Connecting Feminist STS and Human-Centred Design – a Pathway to Practical Implementation for Practitioners

Charlotte Reinhardt, Nicola Fricke

University of Wuppertal, Germany

Abstract. Since the 1980s, feminist researchers undertook great efforts to integrate gender considerations into Human-Computer Interaction (HCI) design processes (Ratzer *et al.*, 2021). Despite the significant scholarly contributions made in this area, there remains a notable scarcity of publications that provide concrete, actionable guidance for practitioners. Much of the existing literature tends to focus on broad frameworks or abstract recommendations regarding research attitudes, rather than offering specific guidelines that can be readily applied in practice (Søndergaard, 2018; Chivukula and Gray, 2020; Dankwa and Draude, 2021).

In a recent research, Reinhardt (currently in revision) undertook a comparative analysis of several guidelines that address the integration of gender dimensions into HCI design processes. Through this analysis, we identified four recurring motifs that emerged across the guidelines: 1) a normative design attitude, 2) the body, 3) social constitution and environmental design, and 4) action and interaction. Each of these motifs in turn encompasses several facets that allow for a more differentiated understanding of the implication and ways of application of a truly gender sensitive design.

The primary aim of our long term research is to translate these identified motifs into actionable strategies for practitioners. We assert that the effective application of said motifs within a design process necessitates a participatory approach, engaging diverse stakeholders in the design journey. To facilitate this, in this contribution, we propose a series of reflexive questions tailored to each facet of the identified motifs. These questions are strategically aligned with the four activities outlined in the ISO guideline on human-centred design (HCD) ISO 9241-210. As an intermediate step the reflexive questions serve as the basis for the further development of a practitioner's guideline.

1 Introduction

When designing a technological artefact (TA), designers must consider the characteristics of the target group they are designing for. Past research has shown that the majority of designers tend to develop for a masculine norm, resulting in varying levels of accessibility to TAs for individuals of different genders (Oudshoorn, Rommes and Stienstra, 2004; Rommes, 2014; Offenwanger *et al.*, 2021). In response, several frameworks for gender-inclusive design have been published. Many of these emphasize the participatory aspects of gender-sensitive design, but they do not provide clear guidance on how to include participation in the design process. (Bath, 2009; Rizvi *et al.*, 2022; Stilke and Buchmüller, 2022).

In this article, we present reflexive questions which we will further develop into concrete guidelines for integrating gender sensitive design aspects into an HCD process, as outlined in the ISO standard 9241-210.

To achieve this, we first summarize four recurring motifs in gender-inclusive design identified in a previous study. These motifs are: 1) a normative design attitude, 2) the body, 3) social constitution and environmental design, and 4) action and interaction. We formulate reflexive questions that allow designers to explore different facets of each motif during the design practice.

Next, we provide a brief overview of the HCD design process as described by the ISO standard 9241-210. This standard outlines six design principles and four activities that constitute an iterative design process. We analyse each activity to formulate precise subtasks, thereby providing a more detailed understanding of the design process. Subsequently, we apply the reflexive questions identified earlier to each subtask, offering a first concretisation for integrating the category of sex/gender into an HCD process.

Finally, we will discuss the limitations of this study and provide an outlook on future developments.

2 Recurring motifs in gender inclusive design

Works that focus on the implication of the gender dimension into a Human-Computer Interaction (HCI) design process can be categorized into either gender aware or gender inclusive design approaches (Breslin and Wadhwa, 2018). Being gender aware means that an approach puts its focus on the questions 1) how gender norms, values and behaviour affects the production, use and operation of TAs and 2) how – as a consequence – they are ingrained in those TAs (Breslin and Wadhwa, 2018). Gender inclusive on the other hand are those approaches that do not only seek to find out on the

impact gender has on TAs but also try to change the design accordingly. Gender inclusion '[...] actively seeks to include multiple and intersectional genders, and perhaps even future unknown users and characteristics' (Breslin & Wadhwa, 2018, p. 73). According to the authors within those gender inclusive approaches, two groups can be distinguished: so-called *feminist approaches* and *queer approaches*. Feminist approaches are characterised by activism whereas queer approaches try to overcome the rigidness, that often comes with feminist approaches and try to remain open to actual and potential future users and their usage requirements (Breslin and Wadhwa, 2018).

Vorvoreanu et al. (2019) state that works, that try to contribute to the question how the gender dimension can be implemented into an HCI context, either result in 'demonstration software projects' or in 'methods and practices' (Vorvoreanu *et al.*, 2019, p. 2).

Joining these two classifications this means, that works, that try to implement the sex/gender dimension into the HCI context are either gender aware or gender inclusive. Gender inclusive approaches can be differentiated into either feminist or queer approaches. Each of the three approaches either creates methods and practices or demonstration software.

When designers decide to include the gender dimension into their design, there are a few aspects they need to consider.

Up until today the research on ways to implement the gender dimension into an HCI design process remains rather sparse. As a basis for this article, in 2024 Reinhardt conducted a systematic comparison of three publications that gave direct recommendations on how to implement the gender dimension into an HCI design process. The aim of the systematic comparison was generating a deeper understanding what the term 'gender dimension' means in this context and how it can be operationalised when being 'implemented' into an HCI design process[1].

When it comes to a clear definition of the concept of sex/gender, the vast majority of the studies trying to give recommendations on »gender aware« or »gender inclusive« design, contents with the generally accepted definition of gender as a socially constructed category (Bardzell, 2010; Pollitzer, 2021; Szlavi and Guedes, 2023). Being created as a *critical concept*, the definition of gender as a social category does not offer any answers to the question on how it can be implemented for a productive use.

To obtain a more in depths understanding of the category gender, Reinhardt conducted a hermeneutical analysis (Betti, 1967; Danner, 2006) on publications that give said recommendations to find out, which implications were at work, when gender had been defined as a socially constructed category. Through repeated and comparing lecture of

---

[1] This comparison is currently in revision.

the three articles, recurring motifs could be extracted. It could be shown, that all works 1) were normatively directed, 2) reflect on the body, 3) reflect on the constitution of the social and the design of the environment and 4) stated the conceptualisation of action and interaction as a central aspect when it comes to the gender dimension in an HCI design process. Each of these motifs fell into several facets, since the articles had enlightened different aspects.

The overarching goal of our research is to offer HCI designers practical guidance on how to include gender in their design processes. As an intermediate step towards achieving this goal, we formulated reflexive questions, that should help designers to derive concrete actions from the motifs for their design process to allow gender sensitive design. Each question corresponds one of the facets described in one of the three articles, that form the basis for Reinhardt's analysis and were clustered in the four motifs.

This contribution is a conceptual work, to link the findings from the feminist science and technology studies to the concept of human centred design. In the next step we will further revise and integrate the reflexive questions together with practitioners for deriving specific guidelines.

The reflexive questions which are mapped to the four motifs are:

A Normative Standpoint

Demand to reflect on the meaning and limitations of one's own standpoint

- What are my convictions? (theoretically and personally?)
- What do I reject? (theoretically and personally?)
- While designing my TA, what do I claim to design and why?

Demand for humility before the user

- Which users or which characteristics of these users do I assume?
- Which characteristics do I subsequently leave out?
- Which physiological concepts do I base my work on?
- Which do I leave out?
- What changes could I make to include a previously excluded group, if that is my aspiration?

Demand to enable to design the environment of a TA

- What influence does the TA have on the environment and is this desirable or not?
- How can people be included into the design process of the design of the environment?

The Body

The body as the subject

- How do I think about the body as a sensing entity?
- What aspects of sensing do I consider in my design?
- What importance do I give to the materiality of my TA?
- Which materials do I choose and why?
- What consequences does this choice of material have for the direct and indirect environment of the TA?
- How does the TA affect the body using it?

The body as the object

- What fundamental image of the human being and the body do I take as the basis for framing the body as the object of a TA?
- What effects does this have on a society?
- Are these effects desirable?

The constitution of the social and the shaping of the environment

The effect on people who use the TA

- What effect do the assumptions I made for this TA have on people and their social environment and is this desirable?
- What roles might be (re)produced by using the TA?

The effect on people who do not use the TA

- In which situations could the TA be used, that has an impact on other people and what does this impact look like and is this desirable?
- What impact does the ecological environment have and is this desirable?

Action and Interaction

Interaction

- In my conception of interaction: who does interact?
- How do I understand interaction between humans and TAs?
- What role does interaction play in my understanding of how society is organized?
- In my opinion, what is the relation between society and interaction?
- What effect does interaction have on the individual?

Action

- Who is acting? (consider human-human and/or human-computer interaction and/or multiple agents' interactions)
- Which aspects of the human being do I consider relevant for action (cognitive processes, body, emotions, etc.)?

These questions were created to enable designers to approach the design of an HCI TA in a gender sensitive way. To ease their use, we suggest to merge them with already existing concepts such as Human-Centred Design.

3 Human-centred design

3.1 What is human-centred design?

The term HCD can be described by numerous definitions, one such definition explains it as 'The process that ensures that the designs match the needs and capabilities of the people for whom they are intended' (Norman, 2013, p. 9). Another one focuses on 'values, concerns, and perceptions of all stakeholders in designing, developing, deploying, and employing products, services, and policies' (Rouse, 2023, p. 4). Based on the ISO 9241-210, the term means designing interactive systems which are user-friendly through using knowledge and techniques from ergonomics and usability research (ISO, 2019). One could shorten the concept to 'honor thy user' (Lee *et al.*, 2017, p. 22) through taking them into account through every step of the design process (Lee *et al.*, 2017).

The term HCD is similar to the term user-centred design (UCD) and often used as a synonym (Billings, 2009) as they both emphasize the human in the centre of research activities. While UCD may include specific methods, such as use-cases in order to derive user-requirements or modelling user-interactions, HCD focusses on understanding user- and other stakeholder-needs (Gasson, 2003). HCD can be understood as a broader concept, maybe even containing UCD. HCD focusses on two aspects: 1) addressing the right problem, and 2) meeting human needs and capabilities (Norman, 2013). One has to keep in mind that the HCD concept developed historically as a counterpart to technology-centred systems design in the tradition of Taylorism (Gill, 1996). Therefore, HCD and UCD both play the same counterpart to technology-centred engineering perspectives.

Norman (2013) specifies four activities as belonging to the HCD process: 1) observation, 2) idea generation, 3) prototyping, 4) testing (Norman, 2013). In his conceptualization, the four phases are organized in spirals with iterative loops in between the phases aiming at an optimization of the created solutions between the iterative loops (Norman, 2013).

The basic ideas of the HCD concept and process formulated by Norman and others have further been formalized within the ISO standard (2019) which we will present followingly.

3.2 The standard 9241-210

The ISO standard 9241-210 (ISO, 2019, p. 6) includes six fundamental principles of HCD:

1) 'the design is based upon an explicit understanding of users, tasks and environments […];
2) the users are involved throughout design and development […];
3) the design is driven and refined by user-centred evaluation […];
4) the process is iterative […];
5) the design addresses the whole user experience […];
6) the design team includes multidisciplinary skills and perspectives […].'

Alongside these principles, HCD has to be integrated and planned through all phases of the product-development lifecycle (ISO, 2019). The following four design-activities are specified in the ISO (2019, p. 10) standard:

1) 'understanding and specifying the context of use […];
2) specifying the user requirements […];
3) producing design solutions […];
4) evaluating the design […].'

Since the fourth principle calls for an iterative process, the HCD process can be visualised as the following:
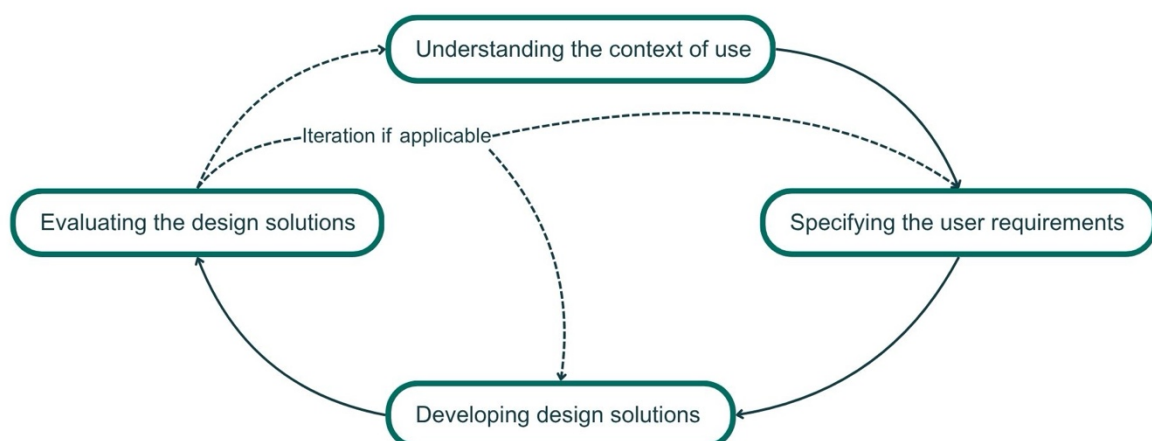

Figure 1.: A simplified visualisation of the HCD process based on the visualisation in: (ISO, 2019).

4 Gendered Design meets Human-Centred Design

4.1 The four activities of human-centred design and their implications

Comparing the findings on gender-sensitive design with the six principles as well as the four activities of HCD, we find structural resemblances.

The motif *A normative standpoint* includes the demand for humility before the user. This humility can be found underlying the principle that demands a fundamental understanding of the user, the task and the context, since the truthful aim to understand somebody is grounded in an openness towards the Other; or as Lee et al. (2017, p. 22) put it, one must 'honor thy user'.

The principle *asking for the user's involvement* resembles heavily the demand to reflect one's own standpoint; as does the principle *asking for design refinement based on user-centred evaluation*. The reflection of one's standpoint is furthermore present in the fifth principle, that demands to involve overall user experience as much as in the sixth principle, that demands to unite interdisciplinary competencies and aspects within the team. Therefore, this first motif works as an addition to the six principles of HCD.

The other four motifs on the other side, rather work as elements, that need to be considered during the four activities of human centred design.

We now would like to integrate the above introduced reflexive questions into the four steps of human centred design. This integration is going to be validated by an expert rating in a future study. In order to do this, it is necessary to generate a deeper understanding of what each activity looks like. We would therefore like to have a closer look on each activity.

Each activity comprehends several subtasks. These subtasks were extracted from the ISO standard. However, they are not identical to the elements formulated in the standard, as they do not only describe subtasks, but also provide general information and therefore operate at different levels. One exception is the activity *evaluation*: The ISO does not foresee subtasks but only provides a differentiation between an inspection-based evaluation and an evaluation with the help of the user. The subtasks were therefore derived analytically.

The first activity according to the ISO standard is to understand and to specify the context of use. Regarding the first principle, this activity asks for nothing less than 'an explicit understanding of users, tasks and environments' (ISO, 2019, p. 6). Hence, analytically the activity *understanding and specifying the context of use* falls into four sub tasks (ISO, 2019):

1.1 a description of users and other stakeholders;
1.2 identification of key characteristics of users or groups of users;
1.3 identification of the user's goals as well as the system's goals;
1.4 identification of the environment of use.

The second activity is to specify user requirements. This activity again falls into four subtasks:

2.1 identify users' and other stakeholders' requirements;
2.2 identify requirements that derive from different aspects (e.g. user context, ergonomics, usability etc.);
2.3 eliminate conflicts between user requirements;
2.4 ensuring the quality of user requirements' specifications.

During the third activity, design solutions are being developed. This falls into five sub tasks:

3.1 designing the task as well as the interaction between the user and the system;
3.2 designing the user interface;
3.3 concretizing design solutions;
3.4 changing the design solutions based on user-centred evaluation and feedback;
3.5 communicating the design solution to the unit responsible for the implementation.

Lastly a user-centred evaluation has to be carried out.

In a gender sensitive design process, analytically this activity needs to happen on different levels, for every aspect of the design process needs to be evaluated to prevent any blind spots:

4.1 Critical investigation of the standard evaluation process;

4.2 Evaluating the design process through a gender sensitive lens;

4.3 Evaluating design solutions.

The critical investigation of the standard evaluation process means, that the evaluation process itself is being looked on.

The standard does not foresee different subtasks, but it provides two different methods on how a user-centred evaluation can take place (ISO, 2019):

A. evaluation with the help of the user and/or
B. inspection-based evaluation.

An evaluation with the help of the user consists of constant involvement of the user in different forms, while an inspection-based evaluation can be conducted with a set of experts and checklists.

Since an inspection-based evaluation that works with checklists implies the existence of checklists, either their development or the choice of existing guidelines can be considered one of the relevant subtasks. The selection of the evaluating experts can be considered a second step within this evaluation method.

On the second level of evaluation, the evaluation offers the opportunity to critically interrogate whether or not the assumptions made during the design process meet the ethical expectations, the designers try to meet. For the evaluation process it is therefore helpful to display all of the assumptions made implicitly or explicitly during the preceding design process. After laying them open, a critical analysis, whether there is room for improvement can take place. It is only then, that design solutions can be evaluated on their own. This step is not specifically gender sensitive; it primarily assesses whether the previously defined design requirements have been fulfilled.

The critical investigation of the standard evaluation process falls into one/two subtasks (depending on the method used):

> 4.1.A Critical analysis of the user-based evaluation (evaluation with the help of the user);

> 4.1.B.1 Critical analysis of the selection of experts used in the evaluation process (inspection-based evaluation);

> 4.1.B.2 Critical analysis of the checklists handed out for evaluation (inspection-based evaluation).

The evaluation of the design process through a gender sensitive lens happens through two subtasks:

> 4.2.1 Disclosure on the explicit and implicit assumptions during the design process;

> 4.2.2 Critical analysis of the design process through a gender sensitive lens.

The evaluation of the design solutions happens as a result of the preceding evaluation and is an activity on its own.

This way we could identify 18 individual tasks, that we can look at from a gender sensitive perspective.
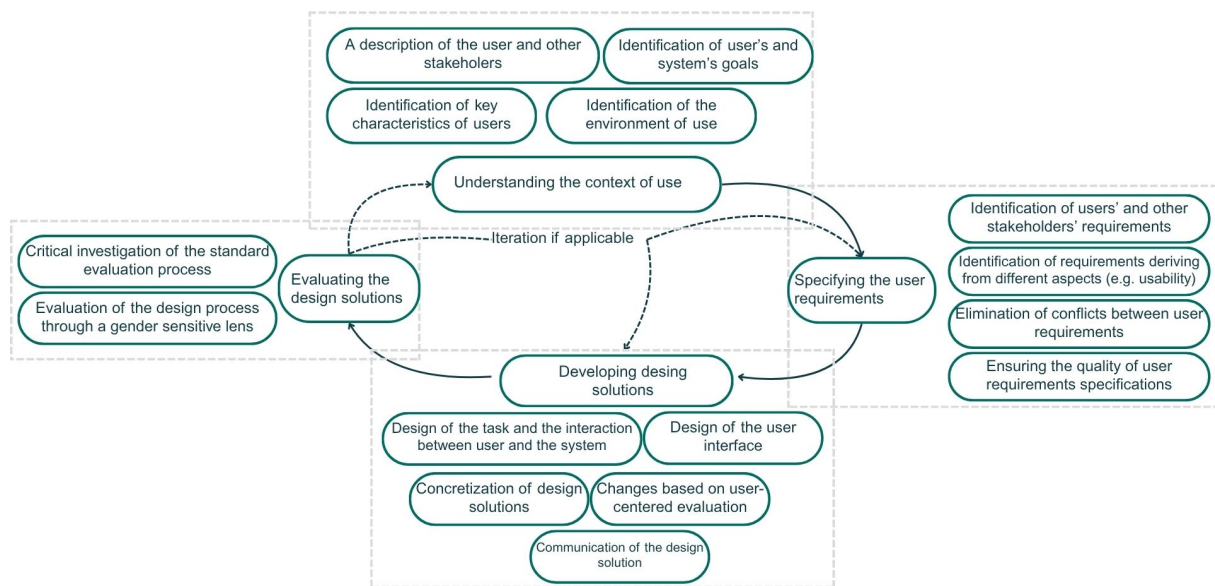
Figure 2.: Illustration of the simplified HCD process including the defined subtasks

4.2 Linking the four activities with the reflexive questions

We are now going through each of the above presented activities and link it to the afore mentioned reflexive questions. To better fit the activities the formulation of the questions has been modified. The reflexive questions can be divided into four different groups of questions: Questions, that invite designers to…

1) reflect on their values and beliefs in a fundamental way;
2) reflect on specific aspects, within a certain subtask;
3) reflect on the ethical implications of their design;
4) critically reevaluate their decisions within a certain subtask.

The reflexive questions were organised according to the four groups, resulting in an order that differs from the sorting introduced above. At this point, it is also relevant to note that not all activities can currently be linked to reflexive questions. Some of the reflexive questions will repeat themselves, however, they are always related to a different object. Lastly, it is necessary to state that the activity *Concretizing design solutions* is identical with the two activities *Designing the user interface* and *Designing the task as well as the interaction between the user and the system.* In order to avoid repetition as far as possible, the questions were not included again.

Understanding the context of use

1. A description of the user and other stakeholders
    a. How do I think about the body as a sensing entity?
    b. Which aspects of the human being do I consider relevant for action (cognitive processes, body, emotions, etc.)?
    c. Which users or which characteristics of these users do I assume? And which do I leave out?
    d. Which body concepts do I base my work on? And which do I leave out?
    e. What aspects of sensing do I consider in my design?
2. Identification of key characteristics of users or groups of users
    a. While designing my TA, what do I claim to design and why?
    b. Why do I consider this specific set of characteristics as key for my design?
    c. What changes could I make to include a previously excluded group, if that is my aspiration?
3. Identification of the user's goal as well as the system's goals
    a. While designing my TA, what do I claim to design and why?
    b. In which situations could the TA be used, that has an impact on other people and what does this impact look like?
    c. What influence does the TA have on the environment and is this desirable?
4. Identification of the environment of use
    a. Which parts of the users' lives do I consider, when thinking about the context of use?
    b. Which physical situations do I consider when thinking about the context of use? (e.g. disabled bodies, pregnancy)
    c. In which situations could the TA be used, that has an impact on other people and what does this impact look like and is this desirable?
    d. What influence does the TA have on the environment? And is this desirable?
    e. Do the aspects, I consider relevant for action, still play the same role in the context of use (e.g. emotional or physical changes)?

Specifying the user requirements

1. Identify users' and other stakeholders' requirements
    a. What is the ideological basis on which I determine the user requirements?
    b. Which users do I assume?
    c. How does the TA affect the body using it?
    d. In which situations, that have an impact on other people, could the TA be used and what does this impact look like?
    e. How can people be included in the design process?
    f. What aspects do I consider in my design and are they pointed out in my participatory design?

    g. What importance do I give to the materiality of my TA and is this pointed out in my participatory design?

2. Identify requirements that derive from different aspects
3. Eliminate conflicts between user requirements
    a. In whose favour will the conflict be resolved?
4. Ensuring the quality of user requirement specifications

Developing Design Solutions

1. Designing the task as well as the interaction between the user and the system
    a. How do I understand interaction between humans and TAs?
    b. What role does interaction play in my understanding of how society is organized?
    c. In my opinion, what is the relation between society and interaction?
    d. In my conception of interaction: who does interact?
    e. What effect does interaction have on the individual?
    f. In an HCI situation, who is acting?
    g. What fundamental image of the human being and the body do I take as the basis for framing the body as the object of a TA?
    h. Which aspects of the human being do I consider relevant for action? (cognitive processes, body, emotions, etc.?)
    i. How do I think about the body as a sensing entity?
    j. While designing my TA, what do I claim to design and why?
    k. Which users or which characteristics of these users do I assume? Who or what do I subsequently leave out?
    l. Which body concepts do I base my work on? Which do I subsequently leave out?
    m. What aspects of sensing do I consider in my design?
    n. How does the TA affect the body using it?
    o. How can people be included into designing the environment?
    p. What effects does this have on society and are these effects desirable?
    q. What effect do the assumptions I made for this TA have on people and their social environment and is this desirable?
    r. What roles might be (re)produced by using the TA?
    s. In which situations could the TA be used, that has an impact on other people, what does this impact look like and is it desirable?
    t. What changes could I make to include a previously excluded group, if that is my aspiration?
2. Designing the user interface
    a. How do I think about the body as a sensing entity?
    b. Which aspects of the human being do I consider relevant for action (cognitive processes, body, emotions)?

     c. What aspects of sensing do I consider in my design?

     d. What importance do I give to the materiality of my TA?

     e. Which materials do I choose and why?

     f. What consequences does this choice of material have for the direct and indirect environment of the TA and is this desirable?

     g. How does the TA affect the body using it and is this desirable?

3. Concretizing design solutions[2]
4. Change the design solutions based on user-centred evaluation and feedback
5. Communicate the design solution to the unit that is responsible for the implementation

For the evaluation process it is helpful to display all of the assumptions made implicitly or explicitly during the preceding design process. After laying them open, a critical analysis, whether there is room for improvement can take place.

Critical analysis of the user-based evaluation process

1. Critical analysis of the user-based evaluation
     a. Which body concepts do I base my work on and which ones do I leave out?
     b. Who do I use as evaluator and on what basis was the sample drawn?
     c. How can people be included into the evaluation process?
     d. What changes could I make to include a previously excluded group, if that is my aspiration?

2. Critical analysis of the selection of experts used in the evaluation process (inspection-based evaluation)
     a. In my opinion, what defines an expert?
     b. Which characteristics do I consider relevant for someone to be an expert in this evaluation process?

3. Critical analysis of the checklists handed out for evaluation (inspection-based evaluation)
     a. What does my checklist evaluate?
     b. Who created the checklist?

Evaluating the design process through a gender sensitive lens

Basically, while the disclosure on the explicit and implicit assumptions during the design process displays the assumptions, the second step *evaluating the design process through a gender sensitive lens* asks for the consequences these assumptions have on the world.

---

[2] See: *Designing the task as well as the interaction between the user and the system* and *designing the user interface.*

1. Disclosure on the explicit and implicit assumptions during the design process
    a. What are my moral, ethical and scientific convictions and what do I reject?
    b. In my conception of interaction: who does interact?
    c. How do I understand interaction between humans and TAs?
    d. What role does interaction play in my understanding of how society is organized?
    e. While designing my TA, what do I claim to design and why?
    f. How do I think about the body as a sensing entity?
    g. What importance do I give to the materiality of my TA?
    h. What fundamental image of the human being and the body do I take as the basis for framing the body as the object of a TA?
    i. In my opinion, what is the relation between society and interaction?
    j. In my opinion, what effect does interaction have on the individual?
    k. Which aspects of the human being do I consider relevant for action (cognitive processes, body, emotions, etc.?)
    l. In a human-computer interaction, who is acting?
    m. Which users or which characteristics of the users do I assume and which do I subsequently leave out?
    n. Which materials do I choose and why?
2. Evaluating the design process through a gender sensitive lens
    a. How can people be included in the design process?
    b. What influence does the TA have on the environment and is this desirable or not?
    c. What consequence does the choice of material have for the direct and indirect environment of the TA and is this desirable?
    d. What effects does the TA have on the body using it and is this desirable?
    e. Are the effects my fundamental image of the human being and the body have on the society desirable or not?
    f. What consequences does my conception of aspects relevant for cognition have on the user and is this desirable?
    g. What effect do the assumptions I made for the TA have on people and their social environment and are they desirable?
    h. What roles might be (re)produced by using the TA and is this desirable?
    i. What impact does the usage of the TA have on other people and is this desirable?
    j. What impact does the TA have on the ecological environment and is this desirable?
    k. What effect does my conception of interaction have on the TA and hence on the society and is this desirable?
    l. What changes could I make to include a previously excluded group, if that is my aspiration?

3. Evaluating the design solutions
    a. What are my convictions (theoretically and personally) and what do I reject?
    b. While designing my TA, what do I claim to design and why?
    c. Which users or which characteristics of these users do I assume? And who or what do I leave out?
    d. What influence does the TA have on the environment? And is this desirable?
    e. What changes could I make to include a previously excluded group, if that is my aspiration?
    f. How can (more) people be included in the design process and is there a better way to do it?

When combining the reflexive questions with the four activities from the standard for HCD, we find, that the dynamic of the process shifts: the fourth activity of the standard had already been evaluation. And since one of the six principles of HCD foresees an iterative process, it can be stated, that evaluation happens several times within an HCD process. Now, that four types of reflexive questions could be identified, of which one once again calls for evaluation, a highly iterative process is created.
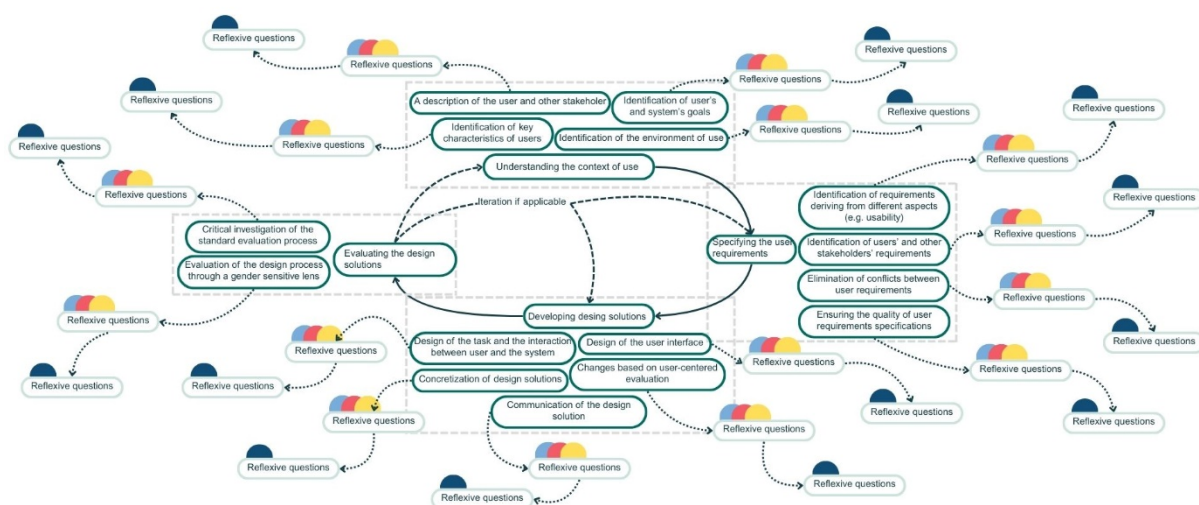

Figure 3.: Illustration of the simplified HCD process including the defined subtasks and the reflexive questions. The Types of questions 1 to 3 are indicated by the colours light blue, red and yellow. The fourth type of questions is indicated by the colour dark blue.

Summary and Outlook

In this article we took a closer look on how to implement the category sex/gender into an HCD process. We started out by describing four recurring motifs, that could be identified in existing frameworks on gender sensitive design and formulating reflexive questions, to elucidate on different facets within each motif. We then provided a short overview of an HCD design process as it is described in the ISO standard 9241-210, focusing on the four design activities, that we analysed to provide a more detailed insight on what each activity includes. We then matched the reflexive questions with the sub tasks to create a first integration of the category sex/gender with an HCD process.

One limitation of this article lies within its sparse literature basis. To further substantiate the data basis, currently we conduct interviews with experts. On this basis we will reevaluate the presented preliminary draft and conduct an expert rating.

This will be further enriched, with general findings from the feminist critique (e.g. on language, power distribution and the link of society and capitalistic structures) as well as findings from adjacent fields, such as feminist architecture, feminist game design, or inclusive HCI design.

Moreover, we will validate the reflexive questions by conducting further expert-interviews and hands-on prototypical usage of the created integration of the questions into the HDC process. In an iterative process the relevant reflexive questions will be modified and adapted to meet developers' needs and for their applicable usage. The outcome will be a shortened list including fewer reflexive questions integrated in the HCD process resembling a guideline for practitioners in order to be more usable in the development process.

References

Bardzell, S. (2010) 'Feminist HCI: taking stock and outlining an agenda for design,' in Mynatt, E. D., Hudson, S. E., and Fitzpatrick, G., *CHI 2010: we are HCI : conference proceedings, Atlanta, Ga, USA, April 10-15, 2010*. New York, N.Y.: Association for Computing Machinery, pp. 1301–1310.

Bath, C. (2009) *De-Gendering Informatischer Artefakte: Grundlagen einer kritisch-feministischen Technikgestaltung*. Universität Bremen. Available at: https://media.suub.uni-bremen.de/bitstream/elib/360/1/00102741-1.pdf (Accessed: January 22, 2024).

Betti, E. (1967) *Allgemeine Auslegungslehre als Methodik der Geisteswissenschaften*. Tübingen: Mohr. Available at: https://digitale-objekte.hbz-nrw.de/storage2/2024/01/06/file_3/9484273.pdf.

Billings, C.E. (2009) *Aviation automation: the search for a human-centered approach*. Boca Raton, Fla: CRC Pr (Human factors in transportation).

Breslin, S. and Wadhwa, B. (2018) 'Gender and Human-Computer Interaction,' in K.L. Norman and J. Kirakowski (eds.) *The Wiley Handbook of Human Computer Interaction*. 1st ed. Wiley, pp. 71–87. Available at: https://doi.org/10.1002/9781118976005.ch4.

Chivukula, S.S. and Gray, C.M. (2020) 'Bardzell's 'Feminist HCI' Legacy: Analyzing Citational Patterns,' in *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. *CHI '20: CHI Conference on Human Factors in Computing Systems*, Honolulu HI USA: ACM, pp. 1–8. Available at: https://doi.org/10.1145/3334480.3382936.

Dankwa, N.K. and Draude, C. (2021) 'Setting Diversity at the Core of HCI,' in M. Antona and C. Stephanidis (eds.) *Universal Access in Human-Computer Interaction. Design Methods and User Experience*. Cham: Springer International Publishing (Lecture Notes in Computer Science), pp. 39–52. Available at: https://doi.org/10.1007/978-3-030-78092-0_3.

Danner, H. (2006) *Methoden geisteswissenschaftlicher Pädagogik: Einführung in Hermeneutik, Phänomenologie und Dialektik*. 5., überarbeitete und erweiterte Auflage. München Basel: Ernst Reinhardt Verlag (UTB Geisteswissenschaften, 947). Available at: https://doi.org/10.36198/9783838509471.

Gasson, S. (2003) 'Human-Centered vs. User-Centered Approaches to Information System Design,' *Journal of Information Technology Theory and Application*, 5(2), pp. 29–46.

Gill, K.S. (ed.) (1996) *Human Machine Symbiosis*. London: Springer London. Available at: https://doi.org/10.1007/978-1-4471-3247-9.

ISO (ed.) (2019) 'ISO 9241-210 Ergonomics of human-system interaction – Part 210: Human-centred design for interactive systems.' ISO.

Lee, J.D. *et al.* (2017) *Designing for people: an introduction to human factors engineering*. 3rd edition, revision 1. Charleston, SC: CreateSpace.

Norman, D.A. (2013) *The design of everyday things*. Überarbeitete und erweiterte Auflage. New York, New York: Basic Books.

Offenwanger, A. *et al.* (2021) 'Diagnosing Bias in the Gender Representation of HCI Research Participants: How it Happens and Where We Are,' in *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. CHI '21: CHI Conference on Human Factors in Computing Systems, Yokohama Japan: ACM, pp. 1–18. Available at: https://doi.org/10.1145/3411764.3445383.

Oudshoorn, N., Rommes, E. and Stienstra, M. (2004) 'Configuring the User as Everybody: Gender and Design Cultures in Information and Communication Technologies,' *Science, Technology, & Human Values*, 29(1), pp. 30–63. Available at: https://doi.org/10.1177/0162243903259190.

Pollitzer, E. (2021) 'Why gender is relevant to materials science and engineering,' *MRS Communications*, 11(5), pp. 656–661. Available at: https://doi.org/10.1557/s43579-021-00093-1.

Ratzer, B. *et al.* (2021) *Enhanced Gender Knowledge and New Content. EECCO. Gender Equality in Engineering through Communication and Commitment*. Projektbericht. Wien: Technische Universität Wien, p. 137. Available at: https://www.tuwien.at/fileadmin/Assets/dienstleister/abteilung_genderkompetenz/gender_in_der_Forschung/GEECCO_Results/Public_deliverables/GEECCO_D6.3_Enhanced_Gender_Knowledge_and_New_Content.pdf (Accessed: May 26, 2025).

Rizvi, N. *et al.* (2022) 'QTBIPOC PD: Exploring the Intersections of Race, Gender, and Sexual Orientation in Participatory Design,' in *CHI Conference on Human Factors in Computing Systems Extended Abstracts*. CHI '22: CHI Conference on Human Factors in Computing Systems, New Orleans LA USA: ACM, pp. 1–4. Available at: https://doi.org/10.1145/3491101.3503733.

Rommes, E. (2014) 'Feminist Interventions in the Design Process,' in W. Ernst and I. Horwath (eds.) *Gender in science and technology: interdisciplinary approaches*. Bielefeld: Transcript Verlag (Gender studies), pp. 41–55.

Rouse, W.B. (2023) *From Human-Centered Design to Human-Centered Society: Creatively Balancing Business Innovation and Societal Exploitation*. 1st ed. New York: Productivity Press. Available at: https://doi.org/10.4324/9781003462361.

Søndergaard, M.L.J. (2018) *Staying with the Trouble through Design: Critical-feminist Design of Intimate Technology*. Ph.D. Aarhus University. Available at: https://doi.org/10.7146/aul.289.203.

Stilke, J. and Buchmüller, S. (2022) 'Users and non-users in engineering and feminist participatory research on sustainable aviation,' *NOvation - Critical Studies of Innovation*, (3), p. 110. Available at: https://doi.org/10.5380/nocsi.v0i3.91148.

Szlavi, A. and Guedes, L.S. (2023) 'Gender Inclusive Design in Technology: Case Studies and Guidelines,' in A. Marcus, E. Rosenzweig, and M.M. Soares (eds.) *Design, User Experience, and Usability*. Cham: Springer Nature Switzerland (Lecture Notes in Computer Science), pp. 343–354. Available at: https://doi.org/10.1007/978-3-031-35699-5_25.

Vorvoreanu, M. *et al.* (2019) 'From Gender Biases to Gender-Inclusive Design: An Empirical Investigation,' in *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. CHI '19: CHI Conference on Human Factors in Computing Systems, Glasgow Scotland Uk: ACM, pp. 1–14. Available at: https://doi.org/10.1145/3290605.3300283.