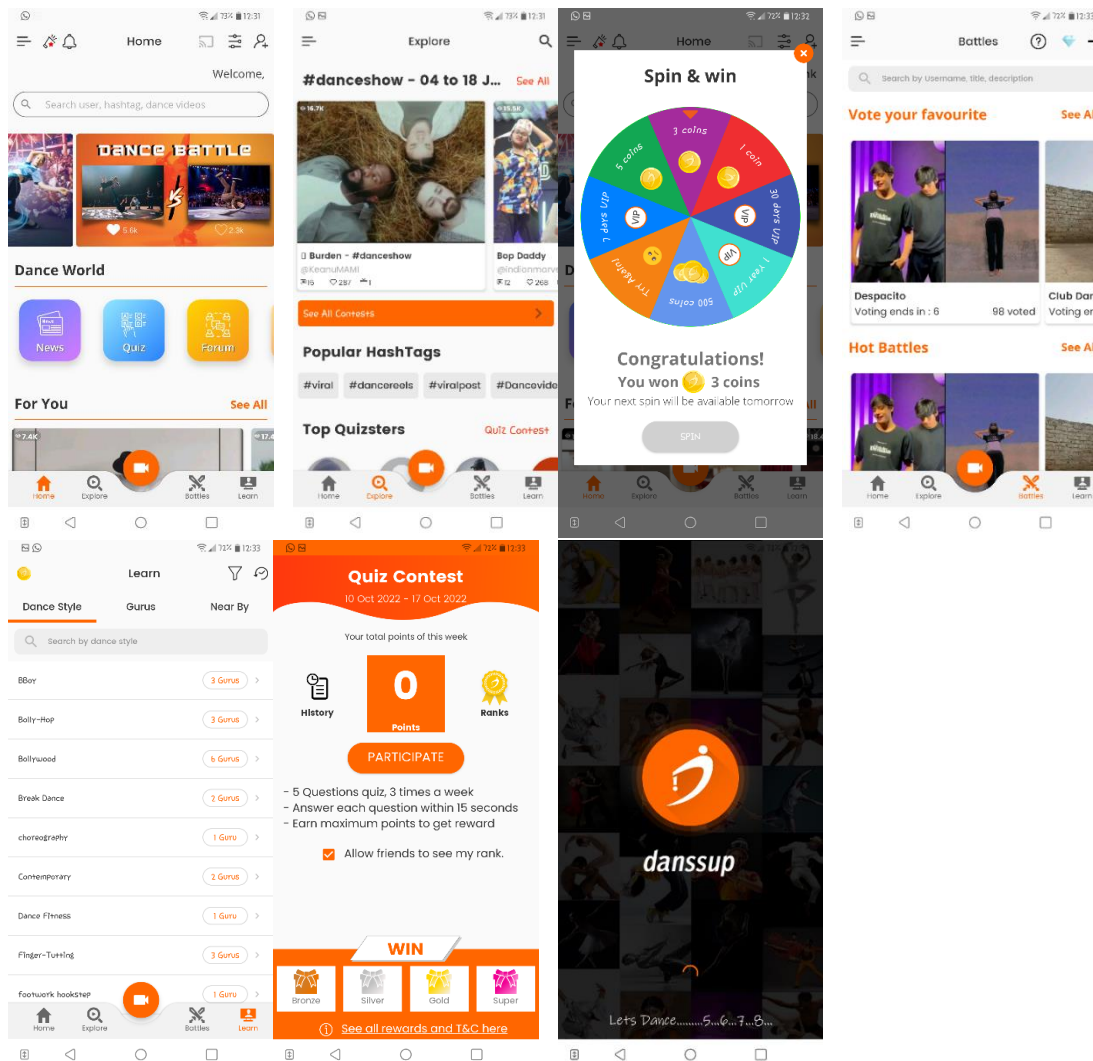


Figure II: first four: onboarding pages first time, home page, exploring page, daily spinning wheel, dance battle page, learning tutorials page, quiz page, onboarding page after first time.

App engagement (mobile user engagement)

- Utilitarian functions
 - o This app has a lot of different functions, but the most important are learning dances and sharing dances. On the learn pages various video tutorials can be/are uploaded which dancers can use to practice and improve their skills. With the camera button on the middle of bottom navigation bar, users can record their dance and share it on the platform. These shared videos can be seen on the explore page. Choreographers can use their Guru profile to upload lessons. Extra functions on the app are the dance battle, where two dancers battle against each other on the same music. Viewers can decide which one wins; the quiz page where users can play quizzes on dance content; a forum where it is possible to chat with others within the dance community; it is possible to follow blogs on dancing; view upcoming events; search for jobs and show news on dancing. A leader board is added to the app where the user can see who the most watched and liked dancers are for this week.
- Focused attention
 - o For the choreographer: when adding materials, a little bit of focussed attention needed. There is not a lot of focussed attention on the site of the choreographer

- For the dancer: dancers can watch tutorials available on the app. When browsing for such tutorials users can experience focused attention, because it can happen that you forget time and are browsing for several hours before choosing something. This can also happen on the explore page or when watching a battle or even when playing a quiz. The app has integrated many elements where the user can be focussed on the information seen on the screen.
- Felt involvement
 - Users of the app (both choreographers and dancers) can interact with others. This can be done by using the forum, leaving a review on a dance tutorial or choreographer or by giving likes and writing reactions on shared dances on the explore page. During dance battles viewers can vote on their favourite dancer, so in this app a lot of interaction is possible which results in a lot of felt involvement.
- Perceived usability
 - The perceived usability is depended on the goals of the user. A choreographer would like to upload his/her tutorials and get good reviews about them. Dancers want to learn from the tutorials and afterwards show their skills when uploading their dances on the explore page. Both user types could, for example, enjoy watching the dance battles and playing the quizzes in the app. For all different user types of the app the perceived usability is different.
- Novelty
 - In the app new tutorials are added regularly, so this new content can be explored by the users. Also, users will get a notification if people they follow upload something new, so they can watch it as one of the first people. Quizzes are constantly updated and the leader board can have other winners every week.
- Aesthetic appeal
 - The app has a very good onboarding page. The first time when opening the app four slides are showed which easily explain the main functionalities of the app with the use of pictures. After this first time the onboarding page shows the user the process of loading the app, which is good, because it gives feedback to the user. The app interface itself is calm with mostly white as colour. Orange is used as an accent colour to make it livelier. Rounded corners are used for a feeling of safety. Also, a bottom navigation bar is added with five functions (home, explore, share, battles and learn). This makes it easy to navigate through the app. Gamification elements are added to increase engagement. These are the leader board and the spinning wheel. The coins won with the spinning wheel can be used to buy exclusive tutorials which are not freely accessible.
- Endurability
 - New content is added frequently to the app, so this triggers users to again take a look and, for example, start browsing the tutorials page or exploring page. Also, the spinning wheel triggers users to return to the app, because prices will get better when having a "logging-in streak".

Dance engagement

- Obstacles
 - Tutorials can be too hard or too easy, decreasing the users' motivation. Getting few likes or comments on shared videos creates the feeling of being not good enough.
- Factors of high engagement

- This app can contribute to higher engagement while dancing by some of its features. It is possible for the user to choose a difficulty when following online tutorials (easy, intermediate, advance). This contributes to two values of high engagement within dance: loving a challenge and setting own standards. The dancer can choose for him/herself on which level he/she wants to follow a tutorial. When liking a challenge, choosing for a higher level can be challenging and therefore engaging. When the level is too high, own standards can be set by saying that the max level of the tutorials should not be higher than e.g., intermediate. This can then lead to being in the state of flow. When the skills and challenge of the dancer are in balance, this leads to flow and flow is one of the main components of engagement.
- Social engagement
 - There is also a lot of social engagement within the app. One of the main reasons to start dancing is because of social reasons. Within the app users can chat with each other and like/comment on videos. By sharing and interacting with others users will start to engage.

Reviews

Table III: Reviews of Danssup.

Review	Date	Stars (1-5)
This is an amazing app ... This is a first app which gives u so many options to explore nd u can learn here absolutely FREE Nd u must install this app if you're a dancer or choreographer	July 29, 2022	5
This app is good, I love it, this app can help you to understand the basics of new dance forms or learn what's new in the dancing world, you can record video, you can connect with trained dancers. This app is suitable for both beginners and trained dancers.	June 10, 2022	5
I'm a dancer and a choreographer, and I'm having a really good experience with this application. I mean this is the first app which gives you so many options to grow ad explore, if you're a beginner or wnt to learn dance, you can learn from here without paying a single penny. Danssup is giving coins on daily basis for users which you can use later on for learning by watching tutorials from guru profiles. Must install this app if you're a dancer or choreographer.	June 30, 2022	5
Outstanding User Interface and online dance platform for dancers to start up their own show-biz. You can even go live and watch tons of dance videos and stories. I personally highly recommend this Danssup dance app. Highly recommended dance app.	February 26, 2022	5
This app is not my favorite I hate that I have to have coins to learn how to dance and the actual good gurus cost to many coins so if you want a app that won't do this than I suggest no downloading this app.	August 13, 2022	2

From the reviews it can be concluded that most users are very positive about the app. A lot of different functions are integrated and most importantly, it is possible to follow dance tutorials on various levels and dance styles. As a choreographer it is able to grow and get a broader network. Dancers can learn and increase skills. A thing that came up which was less favoured about the app was the use of coins. These coins are gained for free by spinning the wheel and playing the quizzes and can then be used for unlocking tutorials. Some users found it annoying to first collect these coins, while others found the game element of added value.

Conclusion

Danssup can be used to learn dancing, put your dances online, watch dance battles and for playing games about dance. Choreographers can use the app to upload their own dance lessons. There is also a forum where users can chat with each other and many more functions. This app engages a lot of users through the combination of multiple functions: learning on your own skill level; sharing your videos with others; chatting with others; game elements to unlock tutorials; regularly added new content. These elements together with an interface design following the current UX/UI trends makes an engaging dance app.

1Million Dance Studio (50K+ downloads, 477 reviews)

Choreographers can use this app to make an online classroom. Videos can be uploaded and dance lessons can be planned using a calendar function. For dancers it is possible to join the classroom and see all the material uploaded in one place. The calendar function is used to see when the next dance lesson will find place.

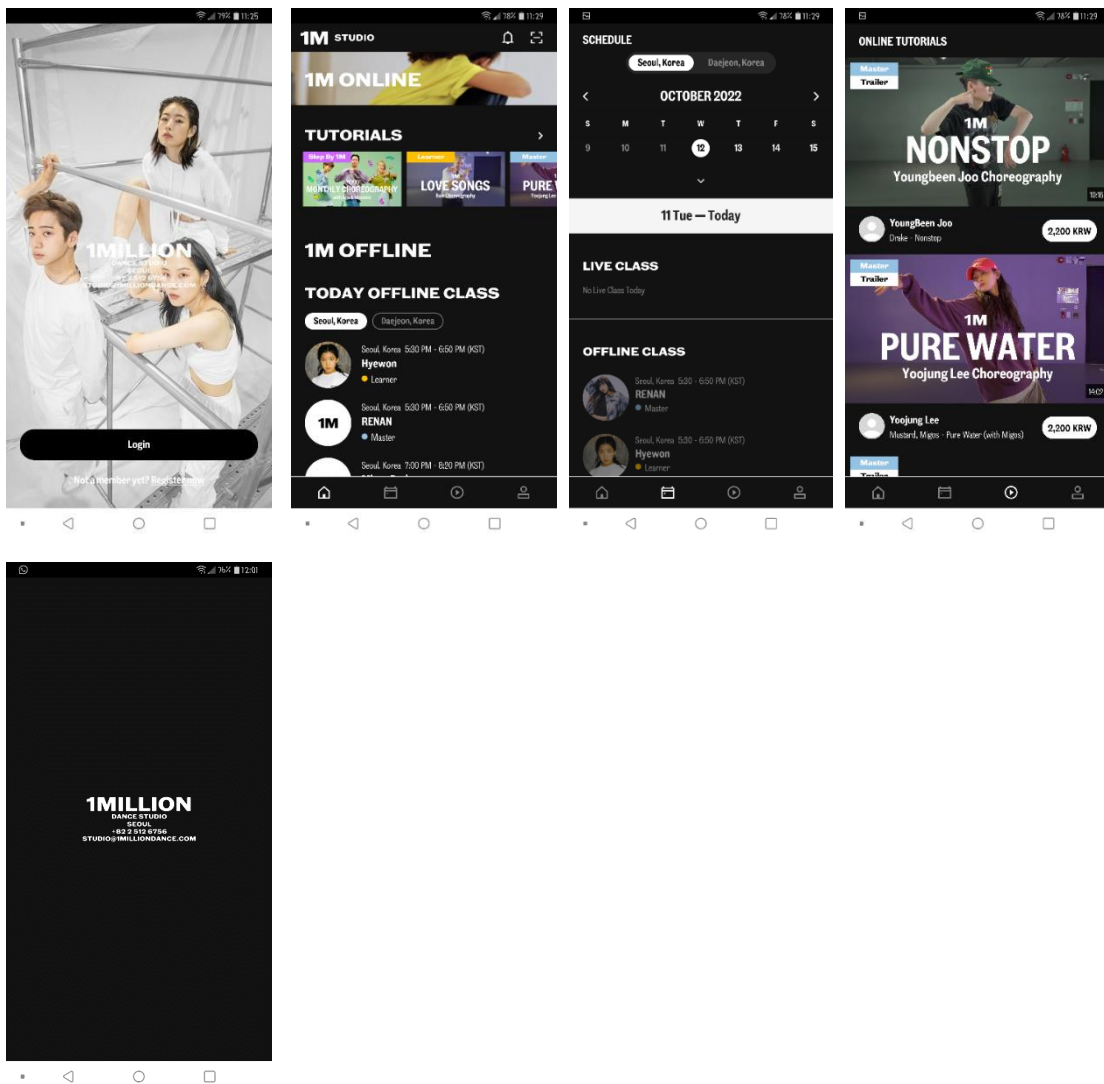


Figure III: boarding page first opening, home page, calendar page, tutorials page, boarding page after first opening.

App engagement (mobile user engagement)

- Utilitarian functions
 - The main function for the app is having an online classroom where teachers and students can share and view lesson materials. An added feature is that there is a calendar function integrated, so lesson planning is also possible within the app. Next to joining your one (private) classroom it is also possible to enter other classrooms where the teachers are professional dancers from all over the world. You can follow tutorials from these dancers to learn various dance styles, such as modern or hip hop. Users of the app have to create an account, so they can join classrooms. This makes it also possible to use the app on various devices, such as smartphone, tablet or desktop.
- Focussed attention
 - For the choreographer: when adding materials to the classroom or planning next dance lessons there is a little bit of focussed attention needed. The videos which can be uploaded however cannot be recorded within the app, so this needs to be done with another app (e.g., camera app). In total there is not a lot of focussed attention on the site of the choreographer
 - For the dancer: dancers can watch material from their own classroom, but can also search for other tutorials available on the app. When browsing for such tutorials users can experience focused attention, because it can happen that you forget time and are browsing for several hours before choosing something
- Felt involvement
 - There is some felt involvement in the app, however limited. Choreographers can upload material which students/dancers can view and use for practice. In that way there is some interactivity. However, it is not possible to, for example, chat with each other or leave feedback by using a system such as like/dislike. Direct interaction is not possible within the app and therefore, the rate of felt involvement is not that high.
- Perceived usability
 - For the choreographer: the biggest plus is that all materials can be shared in one environment which every dancer can access. Also planning lessons is handy, because all students can see the calendar when updated.
 - For the dancer: all materials are in one place and it is also possible to deepen your skills by following other tutorials or lessons. The calendar function makes it possible to create a clear overview of all lessons.
- Novelty
 - The app makes use of notifications to keep users updated on new added tutorials and remind them for their lessons. New tutorials are added frequently, so for dancers this results in new content which they can explore.
- Aesthetic appeal
 - The app looks appealing to the user through the use of various UX/UI trends. For example, dark mode is used for the interface. It looks calming for the eyes, because less light is coming from the screen. The design is minimalistic. The forms are simple and the used colours are mostly black and white. Accent colours are used to indicate the different levels of dance (beginner, intermediate, master). There is an onboarding page where the first time when opening the app the user is asked to log in or make an account. After the first time the onboarding page is a black page where

the name and address of the company are displayed. By keeping this page simple, it is clear what the app is about. The only thing which could be added to this page could be a picture representing the dancing app like the way it is done with the onboarding page when opening the app for the first time. The app makes use of rounded corners for creating a feeling of safety. Also, a bottom navigation bar is added with four functions (home, calendar, tutorials and profile). This makes it easy to navigate through the app. The last thing which is used is bold typography. Important aspects and texts are highlighted this way, so it is easy to read.

- Endurability
 - o Because the app can be used as online classroom users are tempted to return and reuse the app. New content is added frequently, so this triggers users to again take a look and, for example, start browsing the tutorials page.

Dance engagement

- Obstacles
 - o Tutorials can be too hard or too easy, decreasing the users' motivation.
- Factors of high engagement
 - o This app can contribute to higher engagement while dancing by some of its features. It is possible for the user to choose a difficulty when following online tutorials (beginner, intermediate, master). This contributes to two values of high engagement within dance: loving a challenge and setting own standards. The dancer can choose for him/herself on which level he/she wants to follow a tutorial. When liking a challenge, choosing for a higher level can be challenging and therefore engaging. When the level is too high, own standards can be set by saying that the max level of the tutorials should not be higher than e.g., intermediate. This can then lead to being in the state of flow. When the skills and challenge of the dancer are in balance, this leads to flow and flow is one of the main components of engagement.
- Social engagement
 - o There is no direct interaction. Users get a notification if material is uploaded in classrooms.

Reviews

Table IV: Reviews of 1MILLION Dance Studio.

Review	Date	Stars (1-5)
The app is good actually. The problem is myself:(I do enjoy watching dance. I think someone who can dace is really cool tho, but when I try to dance my body is soo stiff, I look like a chicken:’(June 9, 2022	5
Yo everyone be telling they arent able to login but I was able to login so easily and the app overall is great, its functional, aesthetic and most main part fu, you can book a class easily and me who doesn't know how to dance, I know for sure my dancing skills will get improved soon!	September 21, 2021	5
I have registered but I am not able to log in please help me out to log in. it is always showing verification incomplete	January 12, 2022	1
I saw this from yt and I love dancing but I'm nervous to go to the 1 million dance studio but I can just do it at home :D	December 2, 2021	5
Amazing app and it's easy to use I love it	June 7, 2022	5

From the reviews it became clear that people use this app mostly for homeschooling when it comes to the fact of dancing. Obstacles for these people to go to offline classes are mostly anxiety and being not good enough. With this app it is possible to learn and practice the dancing at home, so it is not needed to go to an offline dance studio. However, a lot of people say to have problems with creating an account or logging in, so it is not possible to even use the app. These people are disappointed in the app and therefore do not want to use it anymore if logging in will become possible to them.

Conclusion

Choreographers can use this app to make an online classroom. Videos can be uploaded and dance lessons can be planned using a calendar function. For dancers it is possible to join the classroom and see all the material uploaded in one place. The calendar function is used to see when the next dance lesson will find place. It is also possible to follow other online classes given by professional dancers. This app has a lot of aspects to be engaging for the user. Next to the functionality, which is well worked out, engaging elements are added, such as using notifications and keeping the UX/UI trends in mind. People can be engaged when using this app for their dance activity.

ChoreoStage (10K+ downloads, 41 reviews)

This app will mostly be used by the choreographer for planning and making formations for a choreography. The dancers can make use of it by viewing the formations made by the choreographer.

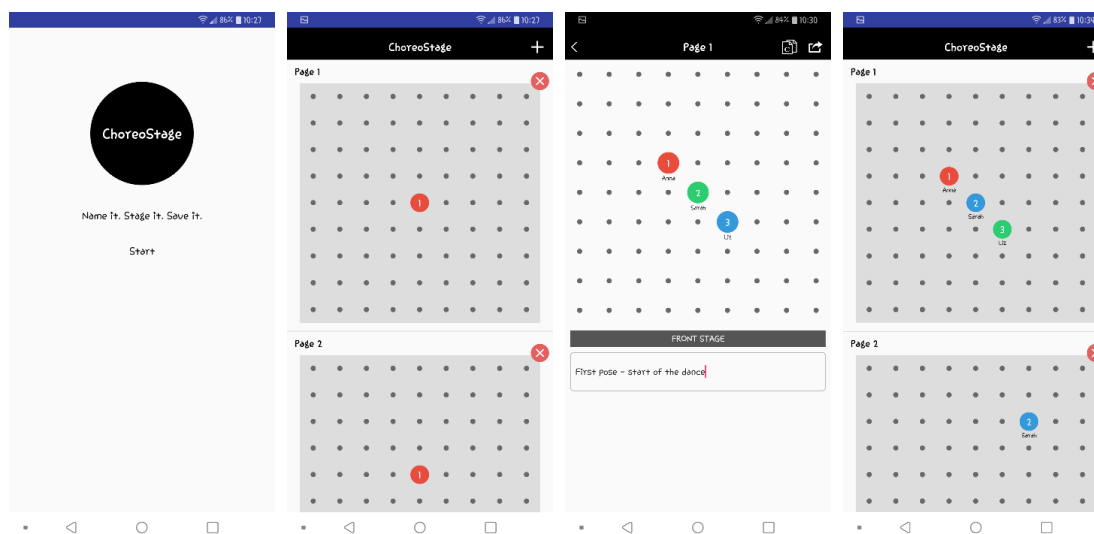


Figure 4: Onboarding, home menu, changing a page, home menu after adding.

App engagement (mobile user engagement)

- Utilitarian functions
 - o The function of the app is to make formations for choreographies. The basics of this app are clear and easy to handle, but there are some important things missing. First, it is not possible to save projects within the app. When closing and opening again your work is gone and you have to start over again. However, there is an option to export your pages to documents on your phone, but it would be more user friendly if the user could save the projects in the app, so formations can be changed later on in the process. The circles get a number and it is possible to choose a colour and change

the name, so it becomes clear which circle is which person. Notes can be added to clarify things (e.g., add a time stamp where this formation holds). It is possible to copy/paste your page, so users do not have to begin every page from scratch.

- Focussed attention
 - When using the app there are some moments when the user can be really focussed. This is while making the formations and writing notes to clarify, so dragging the dots to create formations can ask for focussed attention.
- Felt involvement
 - Not really present, there is no real interactivity with the app. The user does not get feedback from the app. It is just used for storing and combining data.
- Perceived usability
 - The app is usable for the purpose of making choreographies with clarifying notes, so looking at the activity of making a choreography this app can have a high perceived usability. However, the point that it is not possible to store projects decreases the usability. The app does not consider that making a choreography (mostly) is an iterative process. The formations can be changed according to the movements and dancers which are available.
- Novelty
 - There is not a lot of novelty involved. The functions of the app are clear and will not change that fast. And because there is no interaction within the app, new content will not be added. Also, this app does not have notifications.
- Aesthetic appeal
 - The app could look more appealing, but is already better than the AudioNotes app. First, this app does have an onboarding page. This page is very simplistic and therefore easily understandable. Still, I would have placed the word "Start" in a button. It was, when first opening the app, not clear if the app would automatically continue to the home menu or if it was needed to click on the word start. By making it into a button it would be clearer what the user should do. The design of the app is minimalistic and coherent. buttons and text boxes have rounded corners and the colours are simple (mostly black and white) accent colours are used for the numbered circles (standing for the dancers). This works well, because of the black and white interface colours. There is made no use of animations or gamification elements in this app and I think this is also not really necessary. It is more important for the main function to be clear and easily usable, so such elements probable would lead to less functionality.
- Endurability
 - When only the functionality of the app is important for the user (choreographer), he/she will probably want to use the app again. However, the design of the app (mostly the user interface design) will not contribute to endurability, because the app itself gives not the engagement users want of an app. It is pure functionality why the app will be used.

Dance engagement

- The app can be used to view formations, so it does not relate that much with the activity of dancing itself. However, it can be said that the formations can help with memorizing the choreography. The dancer can learn the order of certain formations by head which could lead to a decrease in anxiety. Anxiety is an obstacle for becoming engaged while dancing, so removing/lowering anxiety will lead to a higher engagement.

Reviews

Table V: Reviews of ChoreoStage.

Review	Date	Stars (1-5)
The app is simple and easy to use. I gave 3 stars because I can't save the project. There's no save button, so I have to take screen shot for it to be saved.	July 11, 2022	3
Simple and to the point. User friendly	October 15, 2021	5
I've allowed the app permission to save but the pages still won't save. Otherwise, a really useful app.	April 17, 2022	3
It is good but I cant save my project.	April 28, 2022	1
Great idea but the coding is faulty and you can't save anything. Please fix.	November 13, 2021	2

From the reviews it becomes clear that users are mostly positive about the functionality of the app (it is simple and to the point), but the fact that there is no option to save your projects comes back in almost all reviews. It is an important feature which is missing and this can be seen at the stars which are given to the app. These are low (mostly one or two stars), because the missing saving features stands in the way of the functionality of the app.

Conclusion

The app ChoreoStage can be used by choreographers to create formations and it is also possible to add clarifying notes. Dancers can make use of the formations and notes for memorizing the order of the various formations in a dance. The function of the app is clear and easy in use, but an important feature (saving your projects) is missing. Therefore, the app is lacking in user satisfaction. Looking at the theory and the reviews it can be said that the app does not engage users that much. Motivation for using the app mostly needs to come from the desire to simply create formations online. When all functions would be in there (and working) and the app design would be slightly changed to match a bit better with the current design trends, I see a possibility for this app to become engaging for users.

Audio Note (10K+ downloads, 63 reviews)

This app will mostly be used by the choreographer for planning and making a choreography. The dancers can make use of it by viewing the notes made by the choreographer.

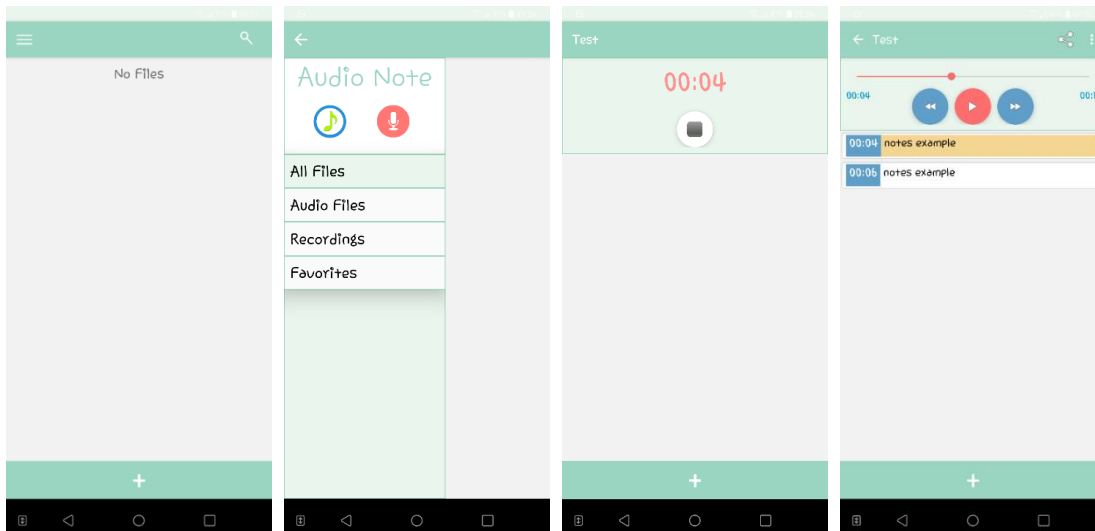


Figure V: Onboarding page, menu, recording, adding notes.

App engagement (mobile user engagement)

- Utilitarian functions
 - Functionality is clear and most important in this app. No explanation is given in the app and a "help-button" is not integrated. However, the interface is clear on itself, so the explanation is not really missing.
- Focused attention
 - When using the app there are some moments when the user can be really focused. This is while making the notes on the right time stamp, so searching for the time stamps and actually making the notes can ask for focussed attention.
- Felt involvement
 - Not really present, there is no real interactivity with the app. The user does not get feedback from the app. It is just used for storing and combining data.
- Perceived usability
 - The app is usable for the purpose of making written notes on certain time stamps, so looking at the activity of making a choreography this app can have a high perceived usability. This will also depend on the preferences of the choreographer, because some people would like to work with written text while others like video better.
- Novelty
 - There is not a lot of novelty involved. The functions of the app are clear and will not change that fast. And because there is no interaction within the app, new content will not be added. Also, this app does not have notifications.
- Aesthetic appeal
 - The app is not very aesthetically appealing. Looking at the UI trends, a real onboarding page is missing. When opening the app, you jump straight into the home screen. There is no real consistency throughout the interface design (sharp and round corners are used together, soft and harsh colours are used together, some buttons have shadows (record button) while others do not (play button)). This inconsistency leads to an incoherent app design. Next to that, there is made no use of elements such as graphs and animations, which makes the interface less interesting.
- Endurability

- When only the functionality of the app is important for the user (choreographer), he/she will probably want to use the app again. However, the design of the app (mostly the user interface design) will not contribute to durability, because the app itself gives not the engagement users want of an app. It is pure functionality why the app will be used.

Dance engagement

- The app can be used to view notes, so it does not relate that much with the activity of dancing itself. However, it can be said that the notes can help with memorizing the choreography. The dancer can learn the order of certain movements by head which could lead to a decrease in anxiety. Anxiety is an obstacle for becoming engaged while dancing, so removing/lowering anxiety will lead to a higher engagement.

Reviews

Table VI: Reviews of Audio Note.

Review	Date	Stars (1-5)
The app could be excellent if it was working. But no, it isn't. the audio file downloaded keep on vanishing. There is lack of stability.	January 1, 2022	2
This app is really simple but functional. Excellent job!	April 2, 2022	5
Finally ... A very good and simple app. Very easy to use. I like it. Thank you.	June 2, 2022	4
Was looking for an app that would let me take notes on my podcast so I cause them to edit. This works fairly well but has some bugs. It's tough to scrub to a specific time when listening to longer audio files. Also, seems to have trouble finding files I've added once already. I have to add them each time I open the app.	May 13, 2022	3
Add save your data option online because if Android lose or looked then no problem get new mobile and install this application and just login and get your audio recording again add this future's please sir this future's is very useful	June 16, 2022	1

Looking at the reviews it becomes clear that the users are variably positive. The simplicity and functionality of the app is seen as the strong point. However, on the other hand a lot of users seem to have problems with the data storage inside the app. Added files cannot be found or are completely removed from the app. Myself, I did not run into this problem. One user suggested an extra feature as a solution to this problem. When it would be possible to store your files online (e.g., via an account) you would have a backup and can open it on more devices.

Conclusion

The app AudioNotes can be used by choreographers to make/plan their choreography. Dancers can view the notes and memorize the movements on certain time stamps. The functionality of the app is clear and self-explanatory. When combining this app with the theory and looking at the reviews it can be concluded that the app is not really engaging the user. It is used for functionality purpose only and the reason to keep using the app cannot be found in its engaging factors, such as novelty and aesthetic appeal, because these are not highly represented.

Appendix 3: Interview questions

Interview questions choreographer

1. Which tools do you use to make choreographies?
 - a. Why these tools?
2. How do you share your choreography with the dancers?
3. You are a choreographer. Do you also like to dance yourself?
 - a. If yes, do you dance your own choreography or someone else's?
 - b. If someone else's or both, Are there differences in sharing the choreography?
 - c. If yes, what is different? Which approach do you like most?
4. Do you feel absorbed in the task of making a choreography?
 - a. If yes, why?
 - b. If no, why not?
5. Do you find making a choreography fun?
 - a. If yes, why?
 - b. If no, why not?
6. How do you feel after you finished a choreography?
 - a. Why?

After showing the apps

7. Would you like to make use of these apps when creating choreographies?
 - a. If yes, which ones and why?
 - b. If no, why not?
8. Would these apps make creating a choreography more fun?
 - a. If yes, why?
 - b. If not, why not?

Interview questions dancer

1. Which tools do you use when dancing?
 - a. Why these tools?
2. Do you work with one or more choreographers?
 - a. How does a choreographer/do the choreographers share a choreography with you?
 - i. If more than one, are there differences in sharing the choreography?
 - i. If yes, what is different? Which approach do you like most?
 - ii. If one, do you like it this way? Why/why not?
3. Do you feel absorbed in the moment while dancing?
 - a. If yes, why?
 - b. If no, why not?
4. Do you find dancing fun?
 - a. If yes, why?
 - b. If no, why not?
5. How do you feel after you danced?
 - a. Why?

After showing the apps

6. Would you like to make use of these apps before/during/after dancing?
 - a. If yes, which ones and why?
 - b. If no, why not?
7. Would these apps make dancing more fun?
 - a. If yes, why?
 - b. If not, why not?