Stakeholder Inclusion and Value Diversity: An Evaluation Using an Access Control System

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Appendix A. Evaluation Questions.

In the following, we represent the questions asked during the first and second focus group sessions in Sections 1 and 2, respectively.

1 Initial Evaluation Questions

In this section, we present the list of the first focus group's questions. The session was divided into two parts: $Part1$ and $Part2$. $Part1$ encompasses questions aligned with the research questions (RQs), while $Part2$ comprises questions pertaining to the ethics-driven instruments.

- **Part 1**
  - *RQ1*
    - *Q1:* What words come to mind when you think about stakeholders (*i.e.,* individuals, groups, or organisations) in the context of an Access Control System (ACS)?
    - *Q2:* Who were the stakeholders that you considered in the system design?
    - *Q3:* How did you identify the stakeholders when designing the system?
    - *Q4:* Did you identify the stakeholders' ethical concerns? What were they?
  - *RQ2*
    - *Q1:* Given the ethical concerns raised, did you identify the affected values in the system design? What were they?
    - *Q2:* What kind of methods or guidance did you use to identify these values?
    - *Q3:* Did you encounter any difficulty or challenge when identifying values? What were they?

* *Q4:* Did you find any relation(s) among the ethical values? What were they?
* *Q5:* What was your solution(s) to identify these value relations?

- *RQ3*
  * *Q1:* When making design decisions, did you consider the stakeholders' ethical concerns and values? If so, how?
  * *Q2:* Did you make any decision(s) to balance ethical values? If so, how?

– **Part 2**
  - *Questions related to the ethics-driven instruments*
    * *Q1:* What do you think about considering the system's benefits and harms to individuals and society when identifying the stakeholders?
    * *Q2:* What individuals, groups, or organisations was the system built for, that was supposed to use it?
    * *Q3:* What individuals, groups, or organisations were involved in the design and development process of the system?
    * *Q4:* Are any individuals, groups, or organisations that do not relate to the system (*e.g.,* not using the system) but can be affected by it? Who are they?
    * *Q5:* By being in the system users' shoes, what do you think could be their ethical concerns in relation to the system?
    * *Q6:* By being in the system development organisation's shoes, what do you think could be their ethical concerns in relation to the system?
    * *Q7:* By being in the indirect stakeholders' shoes, what do you think could be their ethical concerns in relation to the system?
    * *Q8:* By putting yourself in the others' shoes, could you find any value(s) that needed to be supported in the system design, but had been ignored? What are they?
    * *Q9:* Could you discover any potential value conflict(s) relevant to the system? What are they?
    * *Q10:* Do you want to change any of your previously made decisions, or make any new ones to support ethical aspects?

2   Secondary Evaluation Questions

In this section, we present the list of the second focus group's questions that are based on the responses provided for RQ1 (specifically stakeholders' ethical concerns).

– *Q1:* What is your opinion regarding the potential ethical concerns that may arise from using the access control system at the gym?
– *Q2:* How important is it for you to have a secure access control system at the gym, without any potential data breaches or misuse?
– *Q3:* How do you think the access control system at the gym affects your freedom as a member?

- *Q4:* Do you think the access control system, which restricts access to gym members who do not renew their membership on time or make timely payments, could cause embarrassment and shame for those affected?
- *Q5:* What is your opinion on the disturbance that the access control system might cause to the gym's neighbors due to the noise it generates when people enter the gym (especially during nighttime)?
- *Q6:* What is your opinion about the impact of the access control system on the sense of togetherness, *e.g.,* when gym members' families are restricted from entering the gym to support their children's activities?
- *Q7:* What is your opinion on how the access control system affects the physical and emotional well-being of members, *e.g.,* when their families are not allowed to enter the gym to assist them during emergencies or retrieve forgotten items?
- *Q8:* What do you think about the access control system at the gym that sometimes appears to track attendance for classes? Does this make you feel judged or controlled?
- *Q9:* Do you think the access control system at the gym could potentially violate the cultural values of the members? If so, how?
- *Q10:* Does the fact that the access control system does not keep your sensitive information increase your trust in the system?
- *Q11:* What is your opinion on receiving notifications from the access control system when your gym membership or subscription is about to expire? Do you find it helpful in managing your gym attendance and supporting your autonomy as a member?
- *Q12:* Do you think the use of personal tags for entry and exit has improved the overall user experience and usability of the system? How has the system reduced the workload of employees and improved the efficiency of gym operations?
- *Q13:* Do you think there are any other ethical concerns that must be considered in relation to the access control system? If so, please explain.

Appendix B. Initial Evaluation Results.

In the following, we represent the findings derived from the first focus group session, including various aspects, such as potential stakeholders (Section 3), their ethical concerns (Section 4), value relations (Section 5), ethical design decisions (Section 6), as well as recommendations suggested by participants wrt ethical considerations (Section 7).

3   Potential Stakeholders

In this section, we represent the list of the stakeholders identified in the two parts of the session.

- **Part 1**

- *The business owner:* The person or group who is responsible for making decisions about the implementation and use of the access control system (ACS).
- *The building owner:* Individual or organization that owns the physical building where the gym is located.
- *The final users of the system:* Individuals who require access to specific areas of the gym, including gym members, staff members, and even guests visiting the gym for a specific purpose.
- *Software development stakeholders:* The individuals involved in the system design and implementation, including designers, developers, architects, IoT experts, and network designers.
- *Data maintainers:* Individuals who are responsible for ensuring the accuracy, completeness, and security of the data used by the system.
- *The electricians/the electrical team:* Individuals responsible for installing, maintaining, and repairing the electrical components of the ACS.

– **Part 2**
  - *Researchers:* Those who inspect the existing literature to gain insight into how ACSs should be designed.
  - *Domain experts/Policy designers:* Those who are specialists and have knowledge of the system's regulations, such as GDPR. They can be consulted to address queries such as "Are we performing tasks correctly?", "Is deleting the log sufficient?", or "Are we violating any legal requirements or law?".
  - *Families or relatives of the gym members/neighbors of the gym:* Those who can be indirectly affected by the access control system.
  - *Fire safety experts:* Those who possess knowledge and experience in fire safety, testing, and inspection, particularly in emergency situations.
  - *Different groups of system users:* The system may have diverse groups of users, including individuals and groups from different religions or cultures, transgender individuals, and other groups with unique characteristics.
  - *The entire society:* A group of individuals involved in constant social interaction sharing the same social territory and cultural expectations.
  - *The business competitors:* In the event of a company failing to uphold user values, such as through a violation or breach, they risk losing their customers to competing businesses that can capitalize on this loss and offer similar services.
  - *Third parties:* Those who are external to the company and are not directly involved in the business's core operations. They can offer valuable insights into integrating the system with other external systems, thereby enhancing its functionality.

4   Ethical Implications/Concerns

In this section, we represent the list of the ethical implications/concerns identified in the two parts of the session.

– **Part 1**
  - *Violating privacy:* During the COVID pandemic, the system barred gym entry to anyone with a temperature over 38°C, displaying a message on the screen. But, this could potentially reveal users' confidential health information. To prevent this, the system could show a false reason, like an expired subscription, instead of the real cause.
  - *Avoiding malicious activities:* The system can offer protection to users from potential harm caused by others by preventing unauthorized individuals to enter the gym.
  - *Avoiding identifiability:* Access control systems usually allow individuals to view information such as whether someone is inside a room or when they entered. However, this presents a privacy concern that needs to be addressed to prevent identity disclosure. In our system, only the administrator has access to users' entrance logs. Occasionally, family members of gym members may inquire about the presence of their spouse or children to monitor their activities, as they may claim to be at the gym while actually being elsewhere. With our system, users do not need to worry about such violations.
  - *Facilitating financial success:* Ensuring the safety and security of users is a crucial aspect of upholding ethical principles for any gym business. By demonstrating a commitment to this principle, the business can earn a favorable reputation among users and attract more subscriptions. When users feel that their ethical concerns and values are taken into consideration, they are more likely to choose the gym over others, which can result in increased revenue and profits for the business owner.
  - *Supporting mental well-being:* Mental well-being of gym members can be supported by establishing a calm and peaceful atmosphere in the gym, particularly in activities like yoga classes. When individuals enter the class and set up their mats during the final relaxation stage, it could disrupt the experience for others and trigger irritation and anxiety. To avoid such issues, limiting access to the class during a designated period before the activities begin is recommended. This approach helps promote a pleasant environment that enhances the overall mental well-being of all members.
  - *Supporting fairness:* Indoor cycling and gym bikes have varying levels of quality, with newer models being superior. However, some individuals tend to monopolize the best equipment, leaving others with bad options. To address this issue, the gym owner has suggested restricting access to equipments to only 10 minutes before classes begin. This ensures fair equipment usage for all users.
– **Part 2**
  - *Noise pollution:* The system can produce noise upon people entering the gym, which can be problematic, particularly at night, as it may cause disturbance to nearby residents.
  - *Controlling:* There may be instances where the gym owner or staff notices that a gym member has registered for a class but did not attend. This

situation can make him feel like he is being judged or controlled, even though no one is monitoring his every move. This perception can make him feel like he is not in full control of his choices and actions.

- *Security risks:* In the event of an emergency, individuals may become trapped inside or outside of the gym and feel helpless if the system does not allow them to take appropriate action.
- *Freedom restriction:* During a fire emergency at the gym, individuals may be needed to pass through rooms for which they do not have a subscription to reach the nearest security exit.
- *Violating physical and emotional well-being:* Restrictions at the gym may prevent family members from entering to provide assistance to a sick member during a lesson or retrieving a forgotten item, potentially causing undue stress and emotional problem.
- *Violating dignity:* Gym members who fail to renew their membership on time may feel a loss of dignity, as the system prompts them to make a payment and restricts access if they do not comply. This process draws attention to the fact that the payment was not made on time, potentially causing embarrassment and shame.
- *Threatening togetherness:* The system at the gym may threaten togetherness in situations where a member's family wishes to enter to witness their child's activity and show support but is restricted from doing so.
- *Religious discrimination:* Consider a scenario where users are treated differently based solely on their religious beliefs and practices, which is a form of discrimination.
- *Violating cultural and spiritual values:* In situations where a group of individuals culturally oppose monitoring, perhaps due to religious beliefs or lack of documentation, they may view it as a violation of their cultural and spiritual values.
- *Supporting usability:* The owner had a requirement to implement a system that would make it easier for users to access the facility and decrease the workload of the employees. To achieve this, gym members are allowed to use their own tags to enter and exit the room, eliminating the need for employees to constantly check the computer for subscription end dates. This results in improved usability for the system and reduced workload for the employees.
- *Supporting trust:* Users are more likely to trust a system when they can observe that it operates efficiently, provides sufficient functionalities, and does not retain sensitive information. Therefore, implementing these features can enhance the trust users have in the system.
- *Supporting autonomy:* The system notifies gym members when their memberships/subscriptions are expiring, allowing them to stay informed without seeking information from the secretary or administration. This autonomy helps them plan and avoid being rejected at the desk by choosing not to attend until the next billing cycle if they cannot pay.

5   Value Relations

In this section, we represent the list of the value relations identified in the two parts of the session.

- **Part 1**
  - *Conflict between security and privacy:* While ensuring the security of individuals, it is important to be mindful of the privacy of users and their data.
  - *Congruency between fairness and mental welfare:* When a user is consistently given an older bike in the fitness area because they come from a different class, while others have enough time to choose the newer ones, it creates an unfair situation that can lead to negative emotions. This inequality may have a detrimental impact on the user's mental health.
- **Part 2**
  - *Conflict between togetherness and ownership and property:* The owner of the gym, who has the right of ownership, may desire to have the authority to determine who can enter the premises without necessarily considering the togetherness of the gym members and their families.
  - *Conflict between freedom and safety:* Users may have to compromise some of their safety in order to gain greater freedom within the context of the ACS.
  - *Conflict between freedom and control:* While it is necessary to control the entrances of various rooms within the gym, users still desire the freedom to move around the facility.
  - *Conflict between safety and privacy/anonymity:* If the police require the gym to monitor all individuals entering the premises due to safety regulations, it may compromise other aspects for gym members, such as privacy and anonymity.
  - *Conflict between cultural values:* While it is important to acknowledge cultural values, it may not always be feasible to satisfy all of them. Considering the prevailing culture in the region where the gym is situated can aid in determining which values to prioritize. However, applying the same approach in diverse settings may lead to challenges. In such cases, it is necessary to make compromises among cultural values.
  - *Congruency between cultural values and control:* By implementing an access control system, we aim to regulate access and exert control for a specific group of individuals in order to preserve certain cultural values.

6   Ethical Decisions

In this section, we represent the list of the ethical decisions identified in the two parts of the session.

- **Part 1**

- *Ed-1:* Storing sensitive user data externally, separate from internal data that could potentially be linked to user identities through building access logs. Access information is maintained externally, including the logs, that should be removed annually for security purposes.
- **Part 2**
  - *Ed-2:* Designing the system that generate minimal noise, such as using biometric scanners, can foster a peaceful and supportive environment for individuals residing in the same building or nearby area. This can have a positive impact on their mental health and overall well-being.
  - *Ed-3:* Reducing the amount of personal information that we need to collect. This can help to protect user privacy, as there is less data that could potentially be misused in the case of a data breach.
  - *Ed-4:* Categorizing system users based on their gender, cultural background, or religious affiliation and providing tailored services to align with their cultural values.
  - *Ed-5:* Providing customization options in the system to support cultural values in different contexts is certainly a good practice. However, it is important to keep in mind that releasing the system in a simulation environment and forcing it to face different cultural and ethical violations may not necessarily be the best approach. This is because it cannot fully capture the complexity of real-world cultural contexts.

7   Suggested Recommendations

In this section, we represent the recommendations suggested by participants to promote ethical considerations in the context of the ACS.

- *Conducting an ethical assessment* using a framework/model can be crucial in evaluating the system's ethical implications. This can provide insight into potential ethical issues and conflicting values and help determine appropriate responses by the system.
- *Establishing generic policies* using a specific language that can articulate general invariant constraints.
- *Using an ethical model* to guide the design and development of the software system in a responsible and ethical manner.
- *Concretizing ethical considerations* during the design phase, especially in requirements and use cases, can effectively help identify potential violations. This can serve as a good starting point for improving the ethical perspective of the system.
- *Deploying the system in various contexts* can be useful in identifying potential ethical violations, especially those that may be associated with cultural factors.

Appendix C. Secondary Evaluation Results.

In the following, we represent the findings derived from the second focus group session, which pertain to the participants' opinions regarding the potential ethical implications of the ACS.

8 The Participants' Expectations wrt the System's Ethical Implications.

In this section, we present the participants' opinions concerning the potential ethical implications of the ACS.

- **Noise pollution:** The gym in our specific location is situated in an isolated area, away from residential properties, and there is a hospital approximately 600 meters away. Given this setting, an access control system is unlikely to cause significant problems or disruptions to the surrounding neighborhood. However, it is important to consider that in densely populated areas with numerous nearby buildings, the ACS may introduce potential disturbances.
- **Controlling:** In relation to the system, we experienced a sense of being judged and controlled based on our understanding of how it operates. An illustration of this is when we utilize the gym's mobile app to enroll in a class, as the system administrator can track our preferences, such as attending the 7 pm guided sessions. It's worth noting that individuals may have different levels of awareness regarding data gathering and may experience varying degrees of feeling judged and controlled.
- **Security risks:** Since the ACS at the gym does not store sensitive personal information such as bank accounts, there is not a strong requirement for a highly secure access system. Its primary purpose is to confirm a user's visit on a specific day without handling sensitive data.
- **Freedom restriction:** Our freedom is minimally affected by the system. Any limitations we experience are related to the gym's security measures rather than restrictions on our freedom. We are already accustomed to other systems in our daily lives that exert greater control. As long as these systems prioritize user safety by managing access, they do not negatively impact our freedom.
- **Violating physical and emotional well-being:** The accessibility of the gym during emergencies is a significant concern, as it can have a detrimental impact on the gym members' physical and emotional well-being. The presence of closed doors or obstacles that impede immediate access is viewed as problematic in such situations.
- **Violating dignity:** The experience of embarrassment is subjective and can be influenced by individual emotions and perspectives. If someone typically attends the gym with a friend, forgetting to renew a gym membership and subsequently being denied entry by the ACS can be particularly embarrassing. The presence of available staff, such as a receptionist, proves helpful

in resolving access issues and reducing potential embarrassment. However, when staff is absent, especially during the early morning, it may lead to more embarrassing situations. Additionally, to avoid the embarrassment of being denied access, receiving an email reminder one or two weeks prior to the membership expiration would be preferable.

– **Threatening togetherness:** Limitations that prevent family members from accessing the gym can disrupt the feeling of togetherness. While granting access to parents supporting their children's activities is beneficial, it's important to consider such restrictions during the subscription process. Personal experiences illustrate the difficulties that arise when only one parent has access, especially when tasks like preparing the child after swimming lessons become challenging. Such severe restrictions can lead to dissatisfaction and subscription cancellations. Finding a balance that allows for family involvement while maintaining necessary constraints is key to ensuring a positive experience for parents and their children.

– **Violating cultural and spiritual values:** The ACS offers a user-friendly solution, particularly for individuals struggling with technology. Using a physical bracelet as an access device enhances accessibility and transparency compared to relying on software or mobile apps. The wearable nature of the bracelet makes it well-suited for people of different ages and cultural backgrounds, including older individuals with diverse cultural habits. Moreover, this system can help prevent potential conflicts with gym staff or owners regarding membership renewals. Being rejected by an electronic device is often perceived as less aggressive than dealing with a staff member. Furthermore, in specific countries, the cultural value of unrestricted gym access may clash with the presence of an ACS. It is crucial to consider the impact on cultural values when implementing such systems.

– **Supporting usability:** Without an ACS, entering the gym becomes challenging, especially when there is no receptionist available. The ACS is crucial as it enables self-verification and ensures a smoother experience. Manual verification with the receptionist can result in queues and delays, particularly during busy times. Additionally, relying solely on human verification increases the risk of unauthorized access. Implementing an ACS eases the workload of employees and provides valuable insights into customer preferences, allowing the gym to offer improved services based on attendance data.

– **Supporting trust:** We favor an ACS that does not necessitate our sensitive information, as it is unnecessary for a gym or similar establishments. Having a system that does not store or utilize our sensitive data makes us feel more confident and trusting.

– **Supporting autonomy:** While we appreciate receiving notifications about our membership status, we have concerns regarding the level of autonomy granted to us. We are uncertain if the ACS includes a feature that allows us to make membership payments. Even if we receive a notification regarding our membership expiration, we still have to visit the reception to finalize

the payment process personally. Consequently, our autonomy as members remains unfulfilled in this regard.

– **Avoiding identifiability:** Tracking user data, including information about their activities (such as the frequency of gym visits), is a significant ethical concern related to the ACS, as the system administrator could access sensitive information about user habits. It is vital to establish whether there is any link between the tracked data and user identities to address concerns regarding privacy and anonymity.