

# Improvement Potential of Business Models and Usability of Fitness Apps: Results of Expert Interviews and a User Study

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**Keywords:** Fitness App, Usability, Business Model.

**Abstract:** Mobile applications (apps) supporting individual users in their personal fitness have received growing interest on the user side and in the research community. The value offered to fitness app users in general consists of support for changing attitude and behaviour towards a healthy lifestyle and maintaining this behaviour. Work presented in this paper aims at contributing to this field by focusing on the following main research question: what improvement potential exists for fitness apps that at the same time are contributing to the business model and desired from a user's perspective? The contributions of this paper are (1) market and functionality analysis of fitness apps, (2) results of expert interviews on functionality and scenarios with business model improvement potential, and (3) results of a user study on desired improvements from a usability perspective.

## 1 INTRODUCTION

Mobile applications (apps) supporting individual users in their personal fitness, including healthy nutrition and monitoring of health parameters (cf. Section 2.1), have undergone considerable development in the last years. The functionality of such apps continuously grows, integration with other apps improves, and the number of users increases. Some scholars believe that this trend is related to the “quantified self” movement (Swan, 2013) and the growing importance of the mobile health sector (Martinez & López-Coronado, 2013).

From an economic perspective, fitness apps and their business models are part of the mobile business sector and rely on the identification of an individual user based on her/his mobile device and permanent use (i.e., “24/7”) of the device (Wirtz, 2001). The value offered to the fitness app user, in general, supports changing attitude and behaviour towards healthy lifestyle and maintaining or eliciting this behaviour. In practice, this materializes in goal setting and self-monitoring in combination with social learning, competition with other members of the fitness community, reward mechanisms, provision of supportive content (training instructions, recipes),

connection to other actors (personal trainer, nutrition coach) or other elements of established business-to-consumer business models. However, this value offering shows service characteristics according to service-dominant logic (Vargo & Lusch, 2008), particularly the need for cooperation with the user. Only if the user provides information about the own goals and information relevant for self-monitoring (e.g., what, and how much food was consumed?), can the fitness app be supportive. Functionalities supporting this data capture are subject to research.

The growth of the fitness app sector also is reflected in a more academic research in the field. (Liu & Avello, 2021) showed an increase in the number of academic publications with focus on medicine, computer science, and health sciences. However, this work also should a lack of research on business models: less than 4% of all publications were related to business, management and economics, and the keyword “business model” did not occur in any paper. Our work aims to contribute to a better understanding of the business improvement potential for fitness apps by focusing on the user perspective. The main research question is: *what improvement potential exists for fitness apps that at the same time are contributing to the business model and desired from a users' perspective?*

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From a market and function analysis of fitness apps, we use expert interviews to identify areas for utility and business model improvement. The “voice of experts” afterwards is contrasted and refined by the “voice of the users”. Here, we conduct an experiment with a group of users and four different fitness apps.

The contributions of this paper are (1) market and functionality analysis of fitness apps, (2) results of expert interviews on functionality and scenarios with business model improvement potential, and (3) results of a user study on desired improvements from a usability perspective. Section 2 discusses related work from fitness apps, business models and usability. Section 3 introduces the research methodology used in the paper. Section 4 contains the results of the market analysis. Section 5 presents the approach and results of the expert interviews. Section 6 focuses on the user study. Section 7 discusses limitations, conclusions and future work.

## 2 BACKGROUND AND RELATED WORK

### 2.1 Fitness Apps

Fitness apps, in general, are concerned with the self-monitoring of healthy habits of individuals within the context of adopting healthy lifestyles or disease prevention habits. This is often implemented through commercial apps developed without medical administrations supervision. Not subject of this study but often with overlapping functionality areas are mobile health apps in professional medical practices, both on the side of doctors and patients and usually involving the relationships between doctors and their patients.

“Fitness” as a term has several meanings: fitness, in general, refers to a good state of vitality and physical well-being (Corbin & Le Masurier, 2014); the term also refers to the practice of physical exercise to gain or maintain good body. Within Health-Related Physical Fitness (HRPF), fitness is defined as a set of a person’s abilities to perform certain physical activities and to perform daily tasks, and the capacity to reduce the risk of diseases (Leask et al., 2015).

The use of mobile devices and apps has become a key factor in helping individuals in the adoption of healthy lifestyles. Fitness apps have been found to offer a great potential to be effective due to the ability to support on healthy habits at a low operating cost (Blackman et al., 2013).

Work by (Oyibo & Vassileva, 2021) showed that the higher the perceived usefulness of a fitness app by users is, the more likely they are to be persuaded by the app and its features, such as goal-setting and self-monitoring. The higher the perceived aesthetics is, the more likely the users are persuaded by features such as competition and social learning. Similar results were achieved in the investigation of (Cai et al., 2022).

### 2.2 Business Models

At its core, a business model fulfils two important functions: value creation and value capture (Chesbrough, 2010). In the last decade, many definitions for the concept of business model have been proposed, but we limit the presentation in this paper to Business Model Canvas (BMC) as it shows typical business model aspects relevant for fitness apps. The BMC approach by Osterwalder and Pigneur includes building blocks for the four most important areas of a business: customers, offerings, infrastructure, and financial viability (Osterwalder & Pigneur, 2010). Each building block of the Business Model Canvas is explained below:

- Key partners describe the network of suppliers and other partners contributing to the business model’s success.
- Key activities must be undertaken to make a business model work.
- Key resources represent important assets essential to the business model’s success. They can be physical, intellectual, human, and financial.
- Cost structure circumscribes all due costs incurred in the execution of a business model assigned to the term cost structure.
- Customer relationships define the type of relationship a company enters into with specific customer segments for customer acquisition, customer care, and sales growth.
- Customer segments are defined by the customer segments, which include the target groups a company wants to reach with its product or service.
- Value proposition describes the package of products and services that creates value for a specific customer segment.
- Channels include communication, distribution or sales channels through which a company reaches its customer segments and communicates its value proposition.

Revenue streams are income that a company draws from each customer segment grouped under revenue streams.

## 2.3 Usability and Technology Acceptance

Usability combines characteristics of user-friendliness, usability, usability and user quality. ISO 9241-210 (Bevan et al., 2015) defines usability as "the extent to which a product, system or service can be used by specific users in a specific application context to achieve specific goals effectively, efficiently and satisfactorily". The easier and more intuitive an app can guide users to their personal goals, the more user-friendly that app will be perceived by its users. Nielsen's usability model (Nielsen, 1992) characterizes five attributes of usability that help to sharpen the concept of usability:

- Efficiency: resources expended to accurately perform a task to achieve the user's goals.
- Learnability: The ease with which the system can be learned so that the user can use it to perform tasks in the shortest possible time.
- Satisfaction: the product should provide comfort and give the user a positive attitude towards its use.
- Errors: The error rate of the system should be as low as possible so that the user makes as few errors as possible when using the system. If errors do occur, they should be easy to fix.
- Memorability: The system should be so easy to remember that even a casual user who starts using it after a long time does not have to struggle to learn from the beginning.

Both Nielsen and ISO see the components that enable efficient and effective operation of the product as central, but equally point to the essentiality of satisfaction as an emotional component during use. The investigation of technology acceptance is subject of various models. One model that stands out due to the frequency of its application is the Technology Acceptance Model (TAM) (Davis, 1985). It consists of the constructs Perceived Usefulness, Perceived Ease of Use, both of which act on the construct Attitude toward Using. This attitude, together with perceived usefulness, ultimately determines "Behavioural Intention to Use."

## 3 RESEARCH METHODOLOGY

The research strategy for work presented in this paper consisted of four steps. The first step was analysing existing work in the field to confirm problem relevance and the need for additional work. The

results of this step are visible in sections 1 and 2. The following three steps were:

*Step 1: Market analysis of fitness apps and their value proposition (Section 4.1)*

What fitness apps are economically successful and what value proposition do they offer? As economically successful, we consider fitness apps with many users and long market presence. Regarding value proposition, we focus on functionalities offered and aim at selecting apps with different value propositions in order to contrast them? The result of this analysis step was a substantial list of fitness apps with largely overlapping functionalities, i.e. the differences in value proposition is hidden in the way the functionalities are implemented, their application processes and their ease of use.

*Step 2: Determining the focus of usability and potential analysis (Section 4.2)*

What functionalities and application processes are essential for the success of fitness apps and at the same time show clear improvement potential – either because their usability are pain-points from a user perspective or their functionality is not sufficient from the business model perspective? This was the core question of an expert study performed in step 3 with experts for fitness apps and their business models. One of the results was, what application scenarios to select for the user study from a business model perspective.

*Step 3: Preparation, execution and evaluation of the UX and potential analysis (Section 4.3)*

The application scenarios resulting from the expert interviews were the focus of a user study including 22 users and four different fitness apps. All users were new to fitness apps. The core idea was to investigate, how the usability could be improved in the identified application scenarios of high relevance to the business models.

## 4 RESULTS

### 4.1 Fitness Apps Market Analysis

The analysis of fitness apps started from the rankings in app-stores. The focus was on apps with a substantial number of users and availability for the general public, which meant exclusion of fitness apps for specific health insurances or company-internal ones. Furthermore, we only included apps supporting both, nutrition and training. Figure 1 shows details of

the identified apps. One result of the analysis were the following functional areas, each of which was present in several or all apps and was the starting point for the expert interviews and user study:

1. tracking of food intake: food intake at every meal can be entered manually by the user, often based on a food database. Some apps also offer to identify products using a barcode scanner.
2. Measurement of the own training units: many fitness apps can capture sporting activities within the app. Sporting activities are intended to support a healthy lifestyle and to reach the desired weight. For this purpose, the apps include a pedometer or a way to track sports, such as jogging or swimming including calorie consumption.
3. Courses given by experts: some apps offer the feature of courses provided by experts specifically for the user. No distinction is made here whether the courses concern exercise, healthy eating, healthy lifestyle or other lessons on nutritional psychology.
4. Live training: In the case of live training, we distinguished between recorded video courses or courses with the option of live contact with a coach.
- 5 Exchange between users: An active and animated community can help to motivate each other to achieve the user's personal goals. Some apps offer direct contact between users, other apps an integrated forum or communities on social media.
6. Provision of healthy recipes: Most apps offer this function in the premium version, where the user gets access to a database for a certain fee.

competitive advantage and support the business model of fitness app providers. In this context, we decided not to address solitary functional areas but application scenarios reflecting an integrated set of functionalities. Starting point for relevant application scenarios were the results of the market analysis. The first expert has over ten years of experience as a fitness coach and operates his own fitness studio. With years of experience in the fitness scene, his expertise is expected to bring new ideas to light, especially regarding the market situation and the challenges users of a fitness app experience in their daily lives. The second expert was selected to shed light on the topics under investigation specifically with regard to business modelling through his years of experience as an IT consultant, and to provide insights into the potential of an objective evaluation of possible user scenarios that a user may perform when using the fitness app through his technical know-how. The third and final expert is a sole proprietor with expertise in marketing and sales.

The interviews consisted of questions about the experience and the person of the interviewed expert; problems on the market of fitness and fitness apps on offer; possible user scenarios for solving the problems on the market; and ideas and experiences of successful business models. During the interview, the experts were asked where they saw the biggest problems for fitness app users. Six major pain points emerged here:

1. *New habits*: Establishing new habits require more effort for the user.
2. *Daily time tracking*: Current apps on the market are time-consuming.
3. *Personal assistance for the user*: Due to the lack of proactivity of the app, users are feeling lonely and missing support in their daily routines.
4. *Education about healthy nutrition*: Lack of information and education on health/nutrition leads to demotivation of one's healthy diet.
5. *Personalization of the fitness app*: The user wants to find an individual solution for nutrition.
6. *Collecting the relevant fitness data*: The lack of media integration forces users to use the app only on the smartphone instead of collecting their fitness data through other channels.

Fitness App	Country of origin	Description	Client(s)	Employee(s)	Functional areas					
					Tracking of food intake	Measurement of the user's training units	Courses given by experts	Live training	Exchange between users	Provision of healthy recipes
Fatbot	Germany	Nutrition app with focus on interval fasting and coaching support to the user (as well as recipes)	59	12+	●	●	●	●	●	●
MyFitnessPal	USA	One of the largest food database providers with over 200 million entries	111	180+	●	●	●	●	●	●
Lifoscan	Sweden	The app helps to track food and movement to hit a healthier and active lifestyle goal.	205	30+	●	●	●	●	●	●
Freeletics	Germany	Personalized digital workouts based on individual fitness level. High intensity interval exercises & anywhere	3/2	10+	●	●	●	●	●	●
Calm	USA	App focused on sleep, meditation and relaxation, with guided meditations and sleep stories	97	12+	●	●	●	●	●	●
Yazio	Germany	App for online tracking of nutrition and progress of the user's achievements	93	27+	●	●	●	●	●	●
Codecheck	Dutchland	Pure tracking app of nutrients with special filter function and so recommending lists of other users	220	20+	●	●	●	●	●	●
MyFitnessPal	USA	App with many advantages for the user through the premium version: from nutrition training and technology of the user	111	250+	●	●	●	●	●	●
Fatsecret	Australia	Historical app as 100% free calorie counter with diary function, a community and a large collection of recipes	88	10+	●	●	●	●	●	●
Route4Me: Distance app	Germany	Since 2020, Route4Me has removed its fitness tracking app from the market	N.A.	270+	●	●	●	●	●	●

Figure 1: Fitness apps and their functional areas.

## 4.2 The Voice of the Experts – Results from Expert Interviews

Three experts were selected for an interviews study aiming at investigating what improved or future functionality of fitness apps could establish a

Based on the experience of the experts, it involves a great deal of extra work for the user to establish new habits or change their lifestyle. Fitness apps should therefore ensure that this additional effort is minimized as much as possible or that the establishment of the new habits (e.g. new eating habits or sports routines) is as pleasant as possible.

Furthermore, it turned out that current fitness apps on the market are very time-consuming if the user wants to save or track his diet in the app. Most apps only offer the option of a barcode scanner or manual input. This is an additional effort that many users are not prepared to integrate in their daily lives. This point will be examined in greater detail in the subsequent user study. Another pain point focuses on the app's lack of proactivity. Many users simply feel left alone by the app. Although many apps offer solutions on the topic of healthy eating, they do not provide active support for the user in everyday life.

Furthermore, it became clear from the expert interviews that many current fitness apps offer little background information on the complex and extensive topic of nutrition. As a result, users become less motivated by the lack of experience, and instead of achieving their personal nutrition goals, they fall back into old patterns. In particular, since current apps only consider the calories consumed as a success factor for a successful diet, this does not lead to higher user motivation. The user also wants an individual solution, which is something a fitness app must be able to provide. Finally, it also turned out that the current solutions on the market offer no or too few options to use the application beyond their smartphone, i.e. they do not have the option to use the app on smartwatches and the like simultaneously. To circumvent the major problem of the increased time required for a manual input of the eating behaviour, solution must be created that offer more flexibility to the user. One solution could be connections to additional applications or access to smart home devices. A voice control function in the app could also improve the user experience.

The experts were also asked about current problems on the market, which resulted in three major problem areas from the expert interviews: One of the biggest problems is active communication with the user or the absence of such communication. The lack of communication makes users feel left alone and on their own. The lack of proactivity on the part of the app providers must be seen as problematic. Although current apps offer push messages, these are not individually tailored and serve mainly as a reminder function. The second problem concerns the possibility of taking a closer look at the complex topic of a healthy diet from the user's point of view. There needs to be more than the learning curves offered by current apps to educate the user and thus motivate him or her more. The third problem identified was the familiarization phase and the individuality required to know the user properly. Since many apps only use calorie counts as a success factor, this often means that the user only uses the app for a short time and

then stops using it directly due to a failure, since the app does not offer any individual solutions.

As a final result, a prioritized list of the top 5 user scenarios was created from the expert interviews to map which functions an innovative fitness app should offer users (see Table 2). The first rank is the nutrition recording scenario. The user should be allowed to save this function in the app using voice recognition, semantic linking, manual input or automatic camera recognition. This is intended to significantly reduce the time required by the user and make meal recording as convenient as possible. In second place is the familiarization phase. This should be used to get to know the user properly to offer him an individual solution. This should be as intuitive and low-threshold as possible. Next, the app should collect as much data as possible about the user's habits, preferences, and routines to support the getting-to-know phase. With the help of meals that can be selected in advance based on this habit data, the user should be able to carry out his meal recording via push notifications. For example, the app should recognize what the user regularly eats for breakfast and, based on this data, ask the user via notification whether he or she has eaten the same thing for breakfast for today. In last rank, the idea of making automated suggestions based on the nutritional values consumed, which should help the user to improve their diet, was included.

Prio.	Application scenarios from the expert interviews	Score from pairwise comparison
1	The app allows users to record daily meals using semantic links, voice recognition, manual input, or a camera.	5/5
2	To get to know the user, the app gets to know the user in a special "get to know" phase over a certain period, during which the user acts in an active exchange process with the app.	5/5
3	The app collects much data about the user's habits, preferences, and routines to proactively offer ideal healthy eating suggestions and get to know the user.	5/5
4	The app asks the user via push message if the same meal was eaten for breakfast, where the user can answer "yes" or "no" (pre-selectable meal times based on habit data)	5/5
5	The app gives the user suggestions based on the recorded nutritional values, what the user should take in addition to his usual meals to improve his diet.	5/5

Figure 2: Priority of application scenarios as result of pairwise comparison

### 4.3 The Voice of the Users – Results from User Study on Usability

The user study was conducted in three different phases, where 22 study participants were asked about a fitness app before, during and after use. The participants were asked to test one of the four selected apps over ten days to obtain information about user behaviour, wishes and problems relating to the fitness apps. First, a survey was conducted with the study participants before they were to test the app assigned

to them. This included questions about their experience with previous fitness apps, their self-assessment of their well-being and purchasing behaviour, their monthly willingness to pay for a fitness app and the financial possibilities of a healthy diet. The question about the future probability of using a fitness app was chosen as a control question for all three phases of the user study to determine how user behaviour changes before, during and after using the tested app.

Following the initial survey, study participants were assigned their respective apps, which they were free to use during a ten-day trial. However, participants were asked to use the app regularly during the trial and test it extensively for functionality. After half of the test period, the second survey was conducted with the participants to capture the impressions during the use of the app. The questions from the second survey mainly refer to the perceived user experience with the app. With the help of 7-Likert scales, questions were asked about the user experience, usage behaviour, the amount of time required, how well participants felt the app was supported, and the general functionality of the app, among other things. Many questions in the survey were designed based on the TAM (see section 2.3). Thus, four aspects of the model were included in the questionnaire: perceived usefulness, perceived ease of use, attitude toward use (here: satisfaction), and intention to use. Finally, a final interview was conducted with the study participants at the end of the ten days to use open-ended questions to capture precise reasons as to what the user liked about the app, what they did not like, and what they would like to see in an ideal fitness app in the future. The results of the user study were grouped into different areas and are summarized below:

#### *1. Experience with fitness apps*

Approx. half of the study participants indicated little or no experience using fitness apps before the study. When asked about their level of knowledge, 50% of participants indicated that they were ignorant and did not consider themselves experts. Overall, 53% of participants indicated that they felt inexperienced and 57% uninformed about fitness apps. Thus, the results and responses of the participants reveal an unbiased and open-minded attitude toward the fitness apps studied.

#### *2. Willingness to receive advice and coaching while using a fitness app.*

The study results show that most participants would like further information from the fitness app and would also like to be educated on the pros and cons of a weighted diet. Overall, 57% of participants

said they would engage in counselling and coaching, 39% were more averse to counselling, and 5% were neutral about it. A clear trend emerged in information clarification. Here, 20 out of 22 participants stated that they would be given additional information. A clarification of the advantages and disadvantages was desired by 87% of the participants, 23% even expressly agreed with this statement. In addition, the study revealed that participants would welcome decision support. In this regard, 77% of the participants stated that they would like to have accompanying support on nutrition. It can be concluded that future fitness apps should implement the aspects of an additional consulting or coaching service and support the user by providing individual information so that the user knows what she/he should pay attention to regarding a healthy diet to achieve his personal goals.

#### *3. Criteria for the selection of a fitness app*

Quality and performance were found to be the most important for users of a fitness app. The participants indicated 82% that these criteria are essential for the selection. Likewise, the app must positively impact the user's well-being. With 77%, the participants indicated that this is also an essential criterion for choosing a fitness app. Another important criterion is price. Here, 55% of participants agreed that price was very important in making a choice. Overall, 32% said that price was important. Less important is the familiarity of the offer and the recommendation of friends, which the user can obtain from outside experience. The least important factor for the users of a fitness app is the attractiveness of the advertising, where 59% stated that the external appearance of the app is less important.

#### *4. Impact on future likelihood of use.*

The question about likelihood of use served as a control question for overall satisfaction as well as for the added value of the apps' features. The results showed that all four fitness apps failed to convince participants of the promised added value. Although the likelihood of using a fitness app was 47% before testing the app, this likelihood continued to deteriorate during and after the testing period. MyFitnessPal's likelihood of use decreased by 62% and Noom's and Yazio's likelihood of use decreased by 74% each when comparing before and after using the app. For the app Fastic, the probability changed by 32% overall, indicating that the testers are more satisfied with this app.

#### *5. Impact on the user experience of the app.*

Despite the low probability of use, the study showed a high level of popularity with the Noom app.

Thus, there was a very high level of satisfaction with the Noom app among the study participants throughout the usage period. 4 of the 5 Noom testers indicated they were very satisfied with the app. The app Noom meets the expectations of the study participants due to the large and individual offer and established itself as the best fitness app in terms of overall satisfaction compared to the other apps. Since price is an important criterion for users, it can be assumed that the very high price of Noom is the cause why the likelihood of future use (see 4.) was found quite low. Although the study participants were mostly satisfied with the functions of Yazio and Fastic, both apps were not able to completely fulfil the users' needs and wishes during the test period. The app MyFitnessPal received the worst results in the user study. Overall, 60% of study participants said they were not satisfied with the app and 80% indicated that it failed to meet their needs and desires.

#### 6. Time required to use the app

Since the amount of time required is an important factor in evaluating the user experience, the user study asked the study participants how much time they had to invest per day to use the app. The user study found that the Fastic app was the least time-intensive for users compared to the other apps. Overall, 67% of participants agreed they had to make little to no major time investment to use it. Likewise, when asked about the eating behaviour features and the control question that it had only taken a few minutes to use the app, the Fastic app scored the highest in terms of time investment. Although 50% of the testers stated that the meal recording function in the app was too time-consuming, 50% of the Noom testers said that they only had to spend a few minutes on the app to use it. The Yazio app was rated by the participants as time-consuming in some cases. In particular, the meal recording function was rated as too time-consuming for the app. As with the Noom app, it can be assumed that the apps' solutions for meal recording are too time-consuming. The most time-consuming and thus the worst rated app was MyFitnessPal. Here, 60% of the testers stated that the time required to use the app was too high, 40% of them even as not acceptable. Also rated as very time-consuming was the meal recording function. Although 80% of the users stated that they only had to spend a few minutes to use the app in principle, 60% of the participants stated that the time required had kept them from using the app.

#### 7. Results on the functional scope of a fitness app

From the user study, the study participants indicated that users of a fitness app would like to

receive regular push notifications on their cell phones, as long as they are discreetly placed and serve as a reminder to eat healthy. In the case of the app Fastic and Yazio, users were more divided in this regard, with a majority of testers of the app MyFitnessPal and Noom opting for more push notifications. Overall, users need to see the added value of the app before paying money monthly to use it. In particular, a no-obligation, free trial month is very important from the users before they should spend money on an app. Users would like to test the full functionality of the app during this month in order to see the promised added value ahead of time and to test whether the app suits the respective user.

#### 8. Results of the open questions on the status quo

To conclude the user study, participants were asked questions during the interview about what they liked about the app, what they did not like, and what was lacking about the app overall. These results should provide more insight into what users want from fitness apps and what such apps can do better in the future. In summary, it can be said that the study participants rated a modern design and a simple user interface, which has been designed intuitively and clearly, very positively. In the case of the MyFitnessPal app, the huge selection of the food database and the free connection with other sports and health apps on the cell phone were particularly rated positively by users. The app Fastic was rated as beginner-friendly due to its very simple operation and pleasant due to its quick and easy registration. The Yazio app well received by the participants in its range of functions already offered in the free version.

## 5 DISCUSSION

From the results obtained from the user study, the problems and desires of the users result in implications for app providers in the nutrition sector, which are summarized below to improve the user experience for the user.

The evaluation of the user study shows that the functions offered by the apps studied require too much time on the user's part. These confirm the results from the user survey, which revealed that the time required is too great, especially for the food storage function. This large time investment has a large impact on user satisfaction, which is why many users have such a low future likelihood of use. After the user study, users were asked what they would like to see in an ideal fitness app. Many of the study participants would like to see more innovative and,

above all, user-oriented solutions. App providers should ensure that the storage of eating habits is served with functions such as voice recognition, smart home or other innovative functions to make it as easy as possible for the user. Users are only willing to spend a few minutes on a fitness app.

The results of the user study support the established theory that customizability, usability, and user engagement are essential to the user experience. In this regard, user satisfaction, whether they feel pleasure from the app, plays a significant role. At the same time, the anticipated usage before testing the app was investigated with the help of the queried expectation. The usability during the usage was investigated by querying the satisfaction and its influencing factors. The processed usage after the testing phase was investigated by a final interview with the user.

The current problems of the apps can be summarized as follows: Overall, the participants would like to see more individuality from the apps offered, so that they can adjust their use individually to their own well-being. This applies to the individual profile setting, whether vegan or vegetarian. Although some of the apps in the premium version offer a special filter function or individual diet plans for such target groups, the study participants wanted more targeted setting options from the app since the beginning of use, to thereby also build up a sense of understanding on the part of the app with the user. At the same time, many study participants stated that although the app offers many features for healthy eating, they would have liked to see more communication with specific recommendations from the app. In the following and final chapter, the results' exact implications will be elaborated to clarify what specifically fitness apps can do better in the future.

Limitations: Two methods were used for this study: the semi-structured, guided-thread-based expert interview and a standardised, Internet-based questionnaire. To meet the requirements of validity and reliability, the paper described the study's logic, purpose, and reporting style of our approach. To increase transparency and confidence in the results, especially in the expert interviews, the views and opinions of the study participants were reflected and, to some extent, distinguished from each other. Given the small and only partly representative sample of the interviews, it should be considered to test the transferability and generalizability of the results in further studies. This study offers an exclusively German perspective on the study topic. This could lead to bias in the results (Cai et al., 2022).

## REFERENCES

- Bevan, N., Carter, J., & Harker, S. (2015). ISO 9241-11 revised: What have we learnt about usability since 1998? In *International conference on human-computer interaction*. Symposium conducted at the meeting of Springer.
- Blackman, K. C. A., Zoellner, J., Berrey, L. M., Alexander, R., Fanning, J., Hill, J. L., & Estabrooks, P. A. (2013). Assessing the internal and external validity of mobile health physical activity promotion interventions: a systematic literature review using the RE-AIM framework. *Journal of Medical Internet Research*, *15*(10), e2745.
- Cai, J., Zhao, Y., & Sun, J. (2022). Factors Influencing Fitness App Users' Behavior in China. *International Journal of Human-Computer Interaction*, *38*(1), 53–63.
- Chesbrough, H. (2010). Business model innovation: opportunities and barriers. *Long Range Planning*, *43*(2-3), 354–363.
- Corbin, C. B., & Le Masurier, G. C. (2014). *Fitness for life*. Human Kinetics.
- Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [, Massachusetts Institute of Technology]. BibTeX.
- Leask, C. F., Harvey, J. A., Skelton, D. A., & Chastin, S. F. M. (2015). Exploring the context of sedentary behaviour in older adults (what, where, why, when and with whom). *European Review of Aging and Physical Activity*, *12*(1), 1-8.
- Liu, Y., & Avello, M. (2021). Status of the research in fitness apps: A bibliometric analysis. *Telematics and Informatics*, *57*, 101506. <https://doi.org/10.1016/j.tele.2020.101506>
- Martinez, I., & López-Coronado, M. (2013). Mobile health applications for the most prevalent conditions by the World Health Organization: review and analysis. *Journal of Medical Internet Research*, *15*(6), e2600.
- Nielsen, J. (1992). The usability engineering life cycle. *Computer*, *25*(3), 12–22.
- Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers* (Vol. 1). John Wiley & Sons.
- Oyibo, K., & Vassileva, J. (2021). Relationship between Perceived UX Design Attributes and Persuasive Features: A Case Study of Fitness App. *Information*, *12*(9), 365. <https://doi.org/10.3390/info12090365>
- Swan, M. (2013). The quantified self: Fundamental disruption in big data science and biological discovery. *Big Data*, *1*(2), 85–99.
- Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: continuing the evolution. *Journal of the Academy of Marketing Science*, *36*(1), 1–10.
- Wirtz, B. W. (2001). *Electronic business*. Springer-Verlag.