

A strategy for overcoming the stigma associated with tricycle usage by young & intermediate elderly.

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This paper presents a design approach for a non-stigmatising tricycle catering to the mobility needs of young and intermediate elderly individuals (65-75 years). Collaborating with Van Raam, the project targets the rising elderly population in the Netherlands, addressing challenges associated with aging, such as diminished physical abilities and heightened accident risks. Aiming to counter the low acceptance of tricycles due to societal stigma, the design strategy incorporates a cargo function as an alibi, fostering a meaningful interaction with another product—a cargo bike. Drawing on the formative years' influence, the final concept seamlessly combines a modern design with '70s nostalgia, aiming to enhance user recognition and acceptance.

Aging Population; Mobility; Tricycles; Product-related stigma; PIMS; Formative years; Human-centred design.

1. Introduction

The Netherlands, known for its cycling-friendly infrastructure, stands witness to a demographic shift. Like many nations, the Netherlands has witnessed a substantial rise in its aging population, a phenomenon with profound implications for mobility and safety [1]. Over the years, the representation of residents aged 65 or older has increased from 12.8 percent in 1990 to 20.2 percent in 2023, and projections indicate a further increase to 26% by 2050 [2].

This demographic transition requires a thoughtful consideration of the challenges posed by advancing age on the cycling habits of the population. As individuals progress into the later stages of life, factors such as diminished balance, slower reaction times, and heightened sensitivity to mobility issues become pronounced, creating formidable barriers to safe cycling practices [3], [4]. The success of a cycling task, intricately linked to cognitive, sensory, and motoric functions, is notably influenced by these age-related factors [5]–[7].

The impact of these challenges is amplified by the evolving dynamics of the elderly's mobility behaviour, characterized by an increased frequency of travel, longer distances covered, and a growing reliance on bicycles for diverse daily activities. Contributing to this trend is the improved average health situation and the availability of e-bikes, which have significantly encouraged cycling among seniors, constituting 28% of their travels [8], [9]. The bike serves as transportation for (grocery) shopping, visiting friends and family, recreational tour, and personal care [10], [11]. The bicycle is not only a means of transport, but evokes many positive associations of freedom, enjoyment, exercise and being together [12]. Research shows that elderly value their personal control, autonomy and self-sufficiency, freedom in lifestyle and privacy most. Being mobile and flexible in everyday life contributes to the personal control [13]. To enable safe and self-sufficient cycling transport for an aging demographic, it is beneficial to take preventative measures in early stages of mobility decline [14].

While interventions, such as the tricycle, have been proposed to enhance safety and mitigate the risks associated with aging-related mobility decline, there exists a notable aversion among the elderly population towards such devices. This aversion, deeply

rooted in societal attitudes and stigmas, poses a significant barrier to the widespread adoption of assistive devices, hindering the potential benefits these innovations could bring to the aging demographic.

This paper embarks on a design journey focused on the tricycle, aiming to reshape its perception among elderly individuals experiencing mobility difficulties on a bicycle. By addressing and mitigating the associated stigma, this design process seeks to unlock the full potential of tricycles as indispensable tools for maintaining mobility, independence, and overall well-being while aging.

2. Product-related stigma

Stigma, a multifaceted social phenomenon, encompasses negative attitudes, beliefs, stereotypes, and discriminatory behaviours directed towards individuals or groups perceived as deviating from societal norms or expectations [15]–[17]. In the context of transportation, tricycles stand out, deviating in design and function from conventional bicycles and becoming susceptible to product-related stigma. This stigma presents a significant challenge, hindering tricycle adoption and restricting individuals from accessing the benefits these devices offer.

A pivotal aspect of product-related stigma is its ability to link undesirable characteristics to users of specific products, such as assistive devices like tricycles. In the case of tricycles, societal perceptions associate their usage with aging or impairment, perceiving their adoption socially undesirable [16], [18]–[20]. This dynamic significantly shapes user attitudes towards tricycles, potentially deterring potential users from embracing these devices.

2.1. Product Appraisal Model for Stigma (PAMS)

The Product Appraisal Model for Stigma (PAMS) provides a comprehensive framework to understand the pitfalls and social conflicts between users of stigma-sensitive products and their surroundings. The PAMS present three key product components affecting stigma-sensitivity: product perception (non-instrumental interaction), product use (instrumental interaction), and consequences of product use (non-physical interaction). In the

context of tricycles, these components influence how individuals appraise and react to the product. Stigma can be triggered by external factors like societal reactions or judgments, or by the perceived misalignment of the product with cultural standards [16].

2.2. Elderly stereotype

As product-related stigma is closely connected to how individuals perceive product usage, it intertwines with stereotypes. The BIAS-map, elucidating how individuals stereotype social groups based on warmth and competence, reveals the dual stereotype faced by elderly users of assistive devices: a positive perception of warmth and a negative perception of competence (Figure 1)[38]. This stereotype leads to feelings of pity and sympathy among bystanders, fostering avoidance of assistive technologies by individuals due to the fear of being identified as old and associated with undesirable attributes [21].

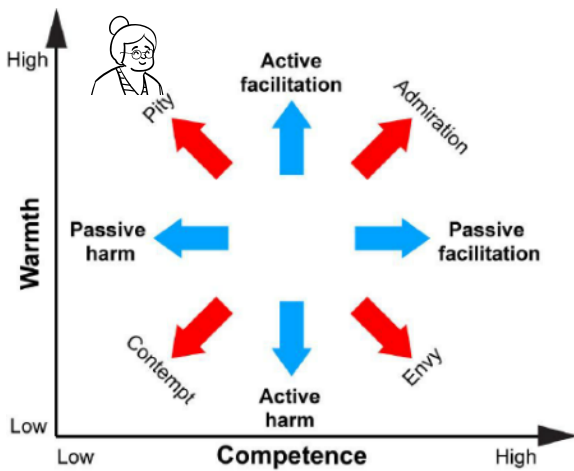


Figure 1.; BIAS map: schematic representation of behaviours from intergroup affect and stereotypes. Red arrows represent emotions, blue arrows represent behaviours [21].

In essence, these theoretical frameworks offer a nuanced understanding of how product-related stigma manifests concerning tricycles. By dissecting the intricate interplay of societal perceptions, individual appraisals, and consequential reactions, these models provide valuable insights into the barriers hindering the acceptance and adoption of tricycles among the elderly population.

2.3. Design strategies

To enhance product acceptance, designers must balance stakeholder needs and avoid conflicting concerns. Vaes proposes the Product Intervention Model for Stigma (PIMS), containing 17 design interventions across three domains, that enables designers to create a successful stigma-free product. The PIMS proves effective in Inclusive Design and Human-Centred Design [16]. Inclusive design aims to maximize product usability for all ages and abilities, considering disability, aging effects, and technological skills. By addressing these aspects, assistive technology can become socially acceptable and desirable [16], [22], [23].

Until recently, elderly have been targeted as a homogeneous group, consisting of individuals aged over 65 years old. However, the elderly age differently [25]. Eger and Mulhof propose a method for designing for elderly considering the cohort effect, the effect of the present, and the effect of an individual's age. It considers the

influence of both the past and the present on the needs and preferences of elderly individuals when designing to accommodate their unique requirements [26].

The cohort effect supposes that people's preferences, norms, and values are mainly formed between the age of 15-25. This is called the formative period. During this age period, people experience many 'first' experiences, making them worth remembering [26]–[28]. Reflecting to these formative years, brings up feelings of familiarity and nostalgia, creating a positive connection with a product.

3. The user

Human-Centred Design (HCD) is instrumental in unravelling complexities around tricycle acceptance. Employing empathising, experiential research, expert interviews, and focus groups, a comprehensive user study delves into elderly's perceptions at different aging stages. Various subtopics relevant to the acceptance process were investigated, including transportation and cycling habits, mobility limitations, challenges associated with tricycles, desires, perceptions of tricycles, acceptance of tricycles, and potential opportunities.

Independence emerges as a key factor, with mobility playing a central role, especially in daily activities such as shopping and commuting. While those interested to tricycles often experiencing mobility challenges leading to dependency, falls, and subsequent acceptance, practical barriers hinder actual use. Vehicle handling differs from bicycles. This is paired with stigmatising appearances and sizes, which create doubts about tricycle purchases. Young and intermediate seniors, though more adaptable, encounter product-related stigma and struggle to envision tricycles as essential for their future mobility needs. However, adaption in this earlier state of mobility decline is beneficial for elderly to stay active while their age increases, which helps to stay more fit, physical as well as mentally [3].

This project focuses on increasing tricycle acceptance among individuals in the early aging stage, aged 65-75, as adapting to tricycles during the early stages of mobility decline prove beneficial. Various strategies emerge from the user study to migrate perceived stigma and enhance tricycle willingness. Appearance becomes a key aspect, and creating an 'alibi' for the bike, such as incorporating cargo functionality, provides a practical reason for tricycle use and aids acceptance. Addressing transition issues involves making the design significantly different from traditional bicycles, potentially influencing societal perceptions.

4. The design

To avoid stigma and enhance overall acceptance, the key is to design a non-stigmatizing tricycle for young and intermediate elderly, to enable early adaptation. Grounded in PIMS interventions, theories of age effects, cohort effects, and the present, the design aims to change non-instrumental interactions, focusing on non-stigmatizing the bike's physical appearance. PIMS suggests five design interventions relevant to this project: camouflage stigma-sensitive features, eliminate confronting moments in product use, integrate additional benefits, create meaningful interactions with other products, and empower users with extra abilities.

Considering young and intermediate elderly individuals, the age-effect, cohort effect, and the present are crucial to consider in the design process. A PESTLE-S analysis, market research of the bike industry, and personas derived from user research guide the incorporation of seventies references in a modern context. This approach aims to create familiarity, nostalgia, leading to a positive connection with the product.

4.2. Proposed function

The design goal has been formulated as follows: *Design a non-stigmatizing tricycle that facilitates a seamless transition from a bicycle to a tricycle for the elderly, aged between 65 and 75 years, who start to face challenges with stability and safety while cycling.* The bike would extend seniors' independence and promote confidence, thereby enhancing their overall quality of life.

To reach the design goal, user-friendly, non-complex, stigma free, safe and stable are five design criteria which the tricycle must meet. Additionally, the translation of a recognizable aspect of the formative years would increase appreciation by the target group. However, the present must also be considered. Therefore, a translation must be made of a reference to the seventies in a modern way. Lastly, the tricycle will form a meaningful connection with a cargo bike by incorporating a cargo container on the tricycle. This will also help camouflaging the stability function of the tricycle by giving the user an alibi.

4.3. Formative years implementation

To adhere to the cohort effect, mood boards from seventies impressions (Figure 2) and modern cycling trends (Figure 3) guide the design's appearance. An example of how a seventies reference was translated to a modern bike is through seventies-inspired embossing. The relief trends from the modern mood board were deemed suitable for a seventies reference. Drawing inspiration from the seventies impression mood board, we incorporated a circular pattern in combination with a red/orange colour scheme. This seventies pattern was then translated into a relief pattern for the cargo container of the bike. We explored various options to create a subtle and elegant pattern (Figure 4). Finally, the colour of the embossed pattern was chosen to complement the seventies red/orange colour scheme, completing the overall seventies reference. The incorporation of such embossing into the tricycle honours the seventies, creating a recognizable yet modern design.



Figure 2.; Seventies impression mood board (result of PESTLE-S analysis).

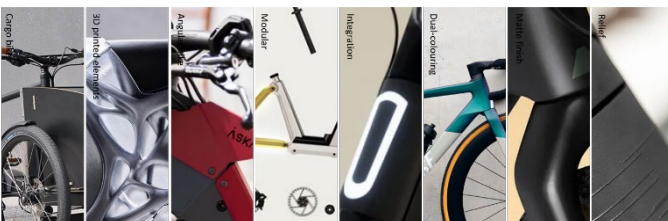


Figure 3.; Trends cycling industry 2022-2023.



Figure 4.; Translation seventies pattern into modern bike relief.

5. Discussion

The approach outlined in this paper considers PIMS from both the product and user intervention domains. However, a limitation of this approach is the exclusion of PIMS within the cultural intervention domain. The incorporation of the cultural intervention domain could introduce an extra dimension to create a stigma-free product, which would be valuable for further product implementation. Within the cultural intervention domain, marketing of the product will be addressed. Since the product has been camouflaged from its original function, product placement, and thus marketing, becomes crucial to support the implemented strategies aimed at mitigating stigma.

Considering the implementation of multiple aspects and strategies in the design, each strategy may contribute differently to stigma reduction. Investigating the specific contributions of each strategy would be worthwhile to determine which strategies are worth implementing in other products as well.

To better understand the problem from a user perspective, a user study was conducted. Qualitative research was undertaken to uncover users' desires and needs related to cycling. The data collected heavily relies on the researcher's observations and interpretations, as well as the participants' input. To support the findings, triangulation was applied; multiple methods were used to develop a comprehensive understanding of the user.

The insights derived from the user study were translated into the problem definition and defined the direction of further design. Although aspects such as low entry and ease of use have been addressed in the design, further focus could be placed on the effects of aging, as proposed in the literature, to achieve a fully inclusive and user-friendly design [26], [29]. Examples include the accessibility of the cargo area and battery.

This paper excludes validation of the design and the proposed approach. Based on the theory on product-related stigma, it is important to validate designs in real size and in realistic environments. This is because the context has a high impact on the perceived stigma. Additionally, next to the non-instrumental interactions, instrumental and non-physical interactions are key factors in product-related stigma [16]. It is advisable to validate the design based on all three aspects.

6. Conclusion

The strategy described in this paper was found useful during the design of a tricycle for young and intermediate elderly. The strategies implemented in the design phase made sure that bystanders as well as the target group did not associate the product's appearance with users who are impaired or old. That association with users who are impaired or old causes aversion towards the product. The implementation of cargo functionalities camouflages and creates an alibi for the stability function of the tricycle, as proposed by the PIMS and the user. Additionally, the application of a reference to the formative period (the cohort effect) of the targeted audience will help to create a personal connection between product and user. It is important to note that this reference should be done subtle, to avoid exclusion of other age groups.

The proposed design represents a step toward a stigma-free secure bike for the elderly, and insights gained can benefit further studies and applications in creating non-stigmatizing products for

an aging demographic, contributing to feelings of self-sufficiency and a good quality of life.

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