Cowlivia, a chatbot intervention for reducing meat consumption

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1 INTRODUCTION / DEFINITION OF DESIGN BRIEF

1.1 Problem

As global environmental concerns have risen in the past decade, it is no surprise that there is an ever-increasing need for sustainable lifestyle choices. Meat consumption has a strong negative impact on the environment. Other than the effects on animal welfare (bad living environments, abuse, slaughtering) [7], livestock production and farming for meat consumption contribute to deforestation (for grazing and growing animal feed), increased greenhouse gas emissions, water pollution [14], and require large amounts of water usage (animal drinking, irrigation, crops and processing). Furthermore, meat consumption can impact health negatively, e.g., the increased risk of spreading diseases and a higher chance of cardiovascular diseases and colorectal cancer [19].

Despite these reasons, meat consumption has increased by 250% from 1960 to 2002. Nonetheless, there also seems to be an increase in the number of vegetarians, who make up 22% of the world's population [12].

Even though one can imagine that going completely vegetarian can form certain obstacles for most, as meat also contains nutrients that are important for one's health or because of people's desire for the taste of meat and social pressures [27], it is proven that even replacing some meals with plant-based meals have positive effects. Take for example the fact that substituting one pound of beef with a plant-based alternative saves almost 2000 gallons of water [2]. Therefore, we are motivated to stimulate people to eat less meat-based meals, rather than stimulating complete vegetarianism.

1.2 Design Case

Eating meat is a process of various stages, where the meal plan is considered, a shopping list is made, the meat is bought and, finally, is consumed (Figure 1).
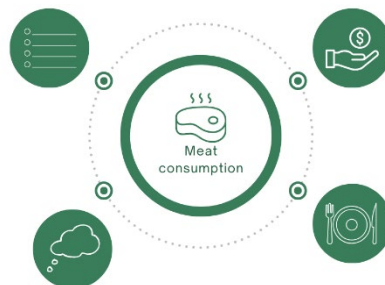

Figure 1: Meat consumption cycle.

This project aims to tackle behaviour at an early stage of the process of eating meat, which is meal planning. Therefore, it is aimed to move from the current behaviour, planning a meal with meat, to the target behaviour which is defined as planning to cook a vegetarian recipe. We chose this behaviour because we think that the decision to consume meat is already made in the step where you plan your groceries (possibly based on the recipes you know). The target users for this behaviour change are people who have the intention to eat less meat, and occasionally eat a vegetarian dish, but struggle to consistently execute this behaviour. When looking at the Trans Theoretical Model (TTM), this means that it is aimed to go from the 'action' stage to the 'maintenance' stage. Users are specifically targeted while planning their meals, before going grocery shopping. Therefore, another defined characteristic of the target group is that they form their shopping list based on their meal plan for the upcoming day(s).

1.3 Stakeholders

The most important stakeholder that is addressed is the target user as described previously. Other stakeholders that would be affected by this behaviour change are household members, as people often prepare a meal for the people they live with. Furthermore, there are also commercial and industrial stakeholders involved in the topic. For instance, supermarkets, butchers, animal farms, and the meat replacement industry. On a broader scale, this project considers non-humans as important stakeholders. The effect on these stakeholders is elaborated upon in section 5.

1.4 Interventions and BCTs

After looking at the COM-B components [28], we found motivation needs to be addressed specifically to achieve the intended behaviour change (Figure 2).

Figure 2: COM-B analysis [28].

Reflective motivation is important for people who very consciously choose to not eat meat. Furthermore, automatic motivation comes into play when we talk about people buying meat, as it is an ingredient in the set list of recipes they know. Research has shown that in many cases, meat consumption is highly habitual [17]. Furthermore, the psychological capability could be interesting when people are not informed on, e.g., the actual extent of consequences of eating meat, what vegetarian recipes can be cooked and what meat replacements still ensure a well-rounded diet.

Therefore, the goal of this project is to achieve the target behaviour through the intervention functions: education, enablement and persuasion. The following sections will detail our design process and describe the resulting behaviour change intervention concept. Furthermore, it will argue for the included intervention techniques and incorporated BCTs, while firmly rooting the concept in behaviour change theory.

2 DESIGN PROCESS AND CONCEPT DESCRIPTION

2.1 Design Process

The following section summarises the design process and frameworks that were used toward the development of a behaviour change intervention concept as a response to the problem analysis and specified design challenge outlined above. The first step taken towards the development of a behaviour change intervention was to follow a structured approach as found in Michie's three-step process [28]. This served as an introductory specification of the design context by clarifying the problem in behavioural terms, specifying the target behaviour, and identifying requirements of change. Consequently, this base allowed for clear and efficient identification of intervention options. Ultimately, a full COM-B analysis created the argumentative foundation for further ideation following identified intervention functions, relevant behaviour change techniques, and applicable behaviour change theory. With this foundation, the ideation process was started with preliminary ideas and concepts sparking from brainstorms and individual inspirations and exercises. The Design with Intent framework by Dan Lockton [10] was an integral part of creating these inspirations. The analysis of the various lenses and design techniques, as seen in Figure 3, served as the basis of inspiration leading to varied and original concepts. Next, these concepts were projected onto a Venn diagram organised to resemble the Functional Triad framework by B.J. Fogg [6], as seen in Figure 4.
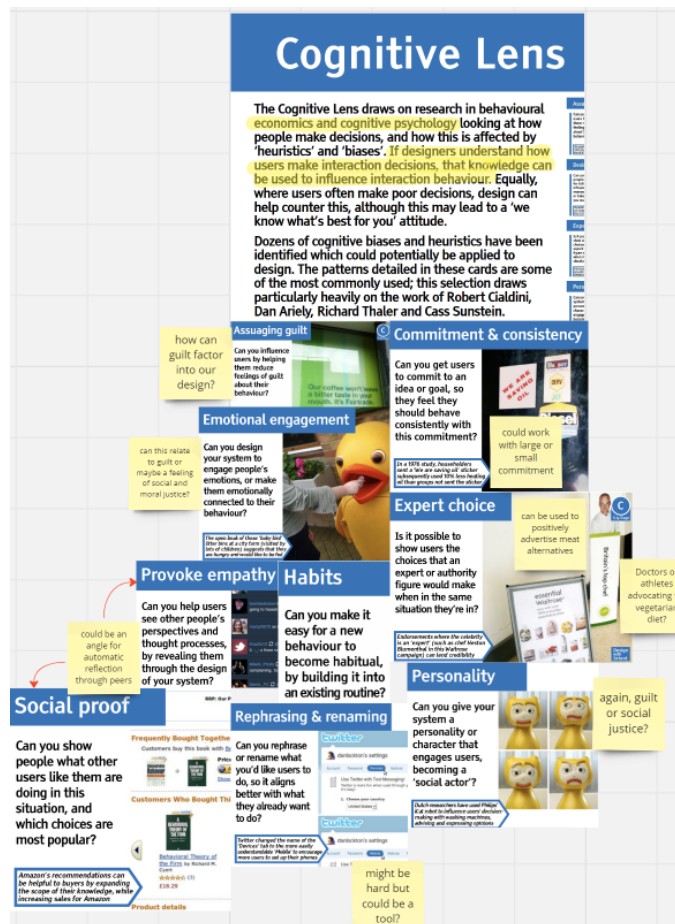

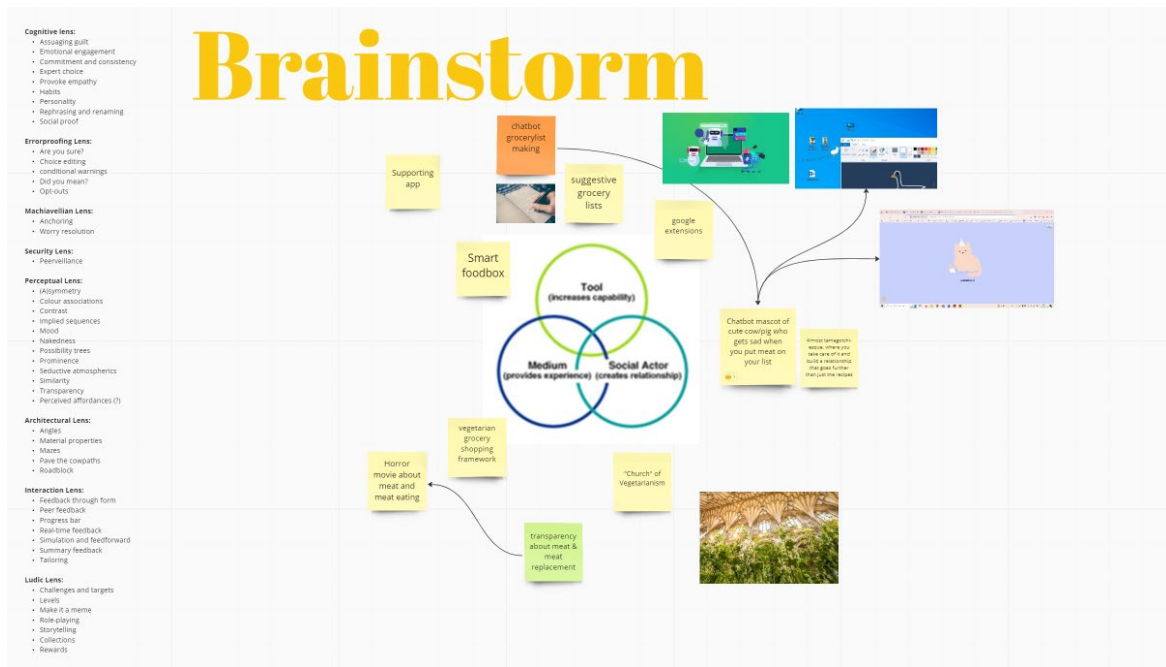Figure 3: Analysis of design with intent: The cognitive lens.

Figure 4: Functional Triad Venn diagram.

Consequently, the tool aspects, medium properties, and social actor elements were discussed for each concept. Eventually, the focus for the behaviour change intervention was aligned with the idea that was balanced most centrally between the three, as this concept would most holistically serve as a tool, medium, and social actor. This idea turned out to be a chatbot. Five distinct concepts were then developed individually. Concept outlines put these ideas in an applied context and provided a scenario alongside functional descriptions, as seen in Figure 5.
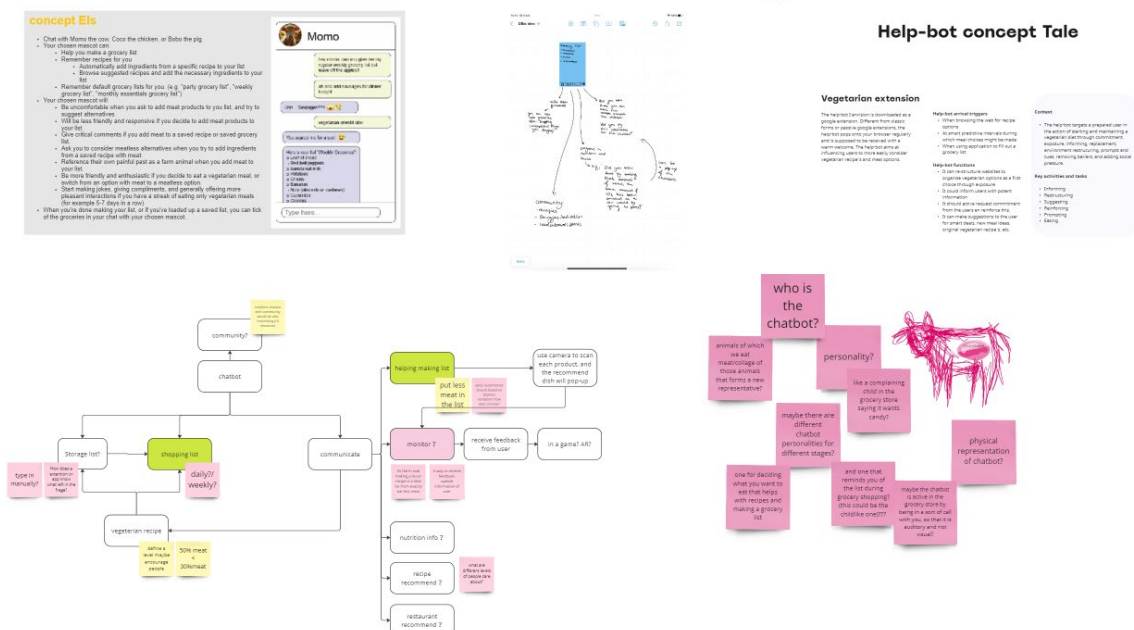

Figure 5: Concept outlines for a chatbot intervention.

2.2 Concept Description

The concept that resulted from the above process is a mobile application containing three functions: chatbot, grocery list and recipe collection. The middle tab is the main function of this application, a chatbot called Cowlivia: a cow who was rescued from a meat farm and shares her personal experience with users through their chats. Users can chat with her to find inspiration and suggestions for vegetarian food. She can also provide some recipes, which users can read and save in their collection (Figure 6, 7). After determining the recipe, she can automatically add the ingredients to the shopping list, which is the second function. Users can modify it by themselves through the "add" button on the top right (Figure 8). During shopping in the supermarket, ingredients might be out of stock, or users might change their minds about a specific ingredient. Then they can talk to Cowlivia and she will provide a recommendation as a replacement, along with some popular facts about healthy eating (Figure 9). Cowlivia understands when the user is doing groceries based on the ingredients being checked off in the grocery list, at which point Cowlivia will send pop-up notifications to remind the user to not buy meat and give optional replacements (Figure 10). During cooking, users can refer to the recipe step by step (Figure 11). After meals, Cowlivia will ask the user to have a light conversation about the experience as a self-report and reflection (Figure 12).

During our discussion of designing the app, we considered community and progress functions. However, we decided to limit the functionalities and consequent amount of behaviour change techniques and see them as future developments, which is further elaborated on in section 3.
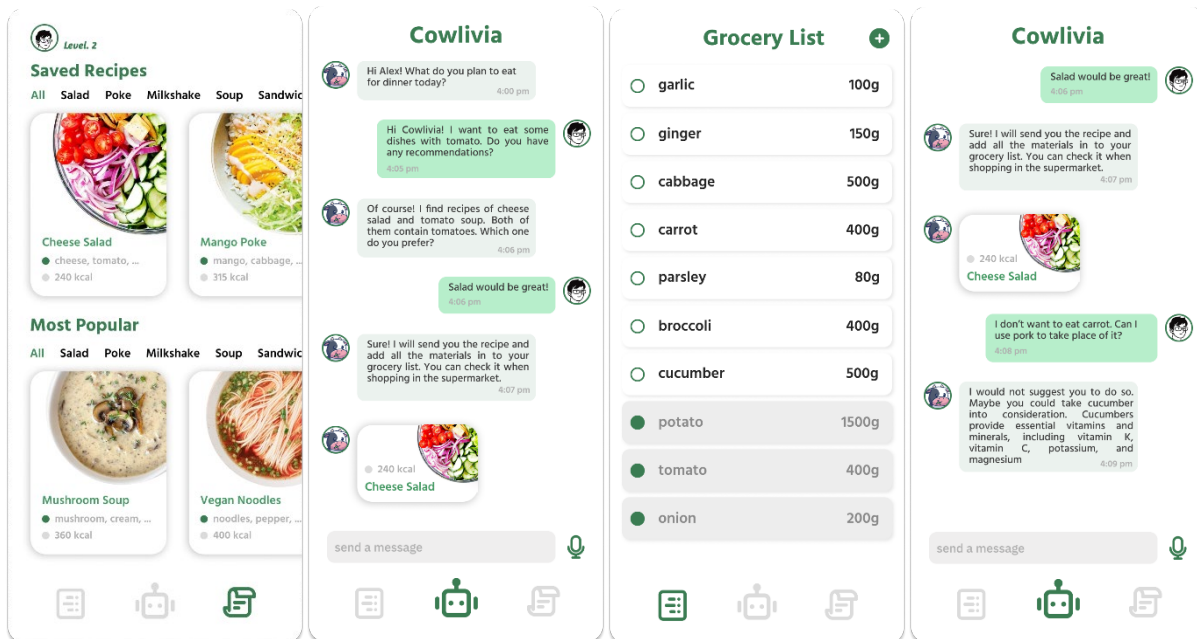

Figure 7: Saved recipes.   Figure 8: Recommending recipes.   Figure 6: Grocery list tab.   Figure 9: Product replacement recommendation.
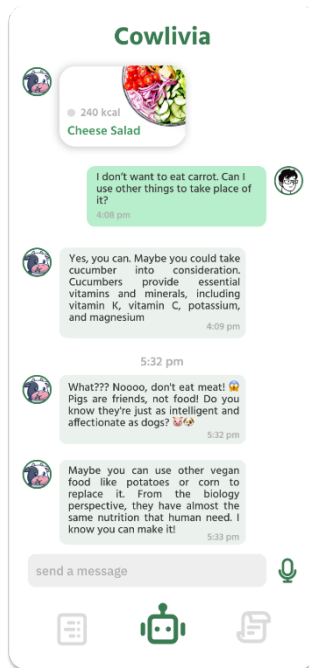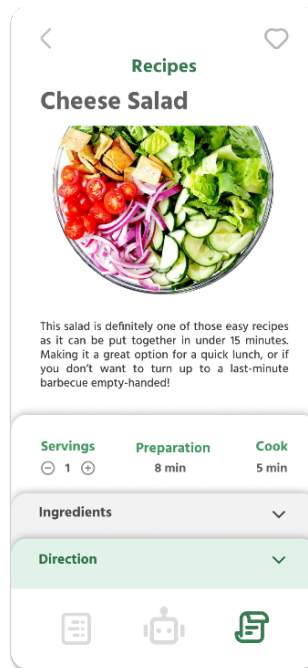
Figure 10: Cowlivia reminds user to not eat meat.

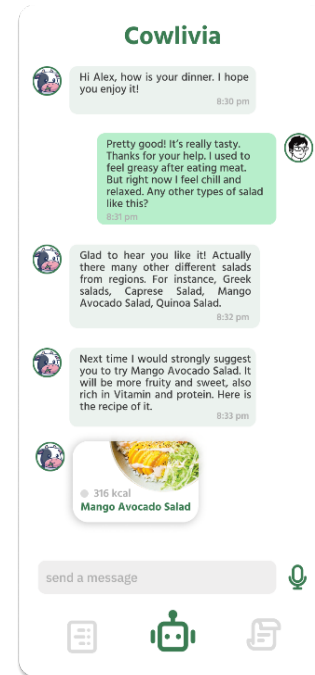

Figure 11: Recipe to refer to during cooking.

Figure 12: Reflective conversation with Cowlivia.

3 IMPLEMENTATION DESIGN RATIONALE

3.1 Current Concept:

As mentioned above, Cowlivia manages three main routes of interaction in the chat (the primary function), the recipe tab, and a grocery list tab. These tabs and their functions are all predominantly stimulated through conversation with Cowlivia. We will first discuss how the intervention in its design accomplishes to be a tool, medium, and social actor following the aforementioned Functional Triad by B.J. Fogg. [6] Stripped down to its core, the app is designed to function as a tool to be used when planning meals and constructing grocery lists. The tabs dedicated to the users' grocery list and recipe book contribute to this by providing overviews, while the chat function first and foremost aims to actively help the user with the creation of a meal plan and grocery list. By stimulating the user while engaging in the behaviour change technique of Action planning through conversation, Cowlivia aims to make the target behaviour easier to do, lead them through the process, reduce barriers, influence decision-making, and effectively increase their self-efficacy through interaction. She accomplishes this by leading the conversation with suggestions for meals or ingredients to incorporate into a grocery list, simplifying the list-making process and reducing tasks, automating and taking over tasks in the background, and providing relevant information. Additionally, Cowlivia would ideally make use of personalised conversational elements to adapt to an individual and tailor her tone and response to adapt to specific contexts. We can conclude that the intervention successfully acts as a tool.

Secondly, we can argue that the intervention also acts as a medium. Cowlivia, either interwoven into conversation or through notifications, presents relevant information on the impacts and consequences of desired or aversive actions. This could for example be facilitated through a message from Cowlivia which aims to communicate the cause-and-effect relationship between wanted or unwanted behaviour and the consequent societal impact, through praising or pressing emotional attitudes respectively. This would engage the behaviour change technique of Information about social and environmental consequences. Alternatively, Cowlivia could achieve this same effect by presenting more emotional information concerning the users' performance or maintenance of the behaviour throughout the general conversation,

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periodically enhancing understanding. Like anti-smoking campaigns, this could also be implemented using exposure, framing, or similar confrontational messaging techniques. However, this would create a suggested negative connotation of interaction with the chatbot, which research shows is less effective in behaviour change than following a motivational approach as opposed to confrontational [3].

Lastly, in many of its functionalities and design aims, the chatbot itself is a social actor. The lively character of Cowlivia that personalises our chatbot uses some visual and psychological features to appeal to emotional cognition and general humanity. Cowlivia is represented by the digital portrayal of a farm animal and builds on this image, along with a catered personality, emphatic reactions, and humour to place herself as an expert, but also as both a friend and a coach. In this, Cowlivia acts as a source of motivation and support through praising and affirming messages. With this image, she creates a front-facing, supportive, and friendly approach to human-computer interaction, while engaging the behaviour change technique of Social reward. Additionally, Cowlivia takes steps towards being a social facilitator by communicating knowledge on and providing links to, helpful and relevant communities which might enhance the performance of the target behaviour, engaging in the behaviour change technique of Practical social support.

3.2 Future Additions:

The concept could in future include a progress page and a community feature in the app. By using the functions of the progress page, Cowlivia could analyse behavioural data retrieved from self-reported performance to provide more succinct feedback and praise personally impactful trends. Furthermore, Cowlivia could increase her claim to being a social facilitator by simulating social presence through a community feature in the app. This could be achieved by activating varying social dynamics in her dialogue with the user, including the stimulation of cooperation and peer feedback among others. This would require using data and features from a community page to refer to peers, considering their behaviour and posts, and broadcast the users' milestones, achievements, etc. Through this link, Cowlivia might better incorporate the behaviour change technique of Social reward and Practical social support, both in her comments providing positive feedback based on data as a social actor and in her communication of social norms as a social facilitator. However, these additive tabs and functions have been purposefully removed from the overall concept description, trying to simplify and streamline the evaluation plan, as this will focus mainly on the app as a chatbot rather than a progress tracker or community space.

4 THEORETICAL RATIONALISATION FOR DESIGN CONCEPT

4.1 Trans Theoretical Model (TTM)

We looked to the TTM to define more clearly who our target users are and to better conceptualize the kind of behaviour change we wanted to support.

Our targeted users are in the action phase. They already occasionally opt for vegetarian meals but do not have a deliberate or sustainable approach to permanently reducing the amount of meat in their diet. Their decisional balance is in favour of eating less meat, although they still perceive some drawbacks to the idea of consistently eating less meat. Through our app, we want to support users to move to the maintenance phase, mostly by improving self-efficacy by enhancing users' confidence and minimizing their temptation to eat meat.

The processes of change that we aim to support with our intervention are Counterconditioning, Helping Relationships, Contingency Management and Stimulus Control. The process of Counterconditioning is supported by teaching people alternative, vegetarian recipes and helping them learn what alternative products to buy when shopping. This is expected to heighten their confidence about being able to sustain a diet with less meat consumption. Helping Relationships is present in the character of Cowlivia. Through offering practical and emotional support and advice, interactions with Cowlivia are expected to enhance users' confidence. The rapport users build with Cowlivia is also used to support the process of Contingency management, as Cowlivia will express approval or disappointment depending on the users' expressed intentions and self-reported behaviours. Stimulus Control in our app is mainly focused on providing reminders to engage in healthy behaviour, in this case opting for a vegetarian meal.

4.2 Theory of Planned Behaviour (TPB)

In the transition from the Action to the Maintenance phase, increasing users' self-efficacy is the main mechanism of change supported by our behaviour change intervention. We use the TPB to further inform how to best support this process. Self-efficacy shares many similarities with the construct of Perceived Control in TPB, which is therefore the construct we aim to influence with our design concept. We expect Cowlivia to increase users' Perceived Control over their behaviour, as she teaches them alternative recipes, explains ways to sustain a diet with reduced meat consumption, verbally affirms their ability to change their behaviour, and praises them when they report to have performed the desired behaviour.

Although we assume users' decisional balance to be in favour of eating less meat, we also expect them to still perceive drawbacks to changing their behaviour, as well as for them to experience the temptation to relapse. We therefore also target the Subjective Norm as defined by the TPB. By having Cowlivia make emotional and moral appeals to the user to decrease their meat intake, we expect to strengthen and reinforce existing normative beliefs the user has about planning vegetarian meals. Simultaneously, Cowlivia builds rapport with the user, which we expect to increase the user's motivation to comply with Cowlivia's requests to reduce their meat consumption.

5   ETHICS ANALYSIS OF DESIGN CONCEPT

Since design shapes how people live, it is crucial to consider design's ethical implications. We used Value Sensitive Design [4] to analyse our design's potential impact on a conceptual level. This entailed identifying direct and indirect stakeholders, envisioning the gains and losses Cowlivia could bring them in terms of values using Kerlin's basic human values [23] (See Table 1), and identifying possible value conflicts through scenarios. We set ethical guidelines for our work accordingly.

To identify the stakeholders, we created a stakeholder onion (Figure 13). The user is in the centre, surrounded by their direct social network. The next ring is for the user's contact points with food, such as vendors, but also experts like celebrity chefs. The following ring consists of the food industry, which is formed by butchers, animal farms, and meat substitute producers. The outer circle is for relevant non-humans.
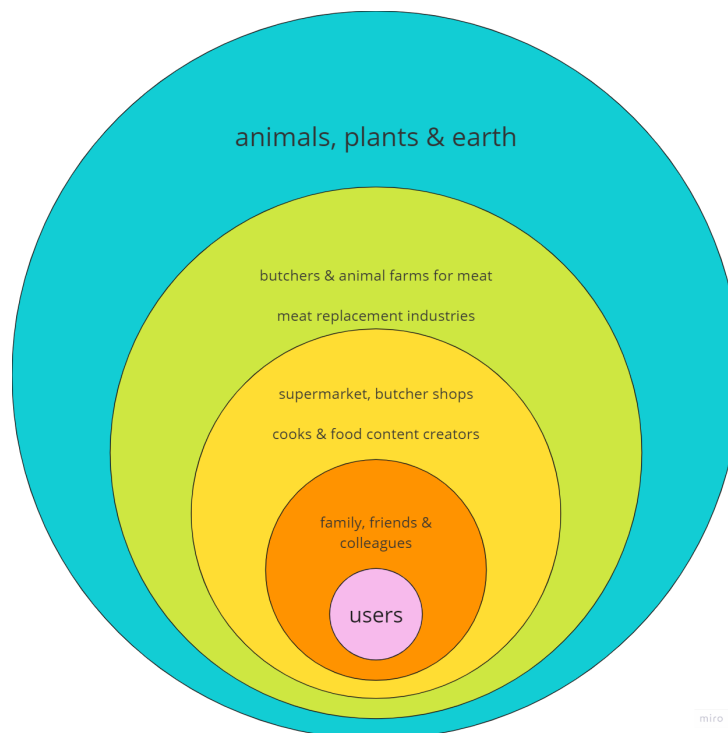

Figure 13: Stakeholder onion.

Table 1: Kerlin's Basic Human Values as referenced in this section.

Original value name	Referred to in the text as
Achieving goals	-
Being inspired	Inspiration
Being safe and well	Safety
Belonging to a group	-
Connecting with others	Connection
Exploring the world	Exploration
Expressing myself	Expression
Feeling impactful	Impact
Growing myself	-
Having autonomy	Autonomy
Having stability	Stability
Pursuing pleasure	Pleasure
Receiving recognition	Recognition
Understanding myself	-
Achieving goals	-
Being inspired	Inspiration
Being safe and well	Safety
Belonging to a group	-
Connecting with others	Connection
Exploring the world	Exploration

5.1 Values Per Stakeholder

Users who successfully lower their meat consumption will have a lower risk of various health issues [19] (+Safety). They learn about new recipes and ingredients (+Exploration, +Inspiration), and might enjoy the new tastes (+Pleasure). Lowering their meat consumption would lower their carbon footprint and could lessen guilt about animal welfare (+Impact, +Autonomy). Changing their diet more consistently might lead them to feel less welcome at social events such as barbecues (-Connection). They might also dislike the taste of the new vegetarian recipes they try (-Pleasure).

The user's social network gains when participating in the user's meals. They taste new things (+Exploration, +Inspiration), have a lower carbon footprint and less guilt regarding animal welfare (+Impact). Nevertheless, they might miss the taste of meat (-Pleasure) or have fewer meals with the user (-Connection). They have less Autonomy about what they are eating when eating together with the user.

Supermarkets gain by selling more meat alternatives and possibly having to cool fewer products resulting in lower CO2 emissions (e.g., nuts do not need to be cooled) (+Stability, +Impact). However, selling fewer meat products could lower their revenue (-Stability). Experts like chefs gain when focusing on vegetarian cooking (+Exploration, +Inspiration, +Stability, +Impact, +Expression). People in this branch focused on meat lose their audience (-Stability) or lose techniques and flavours (-Pleasure, -Expression).

Butchers and animal farmers gain less environmental impact (+Impact), but they have a reduced market and income (-Stability). The meat industry will receive less Recognition. Meat alternatives industries gain in customers (+Stability, +Recognition, +Impact), but their competition will increase (-Stability).

Regarding the non-humans: The animals will gain due to reduced bad experiences considering transport and slaughter (+Stability, +Safety, +Recognition). Nevertheless, animals in the dairy industry and plants like soy experience more strain (-Safety). In a bad scenario, the increased demand for vegetarian proteins results in the reduction of rainforests, negatively affecting the welfare of wild flora and fauna (-Stability, -Safety). Otherwise, reduced meat consumption will reduce pollution and the strain on earth's resources (+Recognition, +Safety, +Stability).

5.2 Value conflicts

Based on this analysis of the impact Cowlivia will have on its stakeholders in terms of values, we distinguish possible value conflicts. Important reoccurring values are Impact, Autonomy, Recognition and Pleasure. Impact: Eating less meat is beneficial for the environment and animal welfare. Autonomy: Reducing meat consumption is a user's voluntary choice. Recognition: The harm of meat consumption to the environment and animals is being acknowledged. Pleasure: Enjoying consuming meat (alternatives). Additionally, the values of privacy, transparency and honesty are relevant in the design of Cowlivia, since it requests the user's data.

When their social network disapproves of the user consuming less meat, there is a value conflict of Connection (user sharing their experiences about reducing meat consumption) versus Impact (effect of reduced meat consumption on the environment) and Autonomy (freedom to consciously choose to eat less meat).

When the user dislikes the taste of vegetarian meals compared to meat, Pleasure opposes Impact. Cowlivia helps the user in this scenario by suggesting different recipes and ingredients that replace meat, enabling the user to discover their preferences.

For Cowlivia's effectiveness, the user must be honest about their meat consumption. This causes a value conflict when the user wants to eat meat and reduce their meat consumption by using Cowlivia. The values of Privacy, Autonomy and Pleasure contrast with Honesty and Impact. Cowlivia is fully dependent on the user's input to know whether they consume meat, protecting their Privacy and Autonomy.

5.3 Ethical guidelines

To ensure the design's morality, we set ethical guidelines that were considered in the design decisions. The first is Transparency. The user should be informed about the design's functions and intentions, based on the disclosure principle by Berdichevsky [11]. An agreement statement before starting to use Cowlivia is our suggested implementation. Additionally, the user's Privacy should be protected. We envision that the users' conversations with Cowlivia remain solely accessible to the user. Since we, designers, could be Cowlivia's users, we designed the intervention how we would want to use it ourselves. We designers hold Accountability for the design's possible outcomes.

6   EVALUATION PLAN

This section describes a hypothetical plan to evaluate the Cowlivia app on the intervention and interaction level. For this evaluation plan, we would need a fully working version of the app as described in section 2.

We will use self-selection sampling to recruit between 50 to 100 participants. Through advertisements in print and online media, we will invite people who meet the requirements to join the evaluation. The requirements to join are:

- Participant is regularly in charge of planning and buying groceries
- Participant occasionally eats vegetarian meals or plant-based alternatives but is not vegetarian

6.1   Intervention Level

The main behaviour change technique in our intervention is action planning concerning the Theory of Planned Behaviour and the Transtheoretical Model.

Our main goal is for our app to aid people in planning to eat less meat. By making this process easier and more digestible for them we increase their self-efficacy, leading to better automatic motivation. Additionally, we want to impact their subjective norm about eating vegetarian meals by giving them a chatbot companion who encourages them to eat vegetarian meals and praises them when they do so. Therefore, on an intervention level, the effect of Cowlivia on the users' self-efficacy and subjective norm will be evaluated.

6.1.1 Self-efficacy

The participants' self-efficacy will be evaluated with questionnaires using 0-100 rating scales as researchers argue that this is a strong way to test self-efficacy [13]. Through these questionnaires, participants can rate their perceived self-efficacy from 0-100 on how confident they are. They can plan vegetarian meals in various contexts, with 0 meaning 'cannot do at

all', 50 meaning 'moderately can do' and 100 meaning 'highly certain can do'. The contexts will be based on obstacles that may make it hard to plan vegetarian meals [1]. Some example contexts might be:
- When cooking for themselves
- When cooking for friends (social influence)
- When cooking a meal for a holiday (cultural reasons)
- When having to quickly prepare a meal (convenience)

The participants will be sent the questionnaire digitally before using Cowlivia, to evaluate their current self-efficacy in planning vegetarian meals. To familiarize the participants with the rating scale they will initially be presented with an introductory scale as can be seen in Figure 14. After having filled in the self-efficacy scale, the participants will be asked to use Cowlivia to plan their meals for 2 weeks. After these 2 weeks, they will be asked to fill in the questionnaire again. The quantitative results of both questionnaires will then portray the change in self-efficacy.

An example you can use to introduce informants to the rating scale

The attached form lists different activities. In the column **Confidence**, rate how confident you are that you can do them **as of now**. Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Cannot   Moderately   Highly
do at all   certain can do   certain can do

Example (used for practice)   **Confidence**
Lift a 10 kilo object   _____
Lift a 30 kilo object   _____
Lift a 50 kilo object   _____

Figure 14: Introductory rating scale [25].

6.1.2 Subjective norm

According to the Theory of Planned Behaviour (TPB), the subjective norm influences users' behavioural intention, and in turn the behaviour. As eating is a social activity, social influences can stir one's decision-making on eating meat or not. Cowlivia aims to change the subjective norm by showing it is socially acceptable to eat less meat and to decrease the motivation to comply with people who say otherwise. Therefore, the subjective norm will also be tested through the questionnaire that will be sent digitally to the participants, as previously described (both before and after utilizing Cowlivia). Only for this part of the questionnaire, the scale is a 5- or 7-point Likert scale as described by Montaño and Kasprzyk [9] to be the way to measure TPB constructs. Some example statements are:
- Belief about whether most people approve or disapprove of planning vegetarian meals (bipolar disagree-agree scale scored –3 to +3)
- Belief about whether each referent (e.g., friend, family member, Cowlivia) approves or disapproves of planning vegetarian meals (bipolar disagree-agree scale scored –3 to +3)
- Motivation to do what each referent (e.g., friend, family member, Cowlivia) thinks (unipolar unlikely-likely scale 1-7)

6.2 Interaction Level

At the end of the two-week intervention period, the app's qualities on an interaction level will be evaluated as well. The two main goals of this evaluation will be to assess:
- The User Experience (UX) of the app, to identify possible areas for improvement.

- The Emotional Connection to Cowlivia, to ascertain whether the chatbot is effective at eliciting the intended emotions in users.

6.2.1 User Experience

All participants will be asked to fill out an online User Experience survey. The standardized User Experience Questionnaire, UEQ for short [5], will be used for this. Each item of the UEQ will be presented separately, with an optional text box below for optional elaboration (See Figure 15).

Figure 15: Sample question from the UEQ-based UX survey. Adapted from the UEQ [5].

From the larger sample of participants, a random sample of 10 people will be invited for a semi-structured interview. The questions used in the interview are prewritten and modified as needed. An example question is:

- I see you answered "2" here, meaning it's more annoying than enjoyable. Could you describe a specific moment during which the app felt annoying to you? What were you trying to do, and how did the app make it more difficult for you?

With the results of the survey and interviews, issues and problem areas for future improvement of the app could be identified.

6.2.2 Emotional Connection to Cowlivia

Since emotional experience is nuanced and difficult to quantify, we will take a qualitative approach to evaluate users' emotional connection to Cowlivia. From the larger sample of participants, we will invite a random sample of 10 people for a semi-structured in-person interview, excluding interviewees from the UX interviews.

To start, participants are given a printout of the UX Curve [26] and the Geneva Emotion Wheel [21] to fill out. The UX Curve is a tool for mapping the progression of the experience with a design over time. The Geneva Emotion Wheel is a tool for evaluating emotional reactions to a design. The interview questions are prewritten and modified as needed. Example questions are:

- I see there is a sharp decline in your experience with Cowlivia here. What happened there? Were there specific messages that made you feel this way?
- You filled out four of the five dots for "Amusement". What did you find so amusing about Cowlivia? Were there specific messages you found amusing?

The results of the interviews could be used to further develop the Cowlivia character.

7 PROTOTYPE AND EMPIRICAL EVALUATION

A key aspect of Cowlivia is the messages exchanged with the user. To further develop Cowlivia into the fully functional intervention needed for section 6, it is necessary to evaluate what types of messages are effective.

To simulate Cowlivia's chatbot functionality, we use a text-message app (WhatsApp Messenger) to let a participant text "Cowlivia". Cowlivia will be enacted by us, which enables the participant to experience Cowlivia through the Wizard of Oz method.

10 participants will be invited to this evaluation. We will respond to the participants' messages as Cowlivia in different predetermined ways, based on the participants' way of responding. These include praising phrases, frequency of messaging, and trays of words for disapproval.

After chatting with Cowlivia for 15 – 30 minutes, we will invite the participants to have an interview about their experience of interacting with Cowlivia. The focus will be their intention and emotional change during their interaction with "Cowlivia" and which messages they experienced as effective.

Furthermore, the usability and readability of the user interface also require feedback which would be valuable for us to iterate the design of the App. This could be achieved by creating a mock-up (e.g., Figma) and using the Thinking aloud method while a participant navigates the app.

8 DISCUSSION

The first point of discussion concerns the selected target audience for the intervention. This subsection of shoppers, defined by specific aspects like being planners and inconsistent vegetarians, limits the reach of the behaviour change and consequently impacts. This concern might be answered by further researching potential audiences for our intervention, analysing additional target groups [18], and modifying the app accordingly.

An issue relating to the evaluation of our intervention is the lack of information on whether the speculated impact on determinants creates the intended behaviour change and impact. This could be tackled with an evaluation plan which ties behavioural performance to data gathered relating to the impact on the participants' consumption. We could construct a prolonged study, measuring the effects of our intervention on meat consumption for a period, comparing this data to a steady state and a period after the intervention. However, tracking behaviour and impact concurrently might affect results, meaning this test should be carefully constructed.

Relating to the relevance of our intervention and background research on the behaviour in question, it would be important to further analyse the problem space with additional literature and user surveys before the development of the intervention. Related literature might suggest that removing meat from one's diet sees more difficulties and consequences than originally considered for the scope of this project [22, 8, 29]. Additionally, analysis of related interventions and frameworks could better influence design decisions, as relevant research exists into interventions tackling meat consumption and a transition into vegetarianism [30, 15, 24].

9 INDIVIDUAL CONTRIBUTIONS

Section 1 - "Introduction" was written by Amna.
Section 2 - "Design Process and Concept Description" was written by Tale and Xingjian. Tale wrote the subsection "Design Process", while Xingjian wrote the subsection "Concept Description" and made the visualizations.
Section 3 - "Implementation Design Rationale" was written by Tale.
Section 4 - "Theoretical Rationalisation for Design Concept" was written by Els.
Section 5 - "Ethics Analysis of Design Concept" was done and written by Luna.
Section 6 - "Evaluation Plan" was created and written by Amna and Els. Amna wrote the subsection "Intervention Level", while Els wrote the subsection "Interaction Level".
Section 7 - "Prototype and empirical evaluation" was written by Xingjian and Luna.
Section 8 - "Discussion" was written by Tale.
The main proofreaders for the report were Els, Luna, Amna and Tale. Luna formatted the final version of the report according to the ACM style. The whole team was involved in the design process.

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