Best Practices (and Stumbling Blocks) for Diversity-Sensitive Behavior Change in Persuasive Application Design

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***Abstract*—Design for Behavior Change can be used to enact changes on an individual basis or beyond to gradually modify users' behaviors and constituting attitudes towards achieving a desired goal. Today, achieving more sustainable behaviors is a frequent goal of behavior change apps found on the market. In order to be effective across a wide and diverse spectrum of users and simultaneously avoid stigmatization or marginalization, the design of such applications should be done in a diversity-aware manner, which is often still lacking. In this paper, we present a best practice analysis of existing applications in the domains of food consumption, mobility, and energy consumption that are available on the market in Austria, Europe. We present the findings as a collection of three design patterns and discuss their status as patterns versus anti-patterns in terms of how well diversity factors are implemented in existing practice and where improvements are necessary.**

***Index Terms*—behavior change, sustainability, diversity, design patterns.**

I. Introduction

Behavior change support systems can be employed to modify users' attitudes and behaviors in consideration of individual motives, living contexts, and other individual or user-specific factors. Today, such support systems are mainly available in the form of apps that can be deployed across devices (typically with smartphones and tablets the primaries, web and desktop secondaries) to enable access to and continuous use of the system.

The climate crisis constitutes one of the most relevant target domains for behavior change [1]. A limiting factor of behavior change effectiveness in this domain is an often insufficient regard for gender and diversity aspects [2] in behavior change support systems, which can cause disengagement from using such systems and exclude groups of individuals from using them [3].

In order to close this gap, the project *biscuit4all* [4] investigates gender- and diversity appropriate design for behavior change support systems in the climate-relevant application domains mobility, nutrition, and energy consumption. In this paper, we present the results from a best practice analysis of behavior change in the Austrian (EU) market (Section III) condensed into brief design patterns (Section IV) that show best practices as well as areas for improvement (Section V) to achieve better behavior change successes.

II. Related Work

Theories of behavior change typically focus on behavioral intention accompanied by other core variables concerning conditions, habits, beliefs, responsibility perceptions and other components. Commonly applied theories and models include Triandis' theory of interpersonal behavior [5] with attitude, social factors, affect and frequency of past behavior impacting intention and habits. Ajzen's theory of planned behavior [6] considers attitudes, norms and perceived behavioural control as core components. Stern et. al's value-belief-norm theory [7] builds on values (biospheric, altruistic and egoistic), beliefs and personal norms. Challenging factors that can pose issues in the context of behavior change towards sustainability are cognitive limitations, insufficiently perceived personal relevance and missing tangibility, distrust and reactance [8].

Persuasive approaches such as the persuasive strategies discussed by Oinas-Kukkonen and Harjumaa [9] and Fogg [10] offer the possibility to directly address important factors of behaviour change and overcome some of these barriers. Common approaches include providing information that underlines the responsibility and agency of the individual, accurate feedback and social feedback to increase literacy and correct self-serving and in-group biases, by offering timely and location-

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specific prompts to battle bad habits and help with limited cognitive resources.

Gender and other diversity dimensions including age and class impact a number of factors important for sustainable behaviour changes, such as attitudes and intentions or habits in connection with societal roles. Women typically show, for example, more positive attitudes towards sustainable behaviour [11], different types of sustainable behaviour [12], [13], which are also shaped through gender roles and access to free time and resources that come with them [14], [15], and more sustainable behaviour overall [16], [17]. We can also see gender differences with regards to the type of values that motivate behaviour [18].

Higher Income households typically have higher carbon footprints [19], [20] but also more resources for high impact changes. Both income and age-related differences can also be seen in attitudes with younger people indicating to care more about climate change [21] and being more likely to cycle [22], and older people being more inclined to purchase food locally [23]. The middle class is more likely to show sustainable behaviour than the upper or lower class [24] but class associations with particular activities, such as cycling, also impact willingness to adopt behaviours [25]. These observed differences change the persuasive effect of different approaches to engagement strategy design and highlight the importance of gender and diversity-sensitive design of behaviour change support apps.

In their review paper from 2016, Thomson, Nash, and Maeder [26] identified and collected a number of issues in implementations of behaviour change techniques and persuasive design principles in physical activity smartphone applications. A lack of support for the diversity of user needs and preferences was highlighted as one of the main issues identified, alongside information flow and presentation, user engagement and retention, and a generally fragmented use of persuasive principles.

Design Patterns were originally conceived by Christopher Alexander [27], [28] for capturing solutions in Architecture and were later introduced for use in Software Engineering by Gamma et al. [29]. Distinguishing features of patterns are capturing of contextual information, problem focus, and the potential to capture implicit knowledge [30], [31], [32]. They are also used in Human-Computer Interaction to capture and communicating working solutions [33] and constitute an effective way to capture a design state-of-the art in a way that enables immediate reproduction to the pattern reader. To address issues outlined by Thomson, Nash and Maeder, the patterns presented in this paper draw from best practices in diversity-sensitive design [2] for personalisation, feedback design, and user engagement.

III. Best Practice Analysis

The screening process and best practice analysis of behavior change support apps followed procedures outlined in previous content analyses of mobile apps [34], [35]. In January 2023, the iOS App Store and the Android Play Store were screened for relevant apps using smartphone devices. Only apps that were free of cost were included in the analysis, as previous studies suggest that users are reluctant to pay for apps and prefer apps that are free of cost. We focused on analyzing apps from three specific categories related to behavior change support that are relevant for climate change: food consumption, energy, and mobility.

To identify best practice examples in our study, we employed a two-step screening process. First, we searched for apps that had been mentioned in reputable journal and magazine rankings, indicating their recognition within the field. Second, the thusly selected apps underwent a meta-analysis that took factors such as the number of downloads, ratings, and the level of star ratings into account. The operationalization of the best practice analysis was conducted using a deductive categorization approach based on content analysis. Predefined categories and characteristics of best practices were established. Based on these criteria, the identified apps were systematically analyzed and evaluated. The deductive approach allowed for a structured and targeted analysis of the apps to identify potential best practices. Apps lacking these functionalities were automatically excluded from our analysis.

The screening process began by defining keywords relevant to the selection of journals and magazines. Since the research focused on German speaking locations, we conducted the screening process on the basis of German keywords. For the ”food consumption” category, we utilized keywords such as ”Besser Essen Apps” (Better Eating Apps), ”Lebensmittel retten” (Food Rescue), ”Ernährung” (food consumption / nutrition), and ”Ernährung verändern” (Changing food consumption). For ”energy,” we used keywords such as ”Energie Apps” (Energy Apps), ”Energiesparen Apps” (Energy Saving Apps), ”Stromsparen Apps” (Electricity Saving Apps), ”Energieeffizienz” (Energy Efficiency), ”Gas sparen Apps” (Gas Saving Apps), and ”Heizkosten sparen” (Save Heating Costs). For ”food consumption” we utilized keywords such as ”Besser Essen Apps” (Better Eating Apps), ”Lebensmittel retten” (Food Rescue), ”Ernährung” (food consumption / nutrition), and ”Ernährung verändern” (Changing food consumption). Through this initial search, we identified 105 food consumption apps, 119 mobility apps, and 54 energy apps. Via an inclusion criterion of needing to be mentioned in reputable journals or magazines at least 7 times, we narrowed down the selection to 8, 15, and 8 apps, respectively. Subsequently, we applied exclusion criteria that filtered out apps available only in the paid version, with less than 1000 ratings, and with less than 4-star ratings in the respective app store. We also employed forward and backward snowballing techniques based on in-app-store recommendations to potentially identify additional relevant apps. The screening process led to the identification of a total of 6 food consumption, 7 mobility, and 7 energy apps for further analysis.

The content analysis of the identified apps was conducted to gain insights into their features and functionalities. For the systematic analysis, we derived the categories to be examined from the work of Oinas-Kukkonen & Harjuuma

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[9]. For each app, we extracted information on the each of the following categories: reduction, tunneling, tailoring, personalization, self-monitoring, simulation, rehearsal, praise, rewards, reminders, suggestion, similarity, liking, social role, trustworthiness, expertise, surface credibility, real-world feel, authority, third-party endorsers, verifiability, social learning, social comparison, normative influence, social facilitation, cooperation, competition, recognition, gender&diversity.

IV. Patterns

The results from the best practice analysis served as the basis for the design patterns, which were generated using the general structure outlined by Mirnig et al. [36]. An additional mining step was performed to consolidate the identified practices per each of the categories by Oinas-Kukkonen & Harjuuma [9], and then formulate an application domain independent description that summarizes the underlying solutions. The categories represented in the patterns were chosen based on the common issues of behavior change systems outlined by Thomson, Nash, and Maeder [26], which also served as the primary inspiration for the problem statements. This matching eventually resulted in three patterns for personalization techniques, feedback tangibility, and effective tunneling. We should note at this point that diversity-sensitive design was usually a by-product and rarely the focus in the identified practices. As a result, the mining focused on directly diversity-sensitive or diversity supporting design. In the following, we present the initial version of all three patterns using the reduced structure by Mirnig et al. [37] in order to suit the publication format.

A. Pattern 1: Personalization Techniques for Diversity Integration

This pattern describes solutions to enable users to fit the app output and or general UI to their personal needs under specific consideration of gender- and diversity-related factors. This cannot only improve the interaction quality but also make app interaction and output more appropriate and better usable within a user's individual situation.

1) Problem: If a user's needs, preferences and abilities are not adequately considered when designing a behaviour change app, then successful usage of the app and adherence to interventions on the user side will be limited [26].

Generalized (i.e., non-personalized) cues, reminders, or entire routines are unlikely to fit every user's context. As a result, system output might mismatch in terms of the user's goals or be inappropriate regarding the user's living situation. Furthermore, either through use of the app or a change in circumstances unrelated to the app, the user can be expected to change and modify their goals, needs, and preferences accordingly. This, in turn, will result in previously effective techniques to no longer be (as) effective and/or established routines or programs to no longer be appropriate.

2) Solution: In order to appropriately reflect and support within a user's individual situational context, behaviour change success can be enabled via:

1) custom goal setting,
2) diversity-sensitive personalization,
3) personalization effects.

Custom goal setting allows the user to define their goals on two levels:

- qualitative, and
- quantitative.

The *qualitative* level specifies the general target that is to be achieved. Sustainability-related and other typical targets are "eat less meat", "reduce food waste", and "lose weight" in food consumption, "fastest connection", "cheapest connection", or "lowest carbon emission connection" in mobility, and "reduce consumption" or "achieve target consumption" in energy. Additional targets depend on app purpose and intended user group. For food consumption, targets to include or exclude based on dietary requirements or preferences (e.g., celiac, vegetarian, vegan – ideally with a default preset and additional customization to specify included and excluded food categories) are recommended. Mobility can similarly allow to set a preference for (or exclude) certain types of mobility means or routes to accommodate motion sickness or sustainability concerns. In Energy, personalization can be tied to actions and events tied to the overall energy consumption. Example factors here are number of laundries done within a period, laundry temperature, or number of hot beverages consumed within a certain period.

The *quantitative* level allows the user to define a specific quantitative target on the previously defined qualitative level. Suitable units for quantities depend on the use case but "cost in [currency]" is commonly sensible across all three target domains. The carbon footprint is commonly used in Energy and Mobility but can serve in food consumption as well when a user wants to additionally tailor their consumption with sustainability in mind. The quantitative level should be addressed with both predefined goals or suggestions as well as customizability of quantities. It is important that a user can customize on both levels and in the order of quality $\rightarrow$ quantity. Presets that stop at the qualitative level or that do not allow full quantitative customization run the risk of not addressing user contexts appropriately.

Diversity-sensitive personalization allows a user to personalize the app and its output in accordance with their individual situation. This is commonly achieved via tying personalization-specific settings to a user profile, so that this step does not need to be repeated unless necessary (i.e., when circumstances change and the user wishes to change their settings). Best practices in diversity-sensitive personalization are still limited, though common settings include age, language, and gender.

Diversity is not limited to the common factors listed above. Financial situation is an important diversity factor and must be addressed in order to avoid exclusionary design. While this factor is partially addressed via goal setting, further integration is important to avoid unintended side effects. E.g., if an app categorizes consumption or prices into cheap/medium/expensive, then these categories need to reflect the general economic situation within the user's economic environment as well as what constitutes cheap vs. expensive within the user's individual situation. Financial situation can be made an explicit value (e.g., enter monthly income and expenses), though care should be taken to not make users uncomfortable or stigmatize if social comparison techniques are also employed. If possible, financial situation should be implemented as a derived value and compare goal settings to local averages; explicit definition should be optional.

The personalization can only be effective if it is tied to actual **personalization effects**. Diversity-sensitive personalization effects should go beyond cosmetics and either impact the successful interaction with the app itself or the generated app output. For the former, font size and colour contrasts need to be customizable to accommodate preferences and disabilities. If and wherever possible, cues, notifications, and general output should be customizable regarding modes (visual, auditory, haptic; inclusion of 'silent' modes) in order to accommodate different daily situations and disabilities.

Customization choice can be reflected visually to communicate to the user that certain settings are currently active. Nonfunctional and overbearing visuals should be avoided. E.g., a user enters 'woman' as a gender in the profile and is then presented with a bright pink theme serves no functional purpose while potentially stigmatizing and repelling the user from further interacting with the app. In addition, defaults should be chosen carefully, e.g., when languages are tied to location settings. In places with several active and/or official languages, it is recommended to let the user immediately specify their primary language after setting the location instead of assuming the standard language and making the user change it post-hoc via the settings page.

Personalization effects must be communicated to the user. This can be done via tooltips when editing the profile, or as part of other information messages during loading or idle periods. Wizards, if employed, should lead the user through the settings and explain the effect of each setting on the respective page. It is important that the explanations are not limited to the wizard alone and can still be accessed when a user decides to update their settings afterwards outside the wizard.

3) Examples: The apps *YAZIO* [38] and *MyFitnessPal* allow personalization regarding age, language, and sex (see Figures 1 and 2). Tooltips explain the effects of each setting. In *YAZIO*, sex choice is reflected via different (gender-switched) images throughout the rest of the interaction process to increase relatability. This example limits the gender choice to only two, which should be avoided in order to not exclude users beyond the binary spectrum.

MyFitnessPal [39] uses a wizard to collect user preferences in terms of their perceived level of activity to match and customize recommended activities and levels of intensity (see Figure 3.

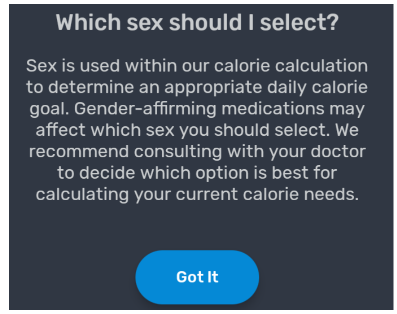

Fig. 1. Example for sex choice explanation from *YAZIO*.

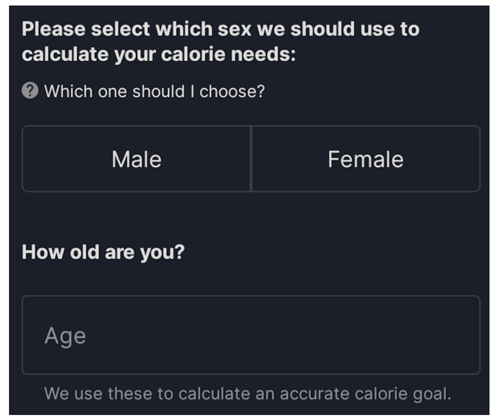

Fig. 2. Example for sex choice, age setting, and explanation of their effects from *MyFitnessPal*.

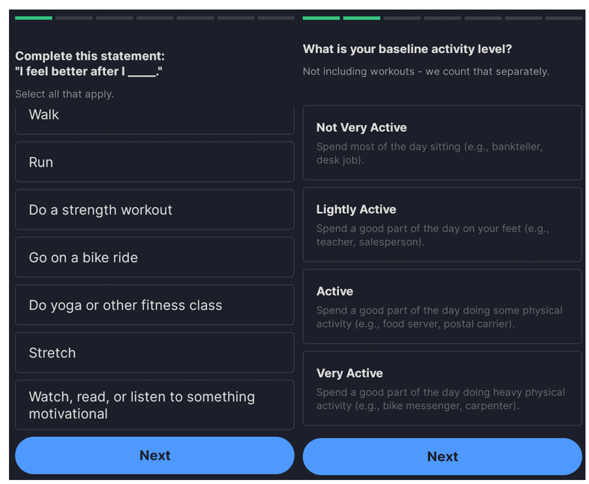

Fig. 3. *MyFitnessPal* asks for user's estimated level of activity after the user specified their desired activity type.

B. Pattern 2: Tangible Feedback Design

This pattern describes solutions to frame the app output in a user intelligible manner. This ensures that the previously diversity-tailored persuasive content is appropriately received and fully processed by the user, increasing its effectiveness.

1) Problem: Presentation and flow of the information the user receives should be intelligible and simple to comprehend [26]. If the presented information does not fit into the user's

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current frame of reference, then additional translational steps are required in order to accurately process the information presented. If this is not provided via the app or cognitively done by the user, the app and its employed strategies can be expected to be less effective. If the additional translation for comprehension needs to be done by the user, then using the app becomes more cumbersome, reducing usability and likelihood of user retention over time.

2) Solution: The feedback by the system must be such so that it is **tangible** to the user. 'Tangible' in this context is to be understood that the user can associate an immediate meaning to a given piece of information and situate it within their frame of reference.

In order for a value to be tangible, unit and magnitude need to be understood by and, if necessary, explained to the user. E.g., an isolated carbon footprint value can be difficult to comprehend without any additional information. Bringing it into context with items the user is familiar with enables framing and referencing. In the concrete example, a user could be presented with the carbon footprint of brewing a cup of coffee as an isolated value. The daily/weekly/etc. average carbon footprint per person/household/etc. within the user's country or region can be used to serve as global reference for the provided value. In addition, the footprint of, e.g., driving their car for 100kms / their daily commute / etc. can further contextualize the action in relation to their other known activities, thus rendering it intuitively graspable and easy to comprehend.

Tangibility is also achieved by allowing a user to monitor and compare current values or behaviours to past as well as future (projected) instances. Thus, *longitudinal information output*, e.g., in form of a histogram or similar visualizations, adds tangibility in terms being able to relate current data points to previous ones and easily see increases, decreases, deviations, and the like. Lastly, additional tangibility can be achieved by enabling intuitive qualitative goals, as described in Pattern 1. If users can tailor their goals not just towards units that they can intuitively comprehend but further into units that they interact with in everyday life (e.g., glasses of water consumed, nr. of gas tank refills, etc.), tangibility of information presentation is increased, leading to more direct engagement with the app.

3) Examples: The food app *Lifesum* [40] enables goals to not only be set towards calories but additionally tracks carbohydrates, proteins, and fats separately. Further tangibility is added by tracking hydration goals (overall indication in litres) via glasses of water consumed (see Figure 4). Additional tangibility is achieved via statistical overview of past food consumption behaviour, a so-called "LifeScore", which provides a single-number approximation regarding how healthy/unhealthy the current eating habits are, and tracking of streaks. Streaks (i.e., periods of uninterrupted goal achievement) provide an easy way to track own achievements in a simple number format and allow historical contrasting via comparison of current to recorded highest streak.

Histograms and similar overviews are commonly used particularly in Energy apps and provide reference to contrast daily with periodic consumption and plan actions to achieve goals accordingly. The *AVA-App* [41] can not only show data on past consumption but also has indicators to denote the price range within that period. The app differentiates on three levels between expensive, medium priced, and low priced, which further aid the user to assess their consumption in relation to costs and can be used for more informed forecasting as well. It has to be noted, though, that while the assessment of whether a price is expensive or not can be done in relation to market highs, lows, and averages, what a user considers expensive will ultimately depend on their disposable income. Thus, such margins are ideally customizable to fit the user's individual situation.

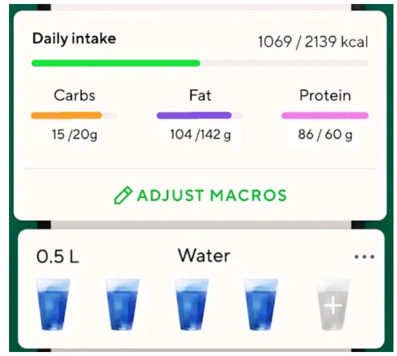

Fig. 4. Separation of intake into carbohydrates, proteins, fats (and respective maximum values) and water tracker from *Lifesum*.

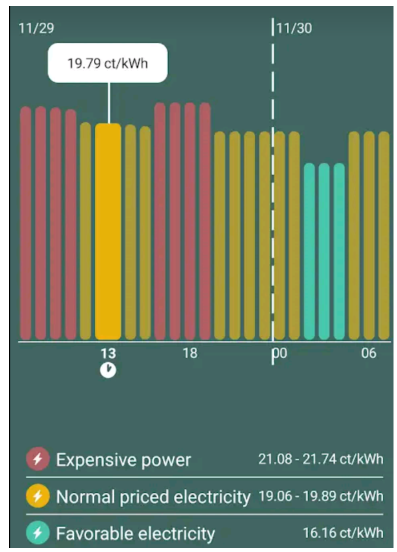

Fig. 5. The *AVA App* labels values in its consumption histogram in relation to how (in)expensive the price per kWh can be considered to be.

C. Pattern 3: Maintaining User Engagement via Effective Tunneling

This pattern describes solutions to increase user engagement and retention via tunneling strategies.

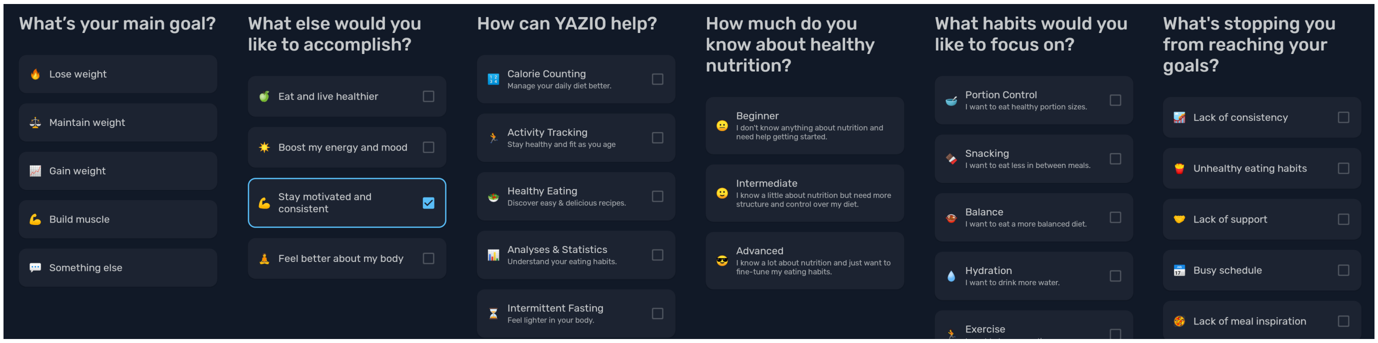

Fig. 6. The Wizard of the app *YAZIO* tunnels effectively by asking the user's goals in steps and additionally captures their nutritional knowledge and impeding factors.

1) Problem: Behaviour change is a continuous process. As a consequence, in order for behaviour change apps to be effective, users need to stay engaged in using the app for an extended amount of time so that a lasting impact on their behaviour can actually manifest. If there is insufficient motivation for a user to keep returning to the app beyond initial use, then the likelihood of impactful app use is low. Even more critical are cases where apps repel users from repeated use due to cumbersome navigation, convoluted interfaces, or lengthy input sequences before each use. Such obstacles need to be minimized in order to retain user engagement and ensure user retention.

2) Solution: Tunneling is a strategy that can be employed to lower the input barrier of complex or multi-step processes, thus making them easier to handle and reducing the workload on the user. Tunneling refers to guiding the user through predetermined sequences of actions instead of giving them free reign over all functionalities from the get-go. This means that users need to give up a certain extent of freedom of interaction and engage with parts of the system or engage in tasks they might not otherwise have engaged in.

This has two important benefits: Since the tasks as well as the ranges of possible tasks per step are pre-defined, the complexity can be controlled and the interaction designed so as to not overwhelm the user at any given point. Any complex or lengthy process can be segmented into individually manageable sequences via tunneling. The second benefit is that users are more likely to commit to completing a sequence to completion once they have begun engaging in it. Thus, tunneling can be used to both lower the initial entry barrier and keep the user engaged throughout the app use.

Effective tunneling means knowing when to employ tunneling, since the user will not always be willing to have their freedom of choice reduced. Two fitting spots for tunneling are: At the *first* start of using an app and at the start of a new activity (task or info query). The former is usually handled via Wizards, which help users set up the necessary profile data in order to effectively start using the app.

When designing a startup-Wizard, it is important to delineate the strictly necessary from the optional information. During interaction with the Wizard, the user should always be informed, what the information provided or setting chosen will impact and whether a step can be skipped. The initial tunneling should be kept flexible, so that the user can either skip parts of the initial sequence or cancel it altogether and still engage with the app on some level. They should also have the opportunity to re-start the Wizard at any point in order to complete their setup (or review information they require a refresher on).

Pre-activity tunneling means that whenever a user decides to begin a new activity, they are presented with a number of predefined options and are then efficiently guided via a sequence consisting of several choices. A well-established solution is to follow a question-based approach. The first question should ask the user what they want to achieve on a general level (e.g., save money, maintain weight, reduce gas consumption, eat more sustainably, etc.). The subsequent questions should then allow them to specify how they want to achieve their goal (by indicating tasks/activities they want to do *or* by having them explicitly exclude activities they do not want to perform or know to not work for them from past experiences). The final step should then allow them to set their goals and should always be in the form of modifiable suggestions, so that the user can tailor if and when desired.

In the context of competency building as important component of sustainable behaviour support, tunneling can be employed to provide pre-selected choices for areas of behavioural adjustment or accordingly tailored actionable advice.

3) Examples: The food consumption app *YAZIO* tunnels the user effectively upon initial use by using a Wizard and following the goal-based question approach (see Figure 6). The app tunnels effectively by asking primary and secondary goals and then presents the app functionalities and brief explanations on how each one can assist to achieve the user's goals. The query on healthy food consumption knowledge is well-positioned and is not something a user easily or immediately divulges on first use but can be used by the app to calibrate the amount of info output in the following steps. Focus on habits and explication of impeding factors help to further tailor the suggested tasks. This allows the generation of a very detailed and customized task profile with an interaction flow that never exceeds a complexity of a six choice maximum presented to

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the user.

V. Discussion

In the following, we discuss the identified solutions, existing best practices, and areas for improvement for each pattern.

A. Personalization

With regards to qualitative personalization, it is important to design options under consideration of diversity-specific needs. For food consumption these include in example elements such as limited budget in the context of income, and/or time for food purchase e.g., in relation to living phase and family situation and preparation. In the context of mobility, traveling with little children and with safety concerns which more often affects women, status-related motivations which we see more often with men, and with limited mobility as can be relevant for the elderly and disabled but also people with care responsibilities are some of the aspects to consider. Regarding energy consumption relevant limitations to consider are e.g., availability for load shifting in relation to employment status, life phase and gender as women often bear the main share of housework and are also more often at home with young children, as well as limited resources and possibilities in relation to income, class and geographical location which are also associated with household equipment, dwelling type and ownership.

Of further importance on the quantitative level is sufficient granularity for captured characteristics that e.g., avoids capturing gender only as binary variable and takes the age of children in the household into consideration. This is specifically important in the context of ensuring the inclusion of marginalized groups such as non-binary users. Options for quantitative consumption should be designed with comprehensibility and personal relevance for different user groups in mind. Even seemingly very generalized translations, such as energy as travel distance by car or hours watched on a TV, could be less accessible for people who do not own cars or TVs.

B. Tangibility of Feedback

Presentation and flow (as well as quantitative goalsetting from pattern 1) should not be in isolation and always stay tied to user-specific motivations. Regarding timing, whether a prompt is considered “timely” will differ between different user groups, e.g., with regards to how much need to plan ahead is needed and how “immediate” their possibility to interact with the app is when a notification has been sent.

Suggestions for actions need to be strongly tied to possibilities and there need to be ways to specify that specific types of actions are not possible such as cycling due to a disability, buying bulk due to food-related intolerances that do not allow for contamination or using the tumble dryer less often if there is insufficient space available to air-dry all laundry.

With any sort of visualization to provide feedback comprehensibility for different user groups also needs to be taken into consideration and different forms should be provided if needed. These forms, as other personalization options should be developed under involvement of a diverse user group to avoid the designer’s specific understanding and context to shape the app to a degree that excludes potential user groups.

C. Tunneling

With tunneling it is particularly important to ask the right questions that allow an understanding of given motivations, abilities, and limitations with a diversity-sensitive approach so that it can be employed in an effective manner but without removing choices needed to indicate diversity-related conditions. Similar considerations apply to tunneling of action-related choices and and information that aim at building literacy and competency. Particular care should therefore be applied in the implementation.

More emphasis is needed on what the right time for which type of assessment is. If users are confronted with one question after another that they do not see relevant at that time, there is a real risk of repelling them. If, however, the question is woven into a task-specific interaction tunnel, then answering a diversity-relevant question will be a logical and intuitively graspable part of the interaction flow. A similar approach has been suggested for communicating privacy-relevant information [42]. Some practices exist on when to ask for sex, gender, age, economic status but a more structured understanding when and where to place which diversity-factor assessment is required to better support tunneling within and across the application domains.

VI. Conclusion and Future Work

In this paper, we presented three design patterns for diversity-sensitive design of behaviour change systems. These patterns are based on results from a best practice analysis of existing applications in the domains of nutrition, mobility, and energy consumption on the Austrian market. The best practices condensed into pattern solutions were chosen such so that they match stated issues that inhibit the success of behavior change support systems. The identified best practices can not yet be considered comprehensive and often lack in explicitly targeting diversity and are rather general design practices that can also be used to support diversity-aware design. When diversity is directly addressed, only a rather narrow range of relevant-factors is currently considered. Including a wider range is necessary to render in- as well as output naturally tied to diversity factors instead of having them “tacked on”. We were able to identify a number of concrete areas for advancement for all three patterns and will further pursue refinement of the pattern solutions in order to arrive at comprehensive and actionable guidance for diversity-sensitive behavior change system design.

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