LookBook: Pioneering Inclusive Beauty with Artificial Intelligence and Machine Learning Algorithms

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Abstract — This research paper introduces LookBook, an innovative application that seeks to redefine the current landscape by addressing the issue of how developing technology reinforces a standardized representation of beauty, potentially impeding the progress towards a more inclusive society. Through a comprehensive process involving futurization analyses, target market research, market research, and prototyping, LookBook has been developed to create a transformative space where users can reshape their realities by embracing the beauty of diverse individuals while recognizing and celebrating their own unique beauty through self-expression and exploration. Leveraging machine learning technology, artificial intelligence and algorithmic controls, LookBook offers personalized experiences, fosters community engagement, cultivates creativity, and empowers individuals to define their own beauty standards. This research paper elucidates the problem statement, underscores the significance of LookBook's innovation, and explores its potential impact on the current landscape of diversity and technology.

Keywords — beauty, inclusivity, technology, representation, futurization, self-expression, exploration, machine learning, algorithms, personalization, community engagement, diversity, data transparency

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I. Introduction

The beauty industry has undergone significant transformations in recent years, driven by the advent of developing technologies and evolving societal values. While advancements in technology have the potential to revolutionize beauty standards and promote inclusivity, there remains a pressing concern regarding the reinforcement of a standardized representation of beauty that may hinder progress towards a more diverse and inclusive society. This research paper introduces LookBook, an innovative application that aims to redefine the current landscape by addressing this problem.

Drawing upon a comprehensive process of futurization analyses, target market research, market research, and prototyping, LookBook has been developed to create a transformative space where users can challenge conventional notions of beauty. By embracing the beauty of diverse individuals and celebrating their own unique beauty through self-expression and exploration, LookBook empowers users to shape their realities in a perspective that recognizes and appreciates the diverse beauty that exists.Central to LookBook's functionality is the integration of cutting-edge machine learning technology and algorithmic controls. This advanced technology enables the app to deliver personalized experiences tailored to each user's preferences and needs. Through the app's algorithmic recommendations and intelligent features, individuals are empowered to define their own beauty standards, free from societal pressures and constraints.

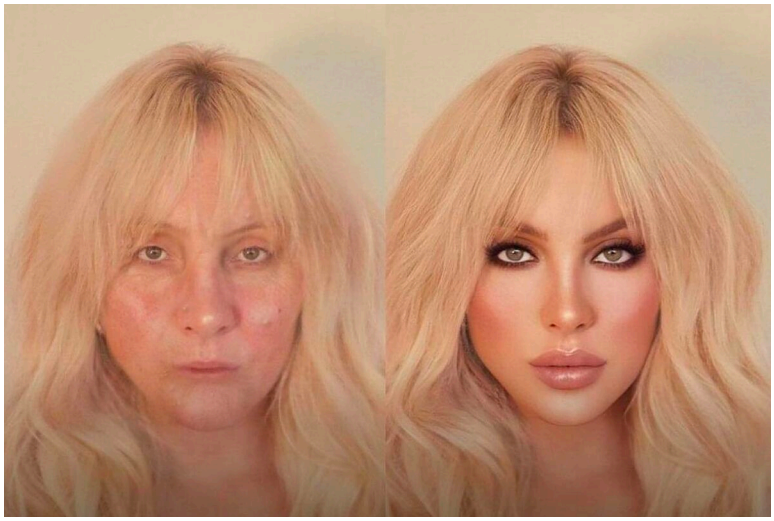
By examining the intricate relationship between technology, beauty, and inclusivity, this paper provides insights into the transformative potential of LookBook and its role in fostering a more inclusive and empowering beauty culture. The subsequent sections of this paper will delve into the problem statement, presenting an analysis of the current challenges surrounding beauty standards and technology. Furthermore, the research methodology employed in the development of LookBook, including futurization analyses, target market research, market research, and prototyping, will be discussed. Additionally, the features and functionalities of LookBook will be explored in a walkthrough guided by screenshots of the latest prototype. Finally, the paper will conclude with a discussion on the potential impact of LookBook on the current landscape of diversity and technology, highlighting its significance and contributions to advancing inclusivity in the beauty industry.

Overall, LookBook represents a promising innovation that strives to redefine beauty standards by leveraging technology to empower individuals, foster inclusivity, and challenge the notion of a standardized representation of beauty. As the beauty industry continues to evolve, it is imperative to critically analyze the role of technology and explore innovative solutions like LookBook that promote diversity, self-expression, and personal empowerment in the pursuit of a more inclusive beauty culture.

II. Problem

In the modern age of technology, the representation of beauty is heavily influenced by artificial intelligence, machine learning, and the rapid dissemination of media through digital platforms. However, this portrayal often reflects a narrow view of beauty, with biases inherited from historical beauty standards (Etcoff, 1999). Western ideals of beauty have long dominated the media landscape, and while efforts have been made to improve representation, diversity is often reduced to tokenism or limited to individuals who possess certain Eurocentric features (Cervantes-Anguas, 2021). This is further reinforced by the aspirational nature of beauty in capitalist societies, where beautiful faces are used to entice and engage consumers. Consequently, daily interactions with technology, such as smartphones and laptops, expose people to a plethora of idealized beauty standards.

To add to these standards, beauty is becoming a hyper-ideal version of itself as technology exacerbates these features to the point of unattainability in the physical or real-life realm (Basar, Coupland, & Obrist, 2021). Augmented reality filters available on platforms like Instagram and Snapchat allow users to digitally alter their appearance by smoothing their skin, lightening their complexion, enlarging their eyes, and plumping their lips, among other modifications. While some of these standards have cultural variations, they often remain rooted in Western beauty norms, thus creating a blend of attainable features that emphasize certain attributes while still adhering to Eurocentric ideals. This accessibility to beauty alterations through technological applications has led to the rise in cosmetic procedures as individuals strive to meet these standards (Tolentino, 2022).



A woman before and after using an augmented reality filter on Instagram, retrieved from El Mundo

The pervasive nature of narrow beauty standards in technology makes it challenging to escape their influence. Algorithms that personalize content and create a "filter bubble" further reinforce these ideals (Pariser, 2011), making it difficult for individuals to encounter diverse representations of beauty. As a result, people are constantly exposed to images and narratives that align with their existing preferences and reinforce the prevailing beauty standards. This perpetuates a cycle where individuals feel compelled to conform to these standards and may face difficulties in embracing their own unique features or exploring alternative definitions of beauty.

The implications of this new-age beauty phenomenon poses a threat to a wide range of problems in both health and technology.

In health, narrow beauty standards and constant exposure to idealized images can contribute to body dysmorphia, a mental illness characterized by a distorted self-perception. Social media platforms, particularly those with augmented reality filters, have given rise to a phenomenon known as "Snapchat dysmorphia," where individuals seek cosmetic procedures to resemble their filtered selves (Ramphul & Mejias, 2018). This desire to conform can lead to detrimental effects on mental health, including anxiety and depression. Furthermore, online platforms have become a source of validation, particularly for younger generations, where who do not fit the narrow beauty norm may feel alienated or excluded, leading to feelings of low self-esteem and social isolation (Rodgers, et al., 2023).

The pressure to conform to societal beauty standards can exacerbate these negative emotions and impact overall well-being.

Advertisement for skin whitening lotion available on eBay

The pursuit of meeting beauty standards has also led to a rise in counterfeit beauty products and services (Morse & Repsha, 2021). Fake cosmetic products, such as skin-whitening lotions containing harmful substances like mercury, pose significant health risks (Refinery29, 2019). Additionally, unlicensed cosmetic surgery clinics targeting individuals seeking physical alterations based on beauty standards have emerged, potentially resulting in lifelong complications or even fatalities (Mayer & Goldberg, 2015).

In technology, face attribute recognition systems plays a significant role in perpetuating narrow beauty standards. There is documented bias towards Eurocentric facial features, which can have serious consequences in various domains. The performance of this technology is not only for tasks like face verification and person re-identification but also for ensuring fairness across different gender and race groups. Failure to achieve equal performance can harm the reputation of service providers and erode public trust in the machine learning and computer vision research community. Incidents involving racial bias, such as Google Photos mistakenly labeling African American faces as gorillas or Nikon's

cameras asking Asian users if someone blinked, have led to the termination of services or features. Consequently, many commercial service providers have ceased offering race classifiers (Karkkäinen & Joo, 2021).

AI program COMPAS, used by Wisconsin court, to assess whether convicts would reoffend incorrectly flagging black prisoners as being more likely to reoffend than white prisoners, retrieved from Medium

It is imperative to emphasize the importance of inclusive technology when dealing with facial recognition. Recognizing the biases and limitations of current systems, efforts should be made to develop facial recognition software that is inclusive and accurately represents the diverse range of facial features across different ethnicities and skin tones. This is crucial to avoid perpetuating discrimination and ensure fairness and equity in various sectors that rely on facial recognition technology.

III. Objectives

A. *To highlight physical and ethnic diversity:* The first objective would be to showcase a wide range of physical appearances and ethnic backgrounds, challenging the prevailing homogeneity of beauty standards in technology-driven platforms. The app aims to create a space where users can find inspiration from diverse sources of beauty. By curating content that showcases a wide range of styles, cultural influences, and aesthetics, LookBook encourages users to broaden their perspectives and appreciate beauty in all its diverse forms.

B. *To provide adequate representation:* The app seeks to ensure that underrepresented individuals and communities have a platform where their unique beauty and experiences are showcased and appreciated. By actively marketing to individuals from diverse backgrounds, the app aims to address the lack of representation in mainstream media and provide a space for marginalized voices to be seen and heard.

C. *To foster personal style and individualism:* The third objective would be to empower users to express their personal style and embrace their individuality. The app aims to break away from standardized beauty norms and encourages users to explore and celebrate their unique features, preferences, and fashion choices.

D. *To encourage creativity and self-expression:* LookBook seeks to inspire users to be creative and express themselves authentically through the app's platform. By showcasing a variety of beauty styles and providing tools for users to share their own content, the app aims to foster a supportive and encouraging environment where creativity and self-expression are celebrated.

E. *To cultivate a positive community*: LookBook strives to create a positive and inclusive community where users can connect, support each other, and engage in meaningful discussions. The app aims to foster an environment free from negativity, body shaming, and discrimination, promoting a sense of belonging and camaraderie among its users.

F. *To educate users about the use of algorithms and datasets:* It is significant for LookBook to raise awareness among users about the role of algorithms and datasets in shaping beauty standards and influencing the content they consume. The app aims to provide

understandable information to empower users to understand the biases and limitations of technology-driven beauty ideals, as well as inspiring users to actively participate in challenging and reshaping beauty standards. By providing opportunities for users to engage in discussions, share their stories, and contribute to positive change within the beauty industry, the app seeks to empower individuals to become agents of transformation and promote a more inclusive and diverse definition of beauty.

IV. Hypothesis

This research project aims to investigate the potential impact of a design solution addressing the homogeneity and unattainability of beauty standards and facial recognition software being limited to a narrow group of datasets. Based on the outlined objectives and considerations, the solution would be designed as a platform for recognizing real beauty, hence providing users with a diverse range of representations. By acknowledging and celebrating the reality of human diversity, including different forms, sizes, ethnicities, and more, the app aims to challenge the homogeneity of beauty ideals perpetuated by mainstream media and technology. It is hypothesized that by allowing users to curate their own content and choose to see individuals who resemble them or explore a broad spectrum of diverse beauty, the app will empower users to embrace their unique characteristics and expand their perception of beauty.

LookBook, with its emphasis on personal style and individual creativity, will counter the pressure to conform to standardized beauty norms. By providing a platform where users can showcase their personal style and draw inspiration from diverse representations, the app aims to foster an environment that encourages self-expression and challenges the idea of fitting into predefined beauty standards. It is hypothesized that by promoting personal style and creativity, the app will provide users with an alternative perspective on beauty, shifting the focus from unattainable ideals to individuality and authenticity.

Overall, it is hypothesized that the LookBook app will offer a transformative experience by providing users with the opportunity to actively shape their beauty preferences and perceptions. By embracing diversity, celebrating personal style, and

allowing users to curate their own content, the app seeks to challenge the homogeneity of beauty standards perpetuated by technology and provide a platform where real beauty can be recognized and celebrated.

V. Scope and Limitations

A. Coverage

The research conducted for LookBook aims to provide a comprehensive understanding of the intersection between beauty and technology. It covers a wide range of topics, including beauty standards, representation, diversity, personal style, and the influence of algorithms. The research investigates the challenges posed by homogeneous beauty ideals in technology-driven platforms and addresses the underrepresentation of diverse individuals and communities. It also explores the impact of technology on personal expression and creativity, with the goal of creating a platform that encourages users to embrace their unique features and showcase their style. Additionally, the research examines the social and psychological implications of narrow beauty standards and highlights the potential for positive change through community engagement and education. However, it is important to note that the research does not extensively delve into the technical aspects of artificial intelligence, machine learning algorithms, or facial recognition software. It also does not provide an exhaustive analysis of the broader societal factors influencing beauty standards or the cultural and historical aspects of beauty ideals, as these can vary across different regions and communities. Moreover, while beauty encompasses more than physical appearance, the research primarily focuses on the representation and perception of physical beauty within the technological context.

While the research aims to develop a solution to address the identified problem, it is important to acknowledge certain limitations regarding the extent of implementation. The study will focus on conceptualizing and designing the solution, outlining its key features and functionalities, and proposing a back-end technology framework to support its implementation. However, due to time constraints and the scope of the research program, the study will not delve into the detailed aspects of training datasets or programming the

application with code. By focusing on the conceptualization and design aspects, the research aims to lay a strong foundation for the development of the solution while recognizing the need for further technical expertise and implementation efforts. It aims to provide a comprehensive framework and guidelines for future development, facilitating the transition from research findings to practical implementation by outlining the key functionalities and technological requirements necessary to address the problem effectively.

B. Time Frame

The research is conducted as part of a one-year program focusing on design, technology, and innovation. The study spans a total duration of 9 months, divided into two phases. The initial half of the study was dedicated to understanding the complex interplay between design, technology, and innovation, as well as conducting future-oriented methods to explore the chosen topic of beauty. This phase involved extensive literature review, trend analysis, and identification of key points to inform the research direction. The latter half of the study will be dedicated to conducting in-depth research and developing a prototype that addresses the identified problem.

Given the time constraints, it was not feasible to engage a large sample of test users for evaluating the solution. Instead, the research leveraged the expertise of professionals and experts in the fields of design and technology. Their insights and feedback were sought throughout the iterations of the project to ensure its framing and innovative aspects are effectively addressed. This approach will enable the research to benefit from the valuable perspectives of experienced individuals who can provide critical input and guidance within the limited timeframe. By consulting these experts, the study aims to enhance the quality and effectiveness of the prototype while acknowledging the practical limitations imposed by the time frame.

VI. Methodology

This section outlines the methodologies employed to address the objectives of the research, starting with problem identification and concluding with the evaluation of the latest prototype and recommendations for further improvement.

To begin with, the research process began by identifying the problem at hand. A comprehensive analysis of the existing landscape in the domains of beauty and technology were conducted, leading to a clear understanding of the challenges and gaps that needed to be addressed. Next, specific research objectives were established to guide the investigation. These objectives provided a framework and served as a roadmap for achieving the desired outcomes.

Formulating a hypothesis was crucial to provide focus and direction to the research. The hypothesis represented an educated guess about the potential solution or outcome of the study. It was constructed based on a synthesis of existing knowledge and insights gained from the problem identification phase and the objectives constructed.

Defining the scope and limitations of the research helped ensure a realistic and manageable study. The scope determined the boundaries within which the research was conducted, specifying the specific areas of focus. Simultaneously, the limitations outlined any constraints or factors that might affect the research process or the generalizability of the findings.

A comprehensive review of related literature was conducted to establish a solid foundation for the research. This involved an in-depth exploration of academic papers, articles, books, and other relevant sources that discussed topics related to beauty, technology, and the impacts current issues have on audiences. The literature review provided insights into existing theories, frameworks, and methodologies, helping to contextualize the research and identify gaps or areas for further investigation.

To envision the future of beauty and explore innovative approaches, various futurization methods were employed. These methods included trend analysis, scenario building, and crafting a future wheel and web.

The research involved iterative prototyping of a solution or system. Two prototypes were developed and refined based on feedback from professionals in the beauty and technology domains. Their valuable input and recommendations helped improve the prototypes. The existing prototype is based on the improvements and comments on the second iteration.

Based on the evaluation of the latest prototype, recommendations were formulated to suggest potential avenues for further improvement. These recommendations aimed to address any limitations or shortcomings of the prototype and provide insights for future research or development.

The methodologies described above formed the foundation for conducting the research in a systematic and rigorous manner.

VII. Review of Related Literature

In the context of this study, the review of related literature will be divided into four parts to explore different aspects of the research topic. The first part will focus on works that provide insights into the intricate relationship between beauty, culture, media, and technology. The second part will identify ways that the technology contains biases and beliefs that can be harmful to people who consume these content and use these services. The third part will detail how the lack of physical diversity in modern media creates a chain of impact due to the standards these uphold. Lastly, works that explore the multifaceted dimensions of style will be examined, including its impact on self-expression, social dynamics, and psychological well-being. Through the synthesizing and evaluating of relevant literature, a comprehensive understanding of the topic will set the foundation for the research study.

A. Beauty and the 21st century

1. Survival of the Prettiest: The Science of Beauty (1999), Book by Nancy Etcoff

Survival of the Prettiest: The Science of Beauty by Harvard and Massachusetts General Hospital psychologist Nancy Etcoff delves into the relationship between biology, culture, and beauty. It highlights the universal foundations of beauty rooted in our biology while acknowledging the influence of cultural factors.

Etcoff argues that beauty is not merely a cultural construct but an inherent aspect of human nature. It is intricately tied to our biological imperative for finding a mate and ensuring reproductive success. Across cultures, there exists a remarkable consensus on what is considered beautiful, such as symmetrical faces, clear skin, and bright eyes. Etcoff's research reveals that beauty encompasses more than just physical appearance; it extends to qualities like intelligence, humor, and kindness crucial for successful mating and child-rearing. The universal foundation of beauty, rooted in our biology, has evolved to favor attractiveness for increased mate selection and offspring survival.

Moreover, Etcoff emphasizes the impact of beauty on social interactions and success. Attractive individuals tend to be liked, trusted, and hired more often. Furthermore, beauty is associated with status and power, evident across diverse cultures. Etcoff's cross-cultural study of 100 societies demonstrates the widespread association of beauty with social standing.

While biology plays a fundamental role in defining beauty, cultural factors also shape its perception. Etcoff explores the evolving beauty standards throughout history, influenced by societal shifts and changing values such as feminism and body positivity movements. In the 19th century, for example, being plump was seen as a sign of wealth and prosperity. In the 20th century, being thin became associated with health and fitness. And today, there is a growing movement to embrace body diversity and to challenge traditional beauty standards. However, even with progress, cultural influences on beauty continue to shape perceptions, and individuals often grapple with reconciling their own appearance with societal expectations.

Etcoff underscores the need for critical awareness of media's influence on beauty standards. Etcoff's exploration of media's influence on beauty reveals the prevalence of a narrow portrayal of beauty ideals. The media often presents an idealized version of beauty that is limited and unrealistic, bombarding us with images that can make us feel inadequate. Models and actors are often digitally altered to conform to societal beauty standards, creating unattainable ideals that can leave individuals feeling like they can never measure up.

The rise of social media platforms like Instagram and TikTok further amplifies the impact of beauty standards. These platforms favor human faces and encourage users to post selfies "for the algorithm," increasing the frequency of seeing idealized beauty on our feeds. Etcoff highlights that our "beauty detectors" are constantly at work, automatically assessing attractiveness in a fraction of a second. This perpetual exposure to beauty-centric content shapes our perception and can influence how we rate our own and others' appearances.

Advertising plays a significant role in perpetuating idealized beauty standards. Advertisements often feature models and celebrities who conform to these standards, creating an aspirational image that suggests achieving a particular look is essential for acceptance and success. Beauty is commodified, with the promotion of products, weight loss programs, and cosmetic procedures that imply attaining a specific appearance is crucial for happiness, success, and acceptance. This commodification reinforces the idea that conforming to societal beauty norms is necessary, impacting consumer behavior.

In conclusion, Nancy Etcoff's exploration of beauty reveals that beauty in itself, is not superficial nor harmful, but rather an inherent aspect of human nature. However, she highlights how the idealization and commodification of beauty by the media can distort its true essence, leading to unrealistic standards and societal pressures. By promoting critical awareness and self-acceptance, Etcoff encourages a balanced perspective that embraces the inherent beauty within each individual while challenging the narrow confines imposed by societal expectations.

The book provides a comprehensive exploration of the relationship between biology, culture, and beauty. The author effectively highlights the universal foundations of beauty while acknowledging the influence of cultural factors. Etcoff's research findings and insights on the biological imperative of beauty and its impact on social interactions are well-supported. However, it is important to note that the book primarily focuses on Western perspectives and may not fully capture the diversity of beauty standards across cultures.

2. We weren't meant to see this many beautiful faces (2022), article on The Face by Felicity Martin

The article explores the influence of media and technology on the perception of beauty. The widespread use of media and the advent of various apps, such as FaceTune, Snapchat, Instagram, and TikTok, allow individuals to digitally alter their appearance through editing and augmented reality.

Augmented reality refers to the integration of digital elements with the real world using smartphone cameras or wearable devices. In the context of beauty apps, it involves applying filters and effects to photos or videos, enabling users to modify their looks.

The constant exposure to images of beauty on social media platforms leads to a tendency to compare oneself with others. This comparison often results in feelings of inferiority, particularly when comparing with peers rather than celebrities or models. The perception that peers possess similar resources, such as professional makeup artists, intensifies the sense of comparison.

The frequent encounter with edited images and the act of comparing oneself can have adverse effects on body image, influencing physical and mental well-being, work performance, social interactions, and romantic relationships. To address these concerns, the author suggests minimizing excessive photo editing and embracing authenticity to promote self-esteem; additionally noting that users now have the power to influence the perception and activity of peers.

Additionally, it is important to recognize that artificial intelligence (AI) algorithms used in beauty apps can also carry biases. These algorithms learn from existing data, which

may perpetuate society's biases and Eurocentric beauty standards. Consequently, certain beauty filters in apps may be more effective for white faces, inadvertently disregarding or distorting the appearance of individuals from diverse racial backgrounds.

In summary, this section highlights the pervasiveness of beauty images in media, the impact of comparisons, the need to question beauty standards promoted by editing apps and social media, and the biases inherent in AI algorithms. It underscores the significance of awareness, self-acceptance, and the promotion of diverse and inclusive beauty ideals in both online and offline contexts. The article offers valuable insights into the influence of media and technology on beauty perceptions. The exploration of augmented reality and its effects on body image is particularly noteworthy. The author effectively highlights the adverse impact of constant exposure to edited images and the culture of comparison, and the discussion on AI algorithms and their potential biases adds depth to the analysis.

3. Digital Culture is Literally Shaping Women's Faces (2023), article on WIRED by Elise Hu

Elise Hu, a journalist specializing in Korean beauty and its cultural impact, explores the influence of digital culture on women's faces in her article for WIRED.

According to Korean cultural researchers like Emily Raymundo, there is a convergence of beauty ideals from different regions, resulting in a more uniform standard. For example, features like large lips, bigger butts, and prominent noses are being melded together from various global trends such as K-beauty, Bollywood, Hollywood, and Instagram influencers. This amalgamation of diverse influences makes these ideals increasingly unattainable for individuals to achieve.

Philosopher Heather Widdows notes that our desires for certain beauty standards are not solely subjective or objective but are influenced by external factors that assign value to objects. This can lead to an investment in a worldview that promotes creaseless appearances, causing anxieties for those who do not conform. Digital platforms create a culture of competition where users become potential models, doubles, and rivals in a perpetual game for attention and validation. This competition extends beyond the digital

realm into physical spaces, where individuals use their enhanced appearances as signals of social inclusion or exclusion.

The development of beauty technology plays a significant role in shaping these ideals. Clinics are designing and refining computer algorithms to analyze aesthetically appealing faces, providing recommendations for optimal procedures. This technological gaze both fuels and satisfies the demand for the latest aesthetic standards. However, these interventions often require costly procedures or increased aesthetic labor.

In summary, Elise Hu's article highlights how digital culture, through its influence on beauty standards, is shaping women's faces. The convergence of ideals, the culture of competition, and the development of beauty technology are all contributing factors. However, the article could benefit from additional empirical evidence and examples to support the claims made. A more nuanced exploration of the positive and negative consequences of these changes would further strengthen the analysis.

B. Realities shaped by technology

1. Excavating AI: The Politics of Images in Machine Learning Training Sets (2021), academic article by Kate Crawford and Trevor Paglen, published by Springer Nature

In their article, Crawford and Paglen explore the use of images to teach artificial intelligence (AI) systems, which are necessary for these systems to learn and recognize patterns. They explain that AI systems, including facial recognition technology, rely on large datasets of images to understand and identify different objects and concepts. The process of collecting and labeling these images involves gathering a vast amount of data and categorizing it based on specific attributes. For example, images of faces may be labeled to indicate gender, age, or facial expressions. This labeled data is then used to train the AI system, enabling it to make accurate predictions and classifications based on new, unseen images.

The authors argue that the images used for machine learning are not unbiased or objective but are influenced by power dynamics and societal biases. They highlight that the training data used for facial recognition systems often lacks diversity and reinforces existing social inequalities. The authors reveal that human labelers introduce their own judgments

and biases into the training sets, which can cause detrimental effects on social justice and perpetuate existing power imbalances. They provide examples of how this bias can manifest in the misidentification of individuals, particularly those from marginalized communities. For instance, if the training data predominantly consists of images of certain racial or ethnic groups, the facial recognition system may have difficulty accurately identifying and categorizing individuals from other groups. This can lead to unfair treatment or discrimination when the technology is used in real-world applications such as surveillance or law enforcement. By reinforcing existing stereotypes and prejudices, biased training data can contribute to systemic inequalities and hinder progress towards a more equitable society.

The article by Crawford and Paglen provides important insights into the political nature of images used in AI training sets and their impact on facial recognition technology. The authors effectively highlight the biases and subjective judgments involved in the data labeling process, as well as the potential consequences of these biases when the technology is deployed.

It is worth noting that the article primarily focuses on the issues related to training data and its potential to propagate biases. While this is a significant aspect, other factors that contribute to biases in facial recognition technology, such as algorithm design and system implementation, receive less attention in the article.

Despite this limitation, the source serves as a thought-provoking piece that underscores the need to critically examine both the data and the societal context in which facial recognition technology operates. It contributes to the broader conversation on biases and ethical considerations surrounding AI systems, emphasizing the importance of increased awareness and proactive measures to ensure fairness and equity in their development and use.

2. The Filter Bubble: What the Internet is Hiding from You (2011), book by Eli Pariser

In the book "The Filter Bubble," Pariser explores the concept of personalized algorithms and filters used on online platforms to create a customized online experience known as the

"filter bubble." These algorithms tailor the content we see based on our past behavior, location, and other personal data. This, in turn, can result in limited exposure to diverse viewpoints and information.

Pariser argues that the filter bubble has implications for democracy and civic discourse. When algorithms selectively show users information that align with existing beliefs and preferences, people are reinforced with their biases and a diminished exposure to alternative perspectives, hindering critical thinking and the formation of well-rounded opinions.

The impact of filter bubbles is also observed in the news media. Algorithms prioritize news stories based on users' interests and clicking habits, potentially narrowing the focus on specific topics while neglecting important news and diverse viewpoints.

The author raises concerns about the lack of transparency and control over these algorithms. Users are often unaware of the extent to which their online experiences are shaped and filtered, as the algorithms operate behind the scenes. Pariser emphasizes the need for greater transparency, accountability, and user control over the algorithms that determine information consumed.

It should be noted that the book was published in 2011, and the online landscape has since evolved. Platforms now incorporate feedback mechanisms, user preferences, and signals of quality and credibility in order to enhance user experience with feeds. Additionally, some platforms contain “fact checkers” to make sure that news being spread is not false, or warnings that some articles may be outdated. Still, Pariser makes valid remarks on issues that are still ongoing over a decade after publishing, such as echo chambers in news feeds, biased AI and algorithms, and the lack of transparency over how data is being used by corporations.

The book serves as a valuable starting point for discussions on the impact of algorithms and filter bubbles on information access and democratic discourse. It underscores the significance of addressing the challenges posed by personalized algorithms and striving to create online environments that are transparent, inclusive, and diverse.

3. FairFace: Face Attribute Dataset for Balanced Race, Gender, and Age for Bias Measurement and Mitigation (2021), academic article by Kimmo Kärkkäienen and Jungseock Joo, published by the Computer Vision Foundation

Existing face image datasets have been a crucial resource for advancing research and development in various areas of computer vision, including face detection, recognition, and attribute classification. However, these datasets have been shown to exhibit significant biases, primarily towards Caucasian faces, while underrepresenting other racial and ethnic groups. This underrepresentation leads to inconsistent classification accuracy when applying face analytic systems to non-White race groups.

To address the race bias problem in existing datasets, Karkkäinen and Joo constructed a novel face image dataset called FairFace. The dataset comprises 108,501 images collected from the YFCC-100M Flickr dataset, Twitter, and online newspaper outlets. FairFace focuses on achieving a balanced representation of seven race groups: White, Black, Indian, East Asian, Southeast Asian, Middle Eastern, and Latino. This emphasis on balanced race composition is a notable contribution to the field, as it mitigates the biases prevalent in other datasets.

The authors conducted evaluations using both existing face attribute datasets and novel image datasets to measure the generalization performance of their FairFace dataset. They found that models trained on FairFace demonstrated substantially higher accuracy on novel datasets and exhibited consistent accuracy across race and gender groups. Furthermore, the authors compared several commercial computer vision APIs and reported their balanced accuracy across gender, race, and age groups. The results emphasized the superiority of the FairFace dataset in achieving fairness and accuracy across various demographic groups.

The research conducted by Karkkäinen and Joo addresses the pressing need for more inclusive and unbiased face image datasets. By constructing FairFace and highlighting its improved generalization performance and balanced accuracy, the authors contribute to the ongoing discussions surrounding algorithmic fairness and ethical considerations in computer vision systems. The availability of FairFace, along with its

associated code and models, provides researchers with a valuable resource for training new models and assessing the balanced accuracy of existing classifiers.

The empirical findings of the study demonstrate that models trained on FairFace outperform those trained on existing datasets when applied to novel data with a greater representation of non-White faces. Moreover, the consistent accuracy achieved across race and gender groups signifies the effectiveness of FairFace in reducing the asymmetrical performance observed in previous datasets. The inclusion of commercial computer vision APIs in the evaluation further strengthens the study's relevance and practical implications. By comparing the balanced accuracy of these APIs across gender, race, and age groups, the authors highlight the importance of dataset fairness in developing reliable and unbiased computer vision systems.

Overall, the research presented in this source underscores the critical role of unbiased and inclusive datasets in mitigating algorithmic biases and promoting fairness in computer vision applications. The availability of the FairFace dataset, along with the associated code and models, offers researchers a valuable resource for further investigation into the challenges and opportunities of algorithmic fairness in face analytics.

4. Skincare FacialMetric V1.0 (2022), project by QOVES Laboratory

Skincare FacialMetric V1.0 by QOVES Laboratory is an AI-based solution that addresses the importance of racial and sex fairness in machine learning algorithms. It recognizes the existing problems related to biases in data science and the limited diversity in training datasets, which perpetuate unfairness and discrimination in AI systems.

Facial recognition AI technology is used in various areas like healthcare, security, and law enforcement. For example, it can help identify skin problems like cancer, assist with surveillance cameras, and even match faces to catch criminals. The problems lie in how the systems can struggle with people who have darker skin or different features. This can lead to mistakes such as false arrests, misdiagnoses, and more.

The initial step in developing a machine learning algorithm involves training it with relevant data. However, the industry faces a challenge as much of the research is trained on

a limited range of photos (notably ImageNet and Yahoo Flickr) that does not represent the diversity of real people, which may lack diversity and contain imbalances and biases.

QOVES aims to address these issues through their Skincare FacialMetric V1.0 solution. They emphasize three primary goals: improving racial parity and fairness in AI, increasing low contrast and low light detection in computer vision, and enhancing transparency and explainability in predictions.

To achieve these goals, QOVES uses a technique called Style-Mixing with a machine learning architecture called Generative Adversarial Network (GAN). This is a type of machine learning architecture that involves two different models working against each other. One model is called the generator, and its job is to create something new, like realistic images or faces. The other model is called the discriminator, and it tries to tell if the things created by the generator are real or fake.

The generator and discriminator constantly compete and learn from each other. The generator keeps trying to create more realistic images to fool the discriminator, while the discriminator keeps getting better at distinguishing between real and generated images. This competition continues until the generator becomes really good at creating images that are hard for the discriminator to distinguish from real ones.This process is called adversarial because the generator and discriminator are adversaries, constantly challenging each other to improve. They learn from their mistakes and get better over time. As a result, the generator becomes skilled at generating realistic images, while the discriminator becomes better at recognizing the fakes.

In the context of Skincare FacialMetric V1.0 by QOVES, the GAN technology called StyleGAN is used to generate new and unique faces by combining features from existing ones. This allows for the creation of diverse and realistic facial images that can be used for various purposes. StyleGAN focuses on high-level attributes of an image, such as pose, phenotypical features, and emotions at different aging levels. Its speed and pre-trained models allow for the machines to efficiently transfer data and generate faces at relative speed. Additionally, StyleGAN introduces stochastic variation, enabling the generation of unique facial features like hairstyles, freckles, or moles. This versatility provides QOVES

with extensive control and the ability to fine-tune parameters to generate the desired type of face.

The Skincare FacialMetric V1.0 solution presented by QOVES addresses important concerns regarding biases in AI algorithms and the limited diversity in training datasets. The explanation of the machine learning architecture and the use of StyleGAN technology to generate diverse facial images is well-articulated. The solution's emphasis on racial parity, fairness, and transparency in AI aligns with the goal of promoting inclusivity. However, it would be beneficial to include real-world examples or case studies demonstrating the effectiveness and practical implementation of the solution.

5. Shape of You: Precise 3D shape estimations for diverse body types (2023) by Rohan Sarkar, Achal Dave, Gerard Medioni, Benjamin Biggs, published by Purdue University

The paper addresses the need for accurate 3D shape estimation in vision-based clothing recommendation systems. The authors highlight the existing gap in the field, where most methods focus on estimating 3D poses but lack precision in shape estimation, particularly for diverse human bodies. They propose novel loss functions and a test-time optimization routine to enhance the accuracy of 3D body shape estimation.

The authors acknowledge the significance of image-based 3D human reconstruction techniques in the fashion industry. These techniques aim to extract shape and pose deformations from 2D images, enabling applications such as predicting suitable clothing sizes and identifying flattering garments. While recent advancements have focused on robust 3D pose estimation, precise shape estimation for diverse body types, including plus-size bodies, remains challenging due to limited training data.

The "Shape of You" (SoY) method surpasses previous work, including the SHAPY method, by achieving a notable 17.7% increase in accuracy on the challenging SSP3D dataset. The authors show that their approach outperforms existing methods in shape estimation, even without the need for annotated body measurements or semantic textual attributes utilized by those methods.

The authors acknowledge the scarcity of training data for precise shape estimation, particularly for under-represented body characteristics. This recognition of the data imbalance and its impact on accurate shape estimation adds depth to the paper's analysis.

C. Implications of inclusivity

1. Body image as a global mental health concern (2023), academic article by Rachel Rodgers, Katherine Laveway, Priscila Campos, and Pedro Henrique Berbert de Carvalho, published by Cambridge University Press

This study examines body image concerns as a global mental health concern. The paper reviews theoretical frameworks that explain the similarities and differences in body image concerns worldwide and provides an overview of the existing empirical data. Body image concerns, including dissatisfaction with appearance and weight, are prevalent globally due to societal pressures to conform to appearance ideals. While cultural contexts may influence the specific manifestations of body image concerns, their prevalence and negative impact on mental and physical health are universal. The study highlights the need for interventions at both individual and systemic levels to address these concerns.

The theoretical overview section explores different frameworks guiding body image research. One notable concept is "body capital," which highlights how physical appearance has become a valuable social currency, conferring varying degrees of power and privilege. Understanding body capital is crucial when examining how individuals perceive their bodies within oppressive systems and view them as a modifiable means of acquiring potential capital. Certain bodies, aligning with societal beauty standards, tend to possess higher body capital, such as women with a slender, toned yet curvy physique, and men with a muscular, lean build and a golden skin tone. Nevertheless, it's important to acknowledge that individuals with marginalized identities, like Black and Indigenous People of Color, as well as those in larger bodies, face greater pressure to invest in their appearance to attain capital. Thus, while certain bodies may be deemed to hold more body capital according to societal norms, the distribution of body capital is inherently influenced by social hierarchies and power dynamics.

Another concept is how societal discourses and media influence beliefs about appearance. Gendered processes and objectification contribute significantly to body image issues. Women, in particular, experience objectification, where their bodies are treated as objects of desire and scrutiny. This objectification leads to negative consequences, such as body dissatisfaction, self-objectification, and comparison to societal ideals. Additionally, minority stress theories explore how individuals with minoritized identities face appearance-based discrimination, impacting their body image. Minority stress, stemming from prejudice and mistreatment based on physical appearance, poses unique challenges for marginalized groups. This includes racist beauty standards, appearance-related homophobia or transphobia, and ableism. The experience of appearance-based discrimination exacerbates body image issues and psychological distress. Understanding these factors is crucial for promoting inclusivity and supporting individuals of all genders and identities.

The paper also provides a comparative analysis of body image issues across different regions including the USA, Europe, Asia, Africa, and the Middle East. The prevalence and presentation of body image concerns vary across these regions due to cultural and socio-economic factors. However, it is important to note that body image concerns are a global phenomenon and are associated with poor mental and physical health regardless of the cultural context.

In high-income English-speaking countries such as the USA, Canada, the UK, and Australia, body image concerns are highly prevalent, with a strong emphasis on adhering to unrealistic appearance ideals. Women, sexual and gender minorities, individuals living in larger bodies, and those from minoritized racial and ethnic backgrounds tend to experience higher levels of body image concerns. These concerns are associated with eating disorders, depression, and poor psychosocial functioning.

In European non-English-speaking countries, body image concerns are also prevalent, although overall rates tend to be lower than in English-speaking countries. Variations exist within Europe, with different countries showing different levels of body image dissatisfaction. Latin countries, such as Portugal and Spain, place a higher emphasis on appearance, leading to higher rates of cosmetic surgery and body image concerns.

Body image concerns in Europe are associated with mental health issues and poor psychological functioning, indicating the need for prevention efforts.

In Latin American countries, body image disturbances and appearance concerns are prevalent. Sociocultural factors such as pressure to achieve social body ideals, internalization of appearance ideals, and unique pressures to meet unrealistic beauty standards contribute to body image concerns. Poor mental health outcomes such as low self-esteem, depressive symptoms, and poor psychological well-being are associated with body image concerns in Latin America.

In Sub-Saharan Africa, traditional standards of beauty often reflect a preference for a larger body size and a curvier shape. However, globalization has brought increasing pressures to achieve Eurocentric beauty ideals in Africa, resulting in a desire for smaller hips, larger buttocks, straight hair, lighter skin tones, and slimmer noses among African women. Body image concerns are associated with exposure to Western media, and similar to other regions, they have been linked to eating disorders, depression, lower quality of life, and general psychiatric morbidity in Africa.

Asia exhibits diverse beauty ideals and body image concerns that vary across countries and cultural groups. There is a particular emphasis on facial features and skin tone, with some regions showing high levels of body image concerns due to Westernization and affluence. Media influence, including the internalization of appearance ideals, plays a significant role in shaping body image perceptions in Asian countries. Body image concerns are associated with negative outcomes such as eating disorders, depression, and lower quality of life.

In the Middle East, body image concerns are present, particularly among women, with dissatisfaction regarding body weight and preferences for Western models' body shapes. Sociocultural factors, including media influence and the internalization of appearance ideals, contribute to body image concerns. Cultural and religious values also play a role, but the relationships between these factors and body image are complex and require further exploration. Body image concerns in the Middle East have been associated with eating disorder symptoms, depression, and anxiety. Tailoring prevention efforts to

these settings is crucial to address the significant mental health burden related to body image.

Overall, while there are regional variations in the prevalence and presentation of body image concerns, the harmful effects on mental and physical health are consistent across regions. The findings suggest a need for increased efforts to prevent and address body image concerns on a global scale, through interventions that challenge appearance ideals, promote positive body image, and address the underlying socio-cultural factors contributing to body dissatisfaction.

D. Dimensions of style

1. ***Seeing Through Clothes (1993), book by Anne Hollander***

The book "Seeing Through Clothes" by Anne Hollander explores the role of clothing as a means of self-expression. Hollander argues that clothing serves as more than just a practical item, but also as a form of communication.

One aspect discussed in the book is how clothing can be used to belong to or segregate different communities. Hollander suggests that clothing plays a role in creating a sense of identity and community within a certain group. Members of a particular group may adopt similar clothing styles, accessories, or hairstyles to establish their affiliation. This fosters a feeling of belonging and solidarity among members. On the other hand, clothing can also differentiate between groups, as each may have its distinct fashion choices, reinforcing the boundaries that separate them. Furthermore, clothing can communicate the values and beliefs, such as sustainability or support for specific causes. In some cases, clothing can facilitate integration between different subcultures, for example, during events where people choose to wear more neutral attire, promoting unity and cohesion.

The book also addresses the connection between clothing and gender identity. Hollander contends that gender identity is not solely determined by biology but is also influenced by cultural factors. Clothing choices can serve as a means of expressing one's gender identity, which can vary across different cultures. Historical examples and cross-cultural comparisons are presented to demonstrate how clothing has been used to express

gender identity throughout time. For instance, specific garments or styles were associated with masculinity or femininity in different eras. Hollander's argument challenges the notion that gender identity is fixed and highlights its fluidity. Clothing, body language, hairstyles, and makeup are cited as ways through which individuals express their gender identity.

Furthermore, Hollander explores how clothing can communicate social status. She asserts that clothing has been utilized to signify wealth, power, and social standing across history and cultures. Historical instances are provided to illustrate how certain colors, fabrics, or designer labels have been associated with specific social classes or privileged positions. By emphasizing the role of clothing in conveying social status, Hollander challenges the perspective that clothing is solely a matter of personal taste and reveals its significance in society.

In summary, "Seeing Through Clothes" by Anne Hollander delves into the multifaceted aspects of clothing as a means of self-expression, belonging to subcultures, expressing gender identity, and communicating social status while citing historical examples and cross-cultural comparisons to support its arguments. However, one potential limitation is the focus on Western fashion and cultural contexts, which may not fully capture the diversity of clothing practices and meanings across different cultures worldwide. Additionally, while the book recognizes the influence of clothing on identity and belonging, it could benefit from further exploration of the power dynamics and social inequalities that can be reinforced through clothing choices.

2. *Mind What You Wear: The Psychology of Fashion (2014), book by Karen Pine*

In the book "Mind What You Wear: The Psychology of Fashion" by Karen Pine, the author explores the impact of clothing choices on self-perception. According to Pine, wearing clothes that elicit positive feelings can enhance confidence and have beneficial effects. This can result in increased productivity, improved decision-making, and stronger social interactions. For instance, a study conducted by researchers at the University of Toronto demonstrated that individuals who wore empowering clothes performed better in creative and problem-solving tasks. Similarly, a study from the University of Pennsylvania found that

people who wore clothes that made them feel attractive were perceived as competent and likable by others.

On the other hand, wearing uncomfortable clothing can have detrimental effects on self-perception. Pine suggests that it can diminish confidence, reduce feelings of capability, and contribute to anxiety. This can lead to negative outcomes such as decreased productivity, impaired decision-making, and social isolation. The aforementioned study from the University of Toronto also revealed that individuals wearing uncomfortable clothes experienced higher levels of anxiety and performed less effectively in creative and problem-solving tasks. Furthermore, research conducted by the University of Pennsylvania indicated that people who wore clothes that made them feel insecure were more likely to experience social anxiety and were less inclined to engage in social interactions.

Pine further explains that wearing uncomfortable or insecure clothing can trigger the fight-or-flight response in the body, resulting in the release of stress hormones like adrenaline and cortisol. These hormones can contribute to feelings of anxiety, stress, and irritability, making it difficult to concentrate and focus. Additionally, wearing clothes that generate discomfort or insecurity can negatively influence self-perception by undermining confidence and a sense of capability.

The book explores the psychological impact of clothing choices on self-perception. It highlights the link between clothing and confidence, productivity, decision-making, and social interactions. The book draws on research studies to support its claims. However, it is important to note that individual experiences and responses to clothing can vary greatly, and the book may not account for the full complexity of human psychology and the multitude of factors that contribute to self-perception. Additionally, the book primarily focuses on the effects of clothing on the individual and does not extensively address the broader social and cultural influences on fashion choices.

VIII. Futurization Methods

A. Trends

Trends refer to patterns or shifts in behavior, preferences, technologies, or other factors that indicate a direction or trajectory of change. They highlight emerging patterns or tendencies that can shape future outcomes. Identifying and analyzing trend will provide insights into the evolving landscape and make informed predictions about the future (Monguet Fierro, Trullols i Farreny, & Trejo Omeñaca, 2022).

1. Diversity

With the globalization of media, there is a continuous push to emphasize diversity and challenge traditional beauty standards (Cervantes-Anguas, 2021). The younger generations are increasingly recognizing that beauty transcends racial boundaries and extends beyond the Eurocentric ideals that have prevailed in the past. This shift is evident in the growing inclusivity of makeup ranges and the increased representation of diverse races in entertainment media (Wharry, 2020).

Actor Timothee Chalamaet and male Korean idols are celebrities widely considered attractive despite having traditionally feminine facial features

Moreover, societal norms are being questioned, leading to a redefinition of the ideal beauty standards associated with gender. The breaking down of traditional expectations allows for greater acceptance and expression of personal style and identity. For instance, the concept of cross-dressing is evolving, as the younger generation challenges "toxic masculinity" and the rigid adherence to traditional gender roles. Androgynous features are gaining popularity and being celebrated, with surgery trends becoming more gender-neutral (Radin, 2019). Additionally, there is a rising movement promoting body positivity and empowerment for individuals who do not fit conventional attractiveness norms (Griffin, Bailey & Lopez, 2022). Movements such as the "Short Kings," empowering men shorter than 5'8, and the focus on plus-size inclusion, are examples of efforts to challenge and broaden beauty standards.

Future methodologies can explore these emerging trends and attitudes towards beauty, delving into the impact of technology, media, and cultural shifts on shaping and redefining beauty ideals. By incorporating diverse perspectives and capturing the voices of different communities, researchers can gain a deeper understanding of the evolving nature of beauty and its social, cultural, and psychological implications.

2. Excess

The advent of social media has facilitated the rapid dissemination and evolution of trends and subcultures, creating a dynamic landscape where beauty ideals emerge, evolve, and fade at an accelerated pace. "-core" cultures have emerged as distinct subcultures, each with its own set of aesthetic ideals and characteristics (Criales-Unzueta, 2022). For example, e-boys embrace an edgy and alternative style with dark clothing, chains, and expressive makeup. Cottagecore celebrates a nostalgic and romanticized rural aesthetic with flowy dresses, flower crowns, and pastoral imagery. Cybergilism, on the other hand, combines futuristic elements with a cyberpunk aesthetic, featuring neon colors, futuristic fashion, and digital themes. These subcultures reflect the diverse influences and inspirations found online and highlight the multiplicity of beauty ideals in contemporary society.

The prevalence of beauty ideals can be attributed to the media and market's exploitation of the demand to conform to these standards. Social media influencers have played a significant role in promoting products that align with these ideals, such as weight loss teas and waist trainers, despite their questionable effectiveness (Pilgrim & Bohnet-Joschko, 2019). These trends and capitalist approaches have created a culture of replication, where individuals strive to imitate the imagery and appearances they encounter online, including celebrities.

A depiction of the e-girl (left) aesthetic and the cottagecore (right) aesthetic, retrieved from YouTube

The accessibility of plastic surgery, the rise of augmented technology for facial modification, and the influence of celebrities have also contributed to the reinforcement of beauty standards. People are willing to take significant risks and invest large sums of money to fit into these ideals. Surgeons now market their services on platforms like Instagram, capitalizing on the demand for cosmetic enhancements (Tolentino, 2019).

To meet the demands of these rapidly changing trends, fast fashion companies have emerged, generating new clothing items at an astonishing rate. Companies like Shein utilize AI to identify and capitalize on real-time trends, producing up to 1,000 new items every day. However, the fast fashion industry's swift production cycle contributes to environmental concerns, including pollution and waste, as companies prioritize speed and quantity over sustainability (PSFK, 2022).

In understanding the dynamics of beauty and its influence on society, it is essential to consider the complex interplay between social media, market forces, consumer behavior, and the environment. Future research can delve into the societal implications of these trends, including their impact on self-esteem, body image, and sustainability, while also exploring alternative narratives and promoting inclusivity and self-acceptance.

3. Virtuality

In virtual spaces, the concept of beauty has evolved with the advancement of technology. Users now have the ability to augment their appearance through various tools and filters, blurring the line between what is real and what is digitally enhanced. Platforms like Snapchat, Instagram, and TikTok offer beauty filters that can alter facial features and even change body proportions. This widespread use of filters and editing tools can create a distorted perception of reality, as users compare themselves to highly curated and edited versions of others. This can lead to feelings of inadequacy or unattractiveness when faced with the unattainable beauty standards set by these augmented representations (Tolentino, 2019).

Standard avatars on IMVU, retrieved from IMVU

In the Metaverse, individuals have the freedom to create and customize their digital personas, allowing them to embody any desired appearance. One example is the IMVU avatar chatroom game, which exhibits aesthetics similar to the popular "Instagram face and body" trends. This aesthetic often includes flawless skin, full lips, contoured features, and an hourglass figure for females, while males may have chiseled jawlines, muscular builds, and fashionable styles. These virtual avatars provide an opportunity for users to experiment with their appearance and explore different beauty ideals beyond their physical limitations.

In VR chat games, users have the ability to assume any form or avatar they desire, pushing the boundaries of self-representation. These avatars can range from humanoid figures to fantastical creatures, granting individuals a high degree of customizability. Users can modify their avatar's appearance, including body shape, facial features, clothing, and accessories, to create a unique and personalized virtual identity. This customization aspect of VR chat games allows users to transcend societal beauty norms and embrace a wide spectrum of creativity in their virtual representation.

Overall, virtual spaces in the Metaverse offer individuals the opportunity to redefine beauty and explore diverse aesthetics, challenging traditional notions of attractiveness and allowing for a more inclusive and liberated expression of self.

B. Scenarios

Scenarios are imaginative yet plausible narratives or descriptions of potential future situations or contexts. They provide a structured framework for envisioning different possible futures. They are often developed based on a combination of trends, uncertainties and headlines (Monguet Fierro, Trullols i Farreny, & Trejo Omeñaca, 2022).

1. Individual: The use of augmented reality technology on social media apps to digitally modify faces and bodies to the ideal standard

Politics or Economics	Social or Cultural	Science and Engineering
Beauty corporation industry capitalizing off of selling the standards being promoted on these applications	The global wide access to social media and this technology will make the standard of beauty more similar across different cultures	Augmented reality beauty technology is advancing, hence becoming more seamless and accessible that it is difficult to identify what is real or fake

Scenario 1 — In a world driven by economic trends, the beauty corporation industry capitalizes on the selling of beauty standards promoted through various applications and platforms. With the rise of social media and technology, beauty companies harness the power of augmented reality (AR) and virtual reality (VR) to create immersive beauty experiences. Consumers can virtually try on makeup, experiment with hairstyles, and even undergo virtual beauty enhancements. This technology allows individuals to customize their appearance and achieve their desired beauty standards with ease.

As the beauty industry embraces these advancements, a virtual beauty empire emerges. Beauty corporations establish virtual platforms where users can access an extensive range of beauty products, services, and tutorials. These platforms integrate seamlessly with social media applications, allowing users to enhance their virtual appearance and share their transformations with their online communities. The industry thrives by monetizing these virtual beauty experiences through subscription models, in-app purchases, and partnerships with influencers and content creators.

Scenario 2 — Driven by scientific advancements, augmented reality beauty technology evolves into a seamless and accessible tool that challenges the perception of reality. As AR technology becomes more advanced, it becomes increasingly difficult to distinguish between real and digitally altered appearances. Beauty filters on social media platforms transcend simple enhancements and offer highly realistic transformations, blurring the lines between what is real and what is manufactured.

In this scenario, society grapples with the illusion of beauty. Individuals increasingly rely on augmented reality technology to present themselves online and in virtual spaces, where flawless features and perfect proportions are the norm. The pressure to conform to these digitally enhanced beauty standards becomes overwhelming, leading to heightened anxiety, self-esteem issues, and a distorted sense of self-image.

As the illusion of beauty becomes more prevalent, there is a growing awareness and discourse surrounding the potential negative impacts of digital manipulation on mental health and self-perception. Some individuals and communities push back against these unrealistic beauty ideals, advocating for authenticity and promoting body positivity. They strive to redefine beauty beyond digitally altered appearances and emphasize the value of real, diverse, and inclusive representations.

In this scenario, society faces the challenge of navigating the fine line between embracing technological advancements and maintaining a healthy relationship with self-image and beauty standards. The rapid progress of augmented reality beauty technology prompts conversations about the ethics, responsibility, and regulation surrounding the use of such tools. It also highlights the importance of fostering a culture that values and celebrates natural beauty, diversity, and individuality in an increasingly digital world.

2. Social: Increased interest in diversity and inclusivity

Politics or Economics	Social or Cultural	Science and Engineering
Beauty brands making products that are suitable for people with different cultural backgrounds	There is an exchange of borrowing beauty techniques and routines from other cultures	Demand for technology to be trained to recognize more than just the Caucasian face, especially since AI is beginning to integrate with beauty

Scenario 1 — As the beauty industry embraces diversity and inclusivity, a scenario emerges where beauty brands prioritize creating products that cater to people with different cultural backgrounds. Beauty brands recognize the importance of embracing and celebrating diverse beauty standards and traditions. They invest in research and development to understand the unique needs and preferences of various cultural communities, ensuring that their product offerings are inclusive and representative of a wide range of skin tones, hair textures, and beauty rituals.

In this scenario, the global fusion of beauty takes place, where there is an exchange of beauty techniques and routines across different cultures. People become more open to exploring and adopting beauty practices from other cultural backgrounds, appreciating the richness and diversity of global beauty traditions. This cultural exchange inspires innovation in the beauty industry, leading to the development of hybrid beauty products and the sharing of knowledge and expertise across borders.

Scenario 2 — Driven by the demand for inclusivity and fairness, a scenario unfolds where the beauty industry embraces ethical AI practices. Beauty brands and technology companies recognize the importance of ensuring that AI algorithms used in beauty applications are unbiased, inclusive, and respectful of diverse beauty standards. They invest in research and development to eliminate racial and cultural biases from AI systems and work towards creating a more equitable and ethical beauty landscape.

In this scenario, the beauty industry adopts comprehensive AI training and validation processes to ensure that algorithms are trained on diverse data sets that accurately represent the full spectrum of human beauty. This involves collaborating with experts from

different cultural backgrounds to provide insights and perspectives that help shape the development of AI technologies. Brands also prioritize transparency, providing users with information on how AI algorithms work and the steps taken to mitigate biases and promote inclusivity.

Additionally, this scenario encourages open dialogue and collaboration between the beauty industry and AI experts to address challenges and continuously improve AI systems' performance in recognizing and catering to diverse beauty needs. It fosters a culture of responsibility and accountability, where the focus is on using AI as a tool to empower and enhance individuals' beauty experiences while ensuring fairness, representation, and respect for all.

In this scenario, the beauty industry sets a precedent for ethical AI practices, prompting other sectors to follow suit. The collaborative efforts and commitment to inclusivity in the beauty industry inspire a broader movement towards building AI systems that embrace diversity, challenge biases, and serve as positive tools for social change.

3. World: Beauty as an economic driving force

Politics or Economics	Social or Cultural	Science and Engineering
Corporations keeping up with the demand of changing beauty standards in order to sell	Social awareness on overconsumption has caused a global increase in online thrift markets	Corporations using AI to generate trends in real time to meet the demands of the market

Scenario 1 — In this scenario, beauty corporations proactively adapt to the changing beauty standards and consumer demands. Recognizing the importance of staying relevant and catering to diverse beauty preferences, corporations invest in market research, trend analysis, and consumer insights. They closely monitor shifts in beauty standards and engage in continuous innovation to develop products that align with the evolving ideals of beauty.

Beauty corporations leverage advanced technologies, such as artificial intelligence (AI), to generate real-time trends and insights. By analyzing massive amounts of data from social media, online communities, and consumer behavior, AI algorithms provide valuable

information about emerging beauty trends and consumer preferences. Armed with this knowledge, corporations are able to rapidly develop and launch products that meet the dynamic demands of the market.

Moreover, the scenario also highlights the growing awareness of overconsumption and the rise of online thrift markets. As consumers become more conscious of the environmental impact of fast fashion and excessive consumption, there is a global shift towards sustainable and second-hand fashion. Beauty corporations recognize this trend and respond by incorporating sustainability into their business models. They introduce initiatives such as recycling programs, refillable packaging, and partnerships with online thrift platforms, allowing consumers to trade or purchase pre-loved beauty products.

Scenario 2 — With the help of AI and advanced data analytics, beauty corporations enter a new era of personalized beauty trends. In this scenario, corporations harness the power of AI algorithms to understand individual consumers' preferences and create tailored beauty trends and recommendations. By analyzing consumer data, including browsing history, purchase patterns, and social media interactions, AI systems generate personalized trend suggestions that cater to each consumer's unique beauty preferences and characteristics.

This personalized approach allows beauty corporations to develop highly targeted marketing campaigns and product offerings. AI algorithms identify patterns and correlations among consumer data, uncovering niche trends and beauty preferences that might have been overlooked in traditional market research methods. As a result, corporations can offer a wide range of products and services that resonate with diverse consumer segments, fostering a sense of inclusivity and individuality.

Additionally, AI-driven trend generation enables beauty corporations to respond swiftly to changing market demands. By constantly monitoring consumer behavior and preferences, corporations can quickly identify emerging trends and adapt their strategies to meet the demands of the market. This agile approach allows them to stay ahead of the curve, launching products and campaigns that align with the latest beauty trends, effectively capturing consumer attention and driving sales.

Overall, these scenarios illustrate the dynamic nature of the beauty industry, where corporations embrace technological advancements, respond to changing consumer demands, and employ AI-driven strategies to thrive in a rapidly evolving market.

C. Future Wheel

The future wheel is a strategic foresight tool used to explore potential future scenarios and their implications. It allows for systematic thinking about future possibilities by examining the consequences of specific trends or events (Monguet Fierro, Trullols i Farreny, & Trejo Omeñaca, 2022). The future wheel consists of a central event or trend in the center of a diagram, with various spokes radiating outwards representing different potential outcomes or impacts of that event or trend. Each spoke is further divided into sub-spokes, which delve deeper into the implications of the scenario.

In the analysis, the wheel has diverted from the traditional wheel concept into a more complex and interconnected web to capture the multifaceted nature of beauty and its various factors, causes and effects. Many of the variables connected to one another, allowing for deeper exploration on the interdependencies and relationships between these elements.

Figure i.C.2 — Future Wheel: Beauty

IX. Target Market

The target audience for LookBook comprises primarily of individuals from the Gen Z and Generation Alpha demographics, who are often exposed to and influenced by the pervasive presence of technology in their lives (Parker & Igielnik, 2020). This audience includes individuals from underrepresented ethnic backgrounds, particularly in regions where Eurocentric beauty standards are prioritized, such as Europe, the United States, and post-colonial nations (Rodgers, et al., 2023). By focusing on these demographics, LookBook aims to address the limited representation and narrow beauty ideals that are prevalent in mainstream media and digital platforms.

In terms of psychographics, the target audience for LookBook is characterized as tech-savvy individuals who are proficient in navigating and utilizing various technological platforms and applications. They value their appearance and are conscious of the impact of beauty standards on their self-perception and societal acceptance. These individuals are creative and seek avenues for self-expression, embracing their unique style and individualism. They are also curious and open-minded, actively seeking diversity and inspiration in their pursuit of beauty.

The target audience experiences the problems discussed earlier in a variety of ways. Firstly, they often feel excluded and underrepresented in mainstream media, which perpetuates Eurocentric beauty standards and fails to acknowledge the diversity of beauty. It has been recorded that generation Z and generation alpha are the most ethnically diverse generations(Parker & Igielnik, 2020) (Fell & McCrindle, 2022) This lack of representation can lead to feelings of inadequacy, low self-esteem, and limited opportunities for self-expression (Rodgers, et al., 2023). Additionally, they face the pressure to conform to unattainable beauty ideals propagated by technology, leading to body dissatisfaction and a negative impact on their mental health (Tolentino, 2019).

LookBook addresses these problems by providing a platform where individuals from underrepresented ethnic backgrounds can find adequate representation and celebrate their unique beauty. By offering a diverse range of beauty inspirations and personal styles, LookBook empowers its users to embrace their individuality and creativity. The platform

fosters a positive community where individuals can connect, support each other, and challenge the narrow beauty standards prevalent in society. Through LookBook, the target audience can explore alternative definitions of beauty, expand their perspectives, and contribute to driving positive change in the beauty landscape.

X. Market Research

The market research delves into applications that people use for appearance. The first part of the analysis includes popular social media applications that individuals utilize to enhance their appearance. The second part is shifted towards style-centric applications used for discovery. By conducting a thorough analysis of various platforms, gaps in the market that call for innovative solutions are to be identified. Alternatively, valuable insights on what is already being done effectively will avoid duplicating these efforts and focus will remain on areas requiring improvement or alternative approaches.

A. Mainstream social media applications

The analysis focuses on examining the impact of popular social media platforms, including Instagram, TikTok, Pinterest, and Reddit, on users' engagement with appearance-related content. While Instagram, TikTok, and Pinterest are renowned for their visually-driven nature, the research acknowledges the importance of Reddit, a forum-based platform, despite its primary focus not being centered on images. This inclusion is motivated by the presence of highly engaged communities within Reddit that exhibit a strong emphasis on appearance and beauty.

	Instagram	TikTok	Pinterest	Reddit
Core Purpose	1. Sharing photos and videos 2. Self-expression, creativity and communication 3. Content discovery 4. Social connections	1. Sharing and creating short-form videos 2. Creativity, entertainment and vitality 3. Content discovery	1. Lifestyle and creative discovery 2. Content organization and curation	1. Sharing content in communities 2. Forum discussions 3. Community engagement
Strong Points	1. Users can express individual style on their feeds 2. Trend, style and influencer discovery 3. Visual inspiration 4. Validation through engagement 5. User-generated content	1. Content challenges 2. Quick trend dispersion 3. Provides short-form DIY, tips and tutorials videos 4. Community-oriented 5. Easy way to build followings 6. User-generated content 7. Cultivates many niche communities that have previously been unrepresented	1. Various sources, such as user-generated content and web crawler-sourced content, for personalized visual inspiration 2. Can be used for specific and personalized occasions and styles 3. Provides DIY, tips and tutorials 4. Allows for following curated content	1. Cultivates many niche communities that have previously been unrepresented 2. User-generated content 3. User-led communities 4. Anonymity allowing users to be open and honest 5. Quick place for sharing, recommendations and feedback

Weak Points	1. Creates pressures for users to be curated, which leads to comparison and feelings of inadequacy 2. Difficulty in discerning accurate information and expertise amidst a vast amount of user-generated content 3. Excess sponsored content and influencer marketing 4. Causes dysmorphia due to high editing and filtering	1. Short-lived trends 2. Content, context, and information are oversimplified to fit the short-form content 3. Difficulty in discerning accurate information and expertise amidst a vast amount of user-generated content 4. Personalized content may result in limited exposure to diverse perspectives 5. Causes dysmorphia due to high editing and filtering 6. Prioritizes “attractive” faces and bodies to be shown first on feeds according to their algorithm	1. Limited social interaction 2. Lack of diversity as posts that are prioritized when searched are geared towards idealized beauty standards 3. Limited real-time updates and trends compared to platforms like Instagram or TikTok 4. Some content lack proper attribution or source verification that has lead to copyright issues	1. Lack of visual focus 2. Anonymity can cause users to be untrustworthy and abusive 3. Men sending unwanted advancements to women who post photos of themselves in communities 4. Certain communities can create an echo chamber of toxic beliefs

Algorithm Models	1. Prioritizes posts that receive most engagement, such as likes, saves, views, etc. 2. Prioritizes posts that use new in-application features	1. Tailored to user preferences and information, such as location, identity, and more 2. Uses captions, hashtags, and sounds to identify patterns and recommend content 3. Prioritizes “attractive” faces and bodies to be shown first for maximize how users like to engage with attractive images 4. Uses user activity data, such as the type of content users like to share and watch in full, in order to learn about their behavior	1. Prioritizes content based on the behavior of the user, such as searches, saved pins and engagement 2. Uses cookies to analyze the activity of users outside the application to recommend content 3. Recommends based on popularity and engagement	1. Users may upvote or downvote posts; posts with high upvotes have higher visibility 2. Posts with high engagement, such as upvotes, downvotes, and discussions, have higher visibility

The analysis sheds light on the utilization of mainstream social media platforms, such as Instagram, TikTok, Pinterest, and Reddit, for style and self-expression purposes, despite their primary focus not being centered on appearance-related content. This highlights the transformative opportunities users create within these platforms, indicating that applications should not be rigidly confined to specific purposes but rather embrace users' creativity and adaptability.

In terms of algorithmic experiences, there is a growing sense of user fatigue with platforms that heavily promote sponsored content, highly curated and edited images, and the perpetuation of an idealized version of beauty. This has sparked a demand for more authentic and genuine user-generated content, with platforms like BeReal gaining popularity as an alternative to the curated and sponsored environment of Instagram. The emergence of trends like "instagram dumps," where users intentionally share unedited and unconventional photographs, further underscores the desire for raw and relatable content (Dazed Studio, 2023). This indicates a shift in user preferences and an increasing awareness of how algorithms shape and manipulate realities presented to them.

Additionally, the analysis highlights the significance of niche communities within platforms like TikTok and Reddit. These platforms provide spaces for users to connect and interact with like-minded individuals who share specific interests. Unlike platforms that foster a sense of competition, TikTok and Reddit promote positive social interactions and encourage the cultivation of communities based on shared passions. This demonstrates the importance of nurturing connections and facilitating meaningful engagements among users with similar interests, fostering a sense of belonging and enhancing user satisfaction.

Overall, the analysis reveals the dynamic nature of user behavior and preferences within social media platforms, emphasizing the need for platforms to adapt to users' evolving needs, embrace authenticity, and foster inclusive and engaging communities.

B. Style-centric applications

The second part of the analysis centers on style-focused applications, namely Acloset, Stylebook, Trendabl, and Pose. While these apps are specifically designed for style-related purposes, it is observed that they have not gained the same level of traction and usage as mainstream applications in the realm of fashion and style. Nonetheless, it is crucial to examine the existing features and functionalities of these applications to identify areas of improvement. Understanding why some of these apps have failed in achieving their objectives provides valuable insights for potential enhancements and innovations in the field of style applications.

	Acloset	**Stylebook**	**Trendabl**	**Pose**
Core Purpose	1. Wardrobe management 2. Uses AI for generating and planning outfits	1. Wardrobe management 2. Virtual clothing catalogue 3. Diary and tracker for outfits	Fashion-focused social network that aims to connect users through shared interests in style and fashion	1. Discovery of styles 2. Connecting users with similar interests 3. Marketplace for clothing
Strong Points	1. Utilizes AI to craft outfits, especially for users who find it difficult to style themselves 2. Outfit organization and categorization 3. Allows users to sell pre-loved clothes in an in-app marketplace	1. Virtual clothing catalogue 2. Allows users to plan and mix outfits 3. Records the usage history of outfits 4. Option to create lists	1. Allowed for browsing and shopping 2. Allowed users to discover trending styles	1. Recommended styles to users 2. Allowed users to browse and shop

Weak Points	1. Time consuming with how users must photograph and categorize their clothing items 2. UI design looks outdated and uninspiring	1. Time consuming with how users must photograph and categorize their clothing items 2. UI/UX may not be as intuitive for some users, requiring a learning curve to fully utilize features 3. Requires payment	1. Shutdown due to failure to retain a significant user base and the challenge to differentiate itself 2. Faced monetization challenges 3. Competed against Instagram, which was growing at the time of release	Lack of focus in terms of the purpose of the application — tried to be a social media network, fashion magazine and shopping platform all at the same time

Upon analyzing the style-focused applications, several noteworthy observations emerge. Firstly, there is a prevalent trend among these apps to create virtual closets that mirror users' real-life wardrobes, serving as platforms for outfit planning and incorporating e-commerce functionalities. However, this approach may be more appealing to users with a specific interest in meticulous tracking and organization, potentially excluding a broader user base.

Another notable issue is the failure of these applications to effectively target specific niches and establish a lasting audience. By not catering to the unique preferences and needs of particular style communities, these apps struggle to gain traction and retain active users.

Furthermore, some platforms suffer from attempting to offer a multitude of features simultaneously, resulting in a lack of clarity and confusion among users. For instance, Pose's endeavor to function as a social media network, a fashion magazine, and an e-commerce platform all at once proves overwhelming for users who struggle to determine the app's primary purpose.

Lastly, it is evident that the user interface and user experience of these style applications often appear complex and outdated compared to other non-appearance-focused apps. While the intended functionalities may not be inherently complex, the presentation and design of these apps can be overwhelming. It is crucial to create a visually inspiring design that complements the application's features and resonates with users' aesthetic sensibilities.

XI. Application

Based on extensive research conducted on the intersection of beauty and technology, a design solution called LookBook was developed as part of this study. This design solution underwent an iterative process, incorporating feedback from advisors and conducting thorough flow checks. This section aims to provide an overview of LookBook, followed by a detailed walkthrough highlighting the application's key features and the underlying technology supporting its functionality.

Communication

Based on the primary objectives of the research, LookBook is grounded in a set of core values that shape its essence. These values include representation, creativity, individualism, diversity, and community. By embracing these values, the application seeks to establish an inclusive space where users feel acknowledged and represented amidst the visually-driven landscape of beauty. LookBook aims to showcase diverse styles, allowing users to appreciate the vast range of creative expressions present within the community.

LookBook offers various tools and features to enable users to craft their personal style and enhance their confidence. These include the utilization of AI image generation to generate images to their likeness and the curation of “Books,” which are collections of organized content created by users. By providing these resources, LookBook encourages users to move away from rigid beauty standards and embrace their own unique preferences and self-expression.

An integral aspect of LookBook is its community-oriented approach. The application fosters positive engagement among users, providing a platform for discussions, collaborations, and empowerment within respective niche interests. By nurturing a supportive community, LookBook aims to create an environment where users can freely express themselves, exchange ideas, and find inspiration from others who share similar passions.

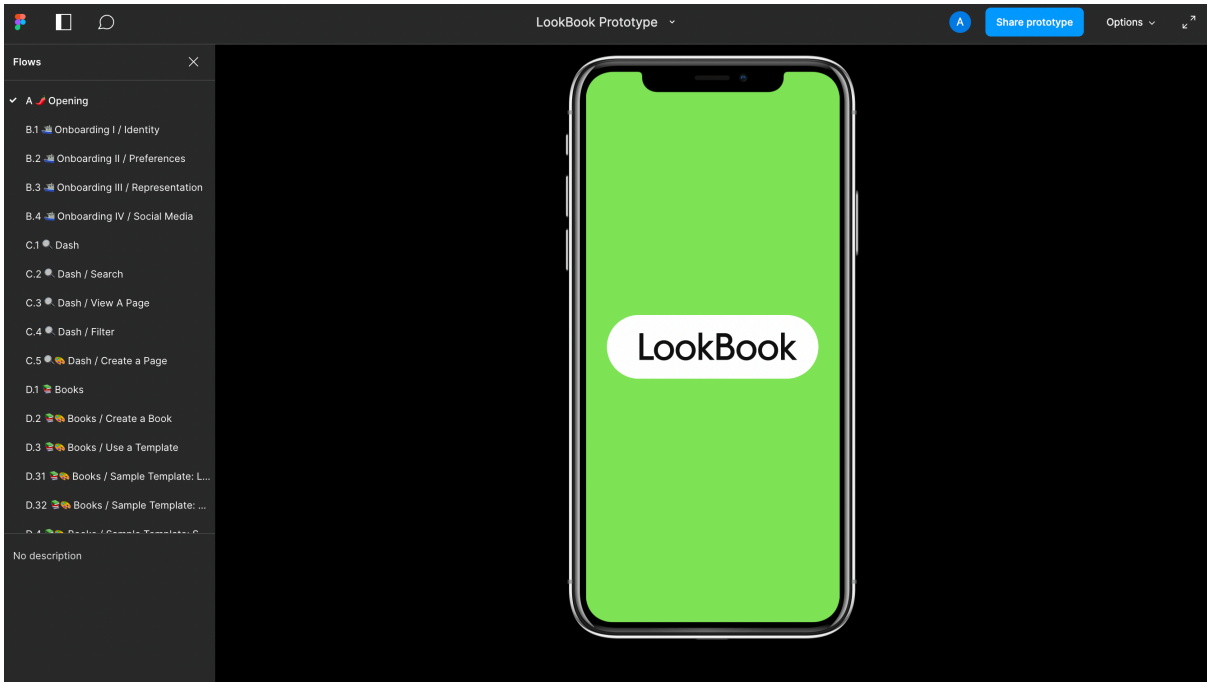
Ultimately, LookBook aims to embody the voice of a trusted companion who accepts and embraces users for who they are. By encouraging individuals to embrace their unique essence and offering the necessary tools and community support, LookBook seeks to empower users on their journey towards self-discovery and authentic self-expression.

Walkthrough

Guide

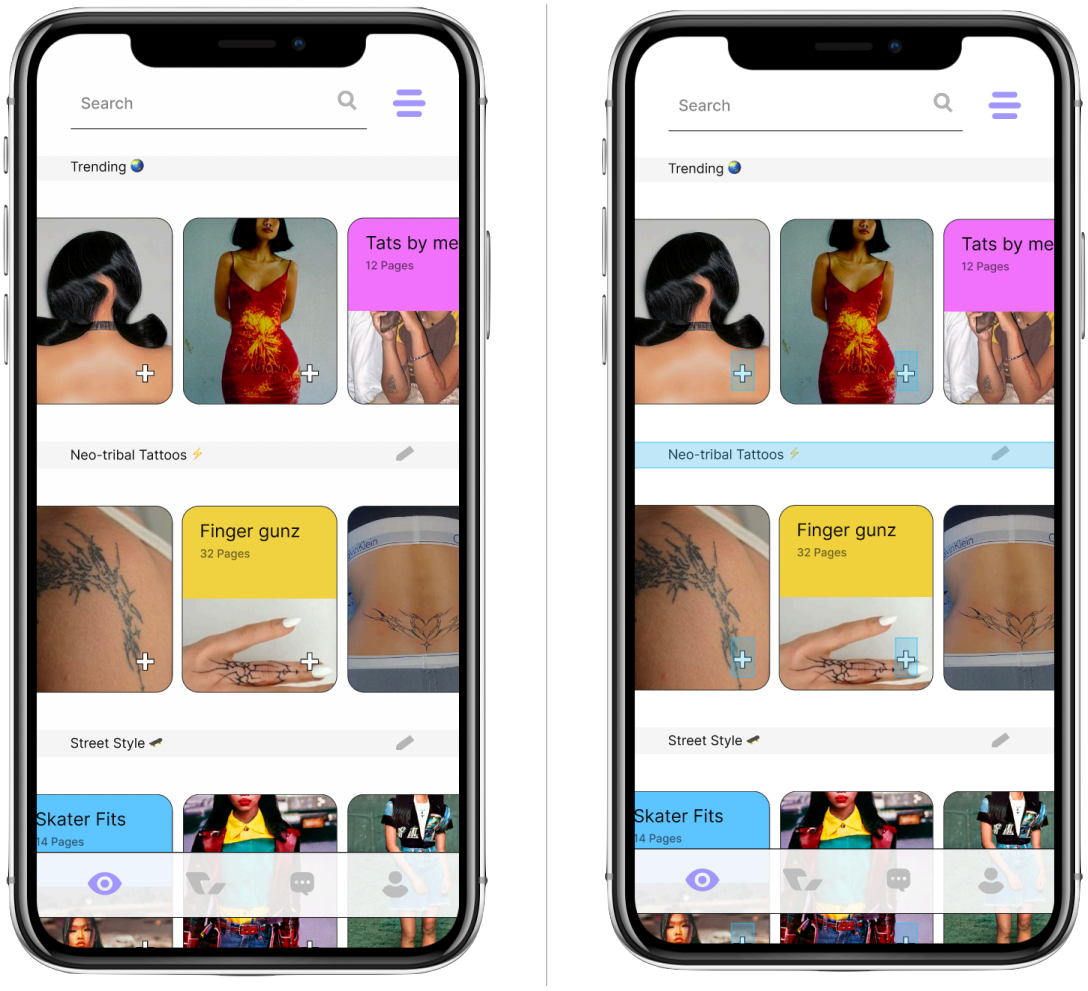
The walkthrough provides users with a step-by-step guide to navigate and explore the application. This section aims to provide detailed descriptions and visual aids through screenshots to facilitate a clear understanding of the application's features and functionalities. To enhance the user experience and allow for a more immersive understanding of the application, it is recommended to access the prototype by opening the link: tinyurl.com/LookBookPrototype3.

Upon accessing the prototype, users will be greeted with an interactive mockup of LookBook displayed on a mobile device at the center of the screen. On the left side of the screen, users will find a list of sequenced flows that correspond to the walkthrough sections outlined in this paper. These flows are labeled accordingly, ensuring a seamless and structured exploration of the application's features.



The first frame of the prototype, accessible on *tinyurl.com/LookBookPrototype3*

During the interaction with the prototype, user testers can click anywhere on the screen and then be guided by blue visual clues on which elements to click or interact with next. These indicators aim to assist users in navigating through the various screens and functionalities of the application, ensuring a smooth and intuitive user experience.



A visual example of a screen before (left) and after clicking, showing the blue visual clues (right) for easy prototype navigation.

Additionally, it is essential to consider the persona represented in the prototype, which is Sasha, a 23-year-old Southeast Asian female. Sasha's characteristics, interests, and preferences have been taken into account throughout the design process, and they will be reflected in the walkthrough to showcase the personalized aspects of the application.

By keeping Sasha's persona in mind, the walkthrough will highlight how LookBook caters to her specific needs and preferences, demonstrating the application's ability to provide personalized recommendations, style inspiration, and a sense of inclusivity. This consideration underscores the importance of tailoring the user experience to individual users, promoting a more engaging and relevant interaction with the application.

Summary

Label	Feature	Section	Purpose	Systems
A	Opening	Opening	Introduce the application	
B.1	I / Identity	Onboarding	Create user profile	Collaborative filtering Recommendation systems CNNs
B.2	II / Preferences	Onboarding	Identify user preferences and user classification	Collaborative filtering Recommendation systems CNNs NLPs
B.3	III / Representation	Onboarding	Identify the physical attributes of the user	Collaborative filtering Recommendation systems CNNs NLPs Cosine similarity Deep learning algorithms Facial recognition systems SoY system FairFace

B.4	IV / Social Media	Onboarding	Integrate pre-existing data Understand preferential sentiments	Collaborative filtering Recommendation systems NLPs CNNs Transformer sentiment analysis
C.1	Dash	Dash	Facilitate content discovery and curation	Collaborative filtering Recommendation systems NLPs CNNs CV Transformer sentiment analysis Prioritization algorithm
C.2	Search	Dash	Facilitate content discovery and curation	NLPs CNNs CV Prioritization algorithm
C.3	View A Page	Dash	Facilitate content discovery and curation	NLPs CNNs CV Prioritization algorithm Cosine similarity
C.4	Filter	Dash	Grant control over algorithms	NLPs CNNs CV Recommendation systems Prioritization algorithm Personalization algorithm Diversity algorithm Feature Extraction User Attribute Mapping SoY system FairFace Cosine Similarity
C.5	Create a Page	Dash	Foster content creation	NLPs CNNs CV Recommendation systems GANs cGANs Feedback mechanism

D.1	Books	Books	Foster content creation	
D.2	Create a Book	Books	Foster content creation	NLPs CNNs CV Recommendation systems
D.3	Use a Template	Books	Foster content creation	NLPs CNNs CV Recommendation systems
D.31	Template	Books	Foster content creation	NLPs CNNs CV Recommendation systems
D.32	Template	Books	Foster content creation	NLPs CNNs CV Recommendation systems
D.4	Template	Books	Foster content creation	NLPs CNNs CV Recommendation systems
D.5	Create a Page	Books / Dash	Foster content creation	NLPs CNNs CV Recommendation systems
E.1	Feed	Community	Foster user engagement and content creation	Collaborative filtering NLPs Recommendation systems Prioritization algorithm
E.2	Share	Community	Foster user engagement and content creation	NLPs Recommendation systems Prioritization algorithm

E.3	Clubs	Community	Foster user engagement and content creation	Collaborative filtering NLPs Recommendation systems
E.4	Sample Club	Community	Foster user engagement and content creation	NLPs Recommendation systems Prioritization algorithm
E.5	Club / AI Q&A	Community	Foster user engagement and content creation	NLPs BM25 BERT
E.6	Messages	Community	Foster user engagement and in-app exploration	Websocket SSL/TLS protocols
F.1	My Profile	Profile	Manage personal data	Data retrieval Side-server gamification
F.2	Friend's Profile	Profile	Foster user engagement Facilitate content discovery	

A. Opening

Upon launching the application, users are greeted with LookBook's brand slogan, "Embrace the real you," accompanied by a concise description of the application's key features. This initial screen serves as an introduction, particularly targeting users who may be unfamiliar with the application and its purpose.

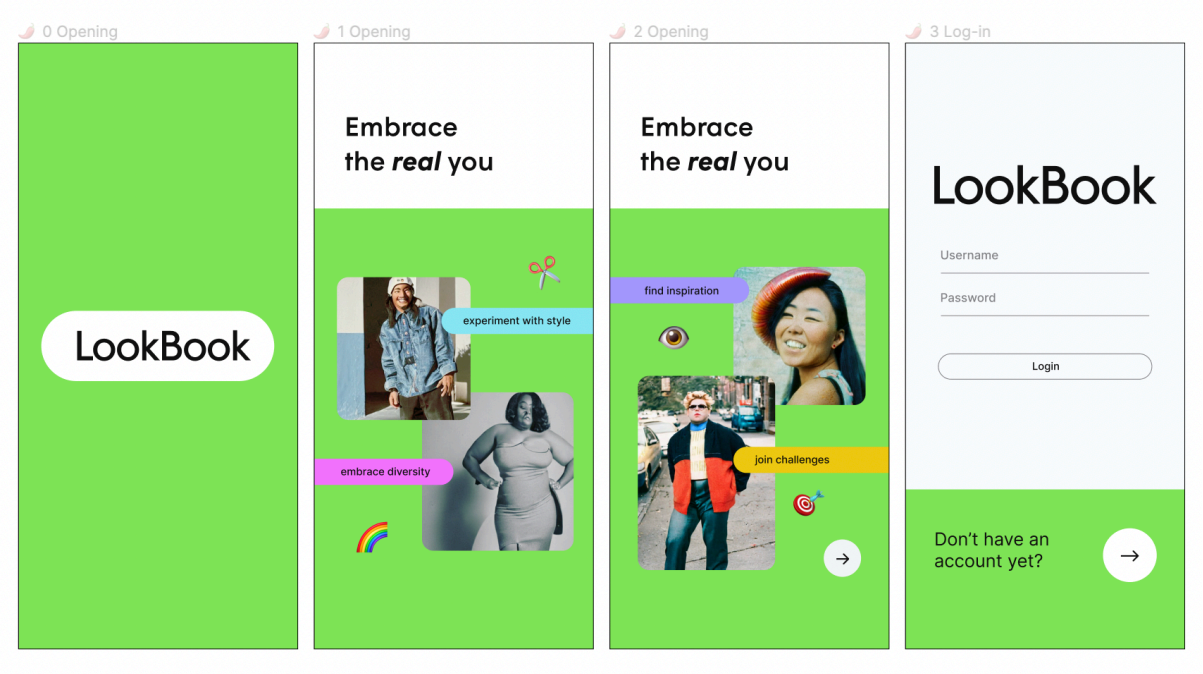


Figure iv.A — A Opening

B. Onboarding

B.1 Onboarding I / Identity

The first part of the onboarding process prompts users to create a distinct username that will serve as their identifier within the LookBook community. Users will then provide basic information such as their age and gender identity, which plays a role in personalizing the user experience. Leveraging collaborative filtering techniques, LookBook employs algorithms that analyze the preferences and behaviors of users who share similar age and gender identity.

By identifying commonalities among users, the application can generate tailored recommendations that align with the user's interests and preferences. In addition, LookBook leverages convolutional neural networks (CNN), a deep learning architecture specifically designed for analyzing and recognizing visual patterns within images (Can & Su,

2022). By applying CNN, LookBook is able to identify relevant visual features, objects, and categories that align with the user's style preferences. This advanced technology ensures that the recommendations provided by LookBook are visually appealing and resonate with the user's individual tastes.

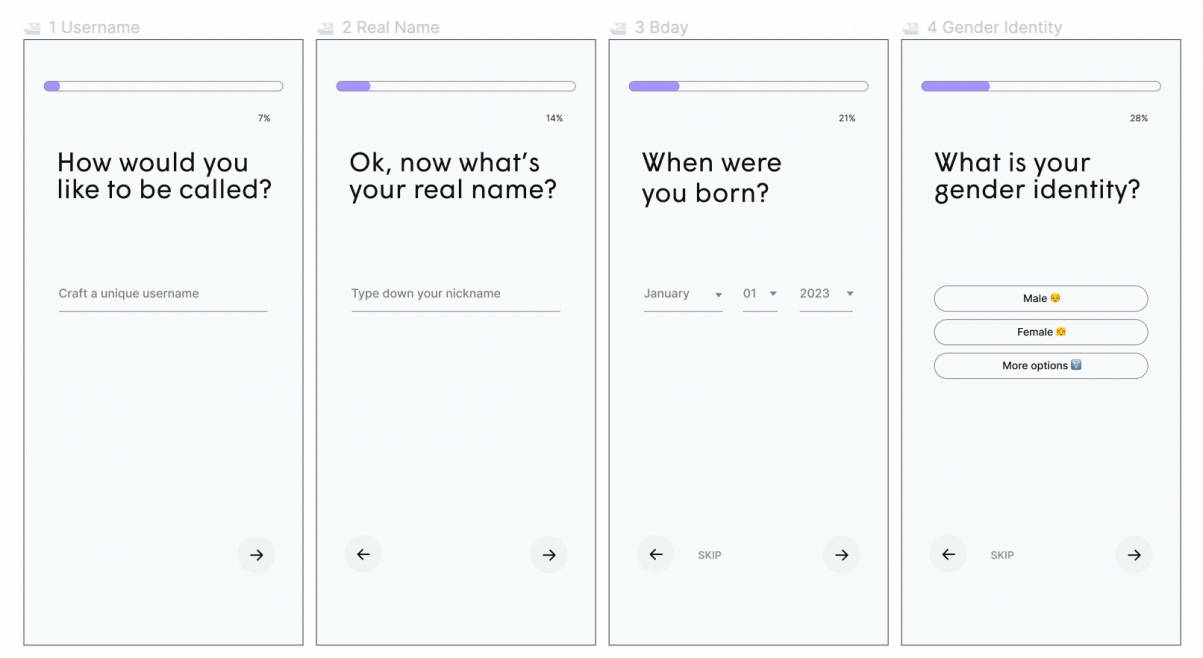


Figure iv.B.1: *B.1 Onboarding I / Identity*

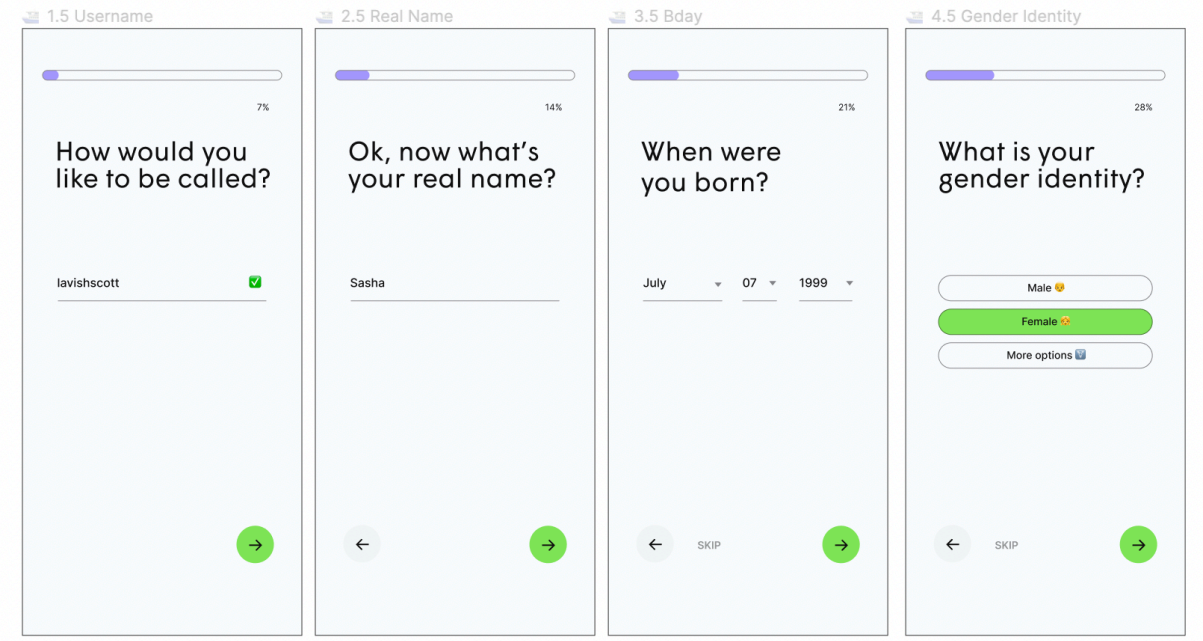


Figure iv.B.1.5: *B.1 Onboarding I / Identity — Answered*

B.2 Onboarding II / Preferences

In the second part of the onboarding process, LookBook prompts users to share their intended usage of the application and their aesthetic preferences. This section serves as a way to gather valuable insights into the user's desired experience and style preferences, allowing LookBook to deliver more accurate and personalized content recommendations.

To ensure the precision of these recommendations, LookBook leverages advanced technologies such as convolutional neural networks (CNN), collaborative filtering, and natural language processing (NLP) (Guha, 2021). The NLPs are used to extract meaning from the words and descriptions provided by the user during the onboarding process. These techniques match textual information to visual imagery, ensuring that the recommended content reflects the user's expressed preferences and desired style.

To create an engaging and enjoyable onboarding experience, LookBook adopts a playful and prompt-like approach. This design choice not only adds an element of fun to the process but also encourages users to provide the necessary data in a lighthearted manner, fostering a positive and interactive user experience.

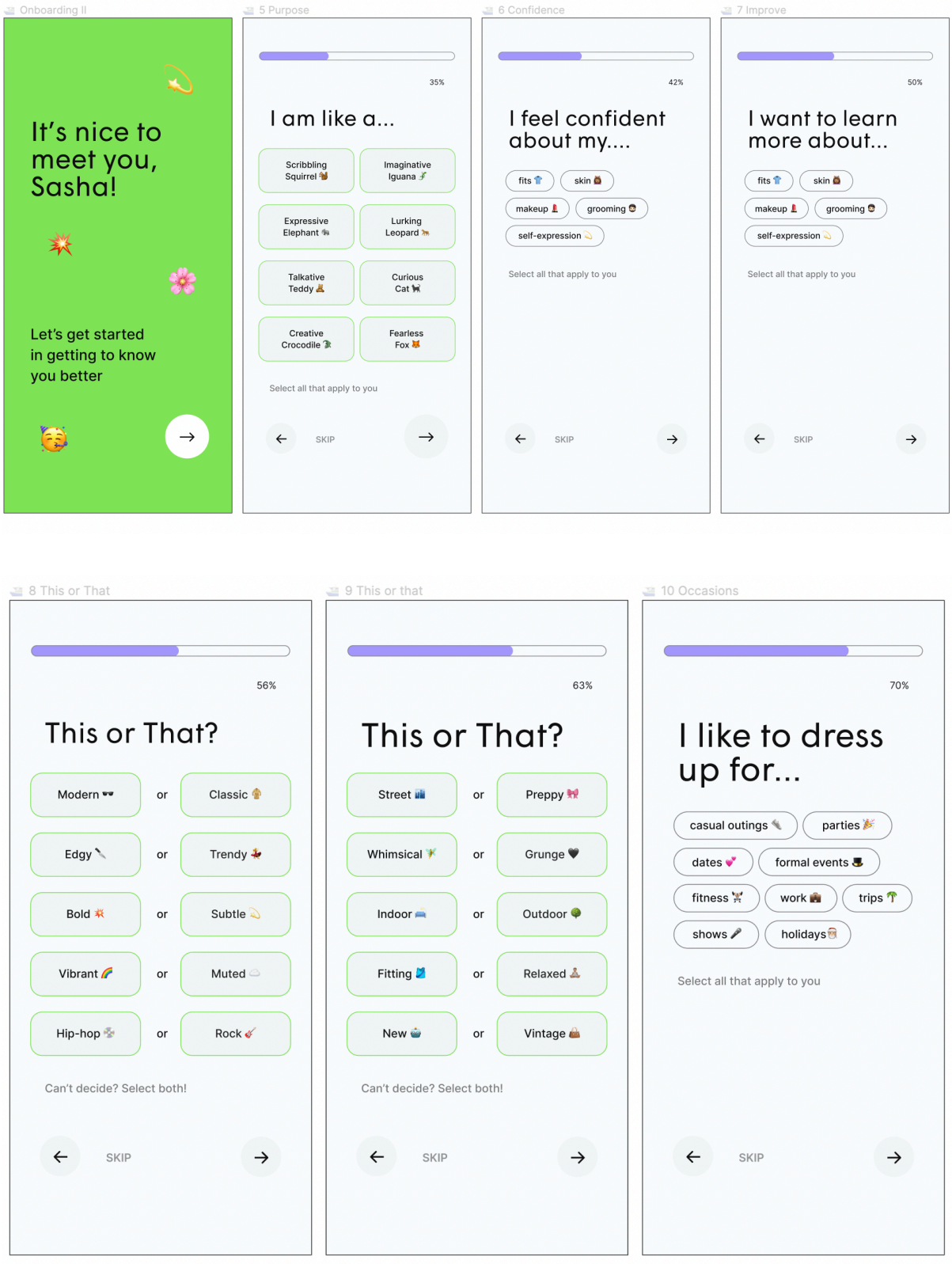


Figure iv.B.2: *B.2 Onboarding II / Preferences*

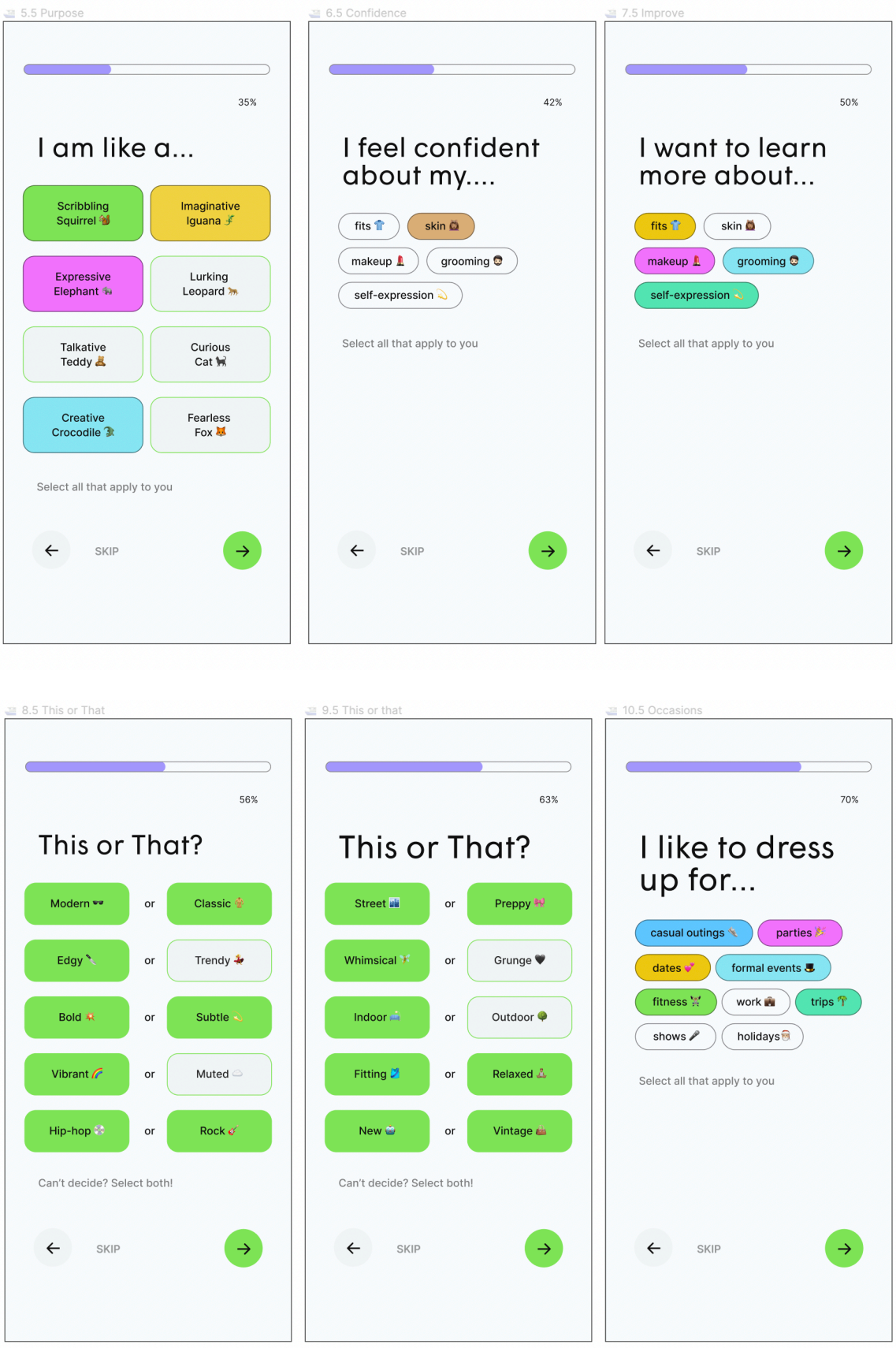


Figure iv.B.2.5: *B.2 Onboarding II / Preferences — Answered*

B.3 Onboarding III / Representation

The third part of the onboarding focuses on the representation aspect of the application. By inputing facial features and body measurements, the user will have the option to see content catered to his or her facial features and body type. This is meant to address how users are constantly shown imagery of artificial perfection and standards unachievable to majority of populations.

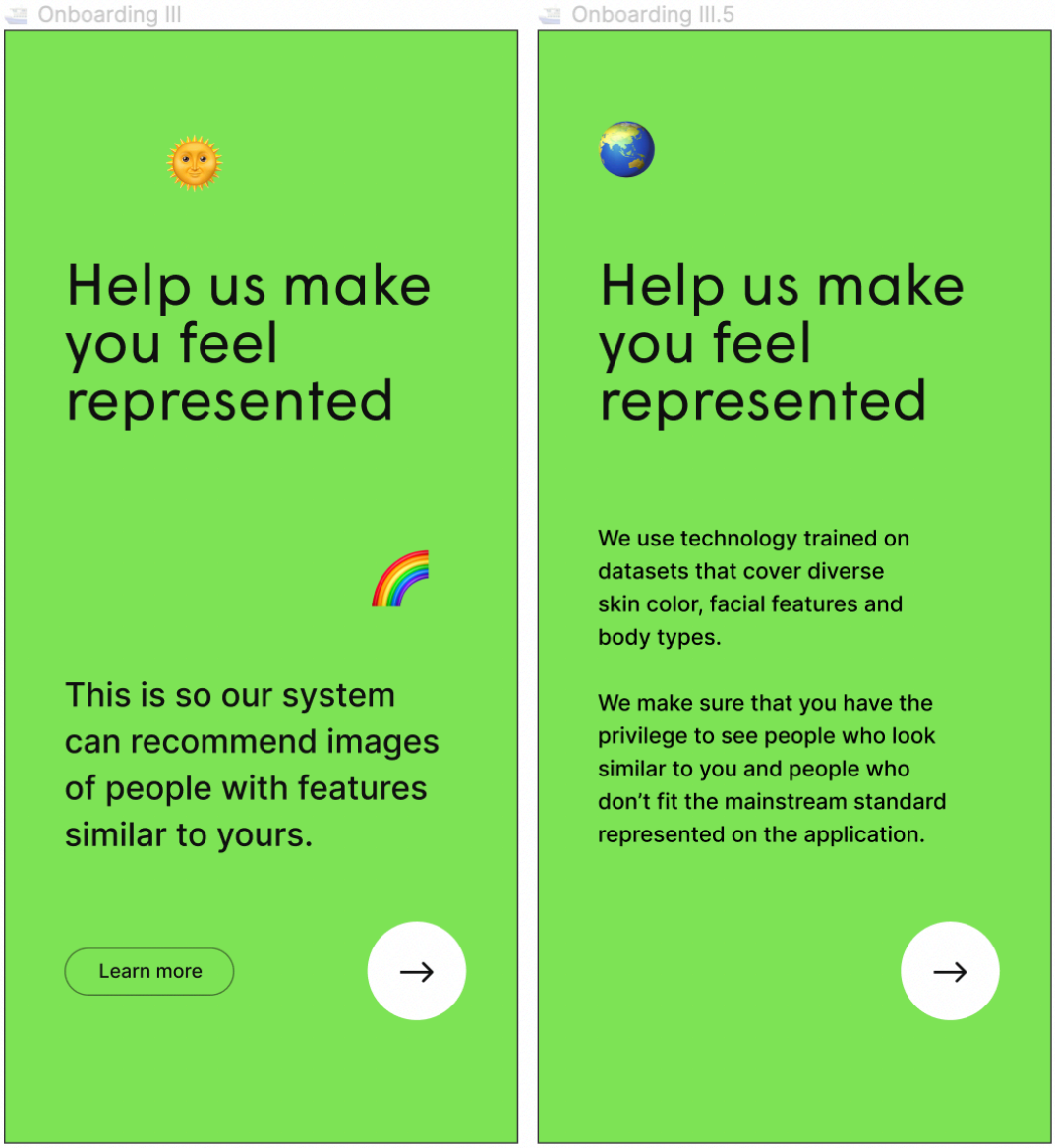


Figure iv.B.3.1: *B.3 Onboarding III / Representation — Introduction*

Users will be prompted to take a selfie for the application. The application will use CNNs to analyze the facial features and extract meaningful data to classify the user based on this information. LookBook will be trained on FairFace, a novel face image dataset containing 108,501 images which is balanced on race defined by 7 race groups: White, Black, Indian, East Asian, Southeast Asian, Middle Eastern, and Latino. Images were collected from the YFCC-100M Flickr dataset and labeled with race, gender, and age groups (Kärkkäinen & Joo, 2021).

The user's facial features will be pre-processed and the system will compare these features with the features of images in the dataset. Once the user uses the app, it will not classify the user by ethnicity or race per say to avoid racial segregation, but instead aim to recommend faces with an overall similarity when it comes to physicalities such as skin tone, eye shape, head shape, nose shape, mouth shape, cheek height, etc. Cosine similarity system will be used to calculate the similarity between the user's facial features and the features in the dataset. Cosine similarity is advantageous when dealing with high-dimensional feature vectors, such as those extracted from facial images. It measures the cosine of the angle between two vectors, indicating the similarity in direction rather than magnitude (Wang, et al., 2017). This property makes cosine similarity robust to variations in feature vector lengths and scales, making it suitable for comparing facial features that may have different scales or amplitudes.

Based on similarity scores, the system can rank the images in the dataset according to their resemblance to the user's overall facial features. The images with the highest similarity scores, indicating a closer match to the user's facial features, will be recommended as the most relevant to the user.

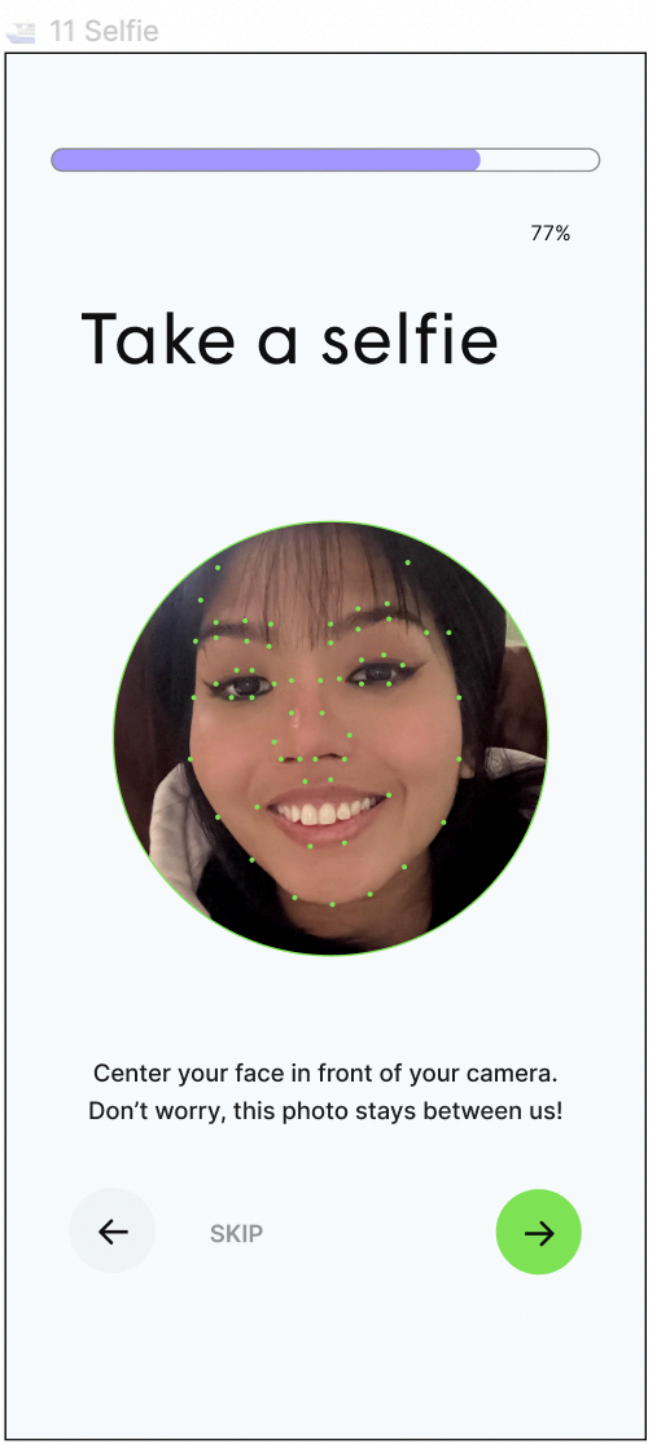


Figure iv.B.3.2: *B.3 Onboarding III / Representation — Facial Analysis*

To provide body analysis within LookBook, users will input their skintone, height, weight, fitness level, and body type based on their biological sex.

NLPs will be used to extract textual information such as height, weight, and body type from the user's input. This helps the app understand and classify these details based on a dataset. CNNs will be used to analyze and classify body metadata obtained from the user and match this to images in a dataset of various body shapes and body types. To estimate body shape and body type based on photographs, LookBook incorporates Shape of You (SoY), a system that can estimate body shapes on 3D poses, to classify body types and body shapes of imagery on the platform and compare them to images in the dataset (Sarkar, et al., 2023).

Similar to the facial analysis, cosine similarity is employed to calculate the resemblance between the user's body features and the features found in the dataset. Body type analysis often involves multiple features or measurements, such as body ratios and proportions. In such cases, the feature vectors become high-dimensional. Cosine similarity remains effective even in high-dimensional spaces, making it a preferable choice for comparing complex body type representations. This similarity measurement enables the system to rank the images in the dataset based on their similarity scores to the user's overall body features. The images with the highest similarity scores, indicating a closer match to the user's body features, are recommended as the most relevant content for the user.

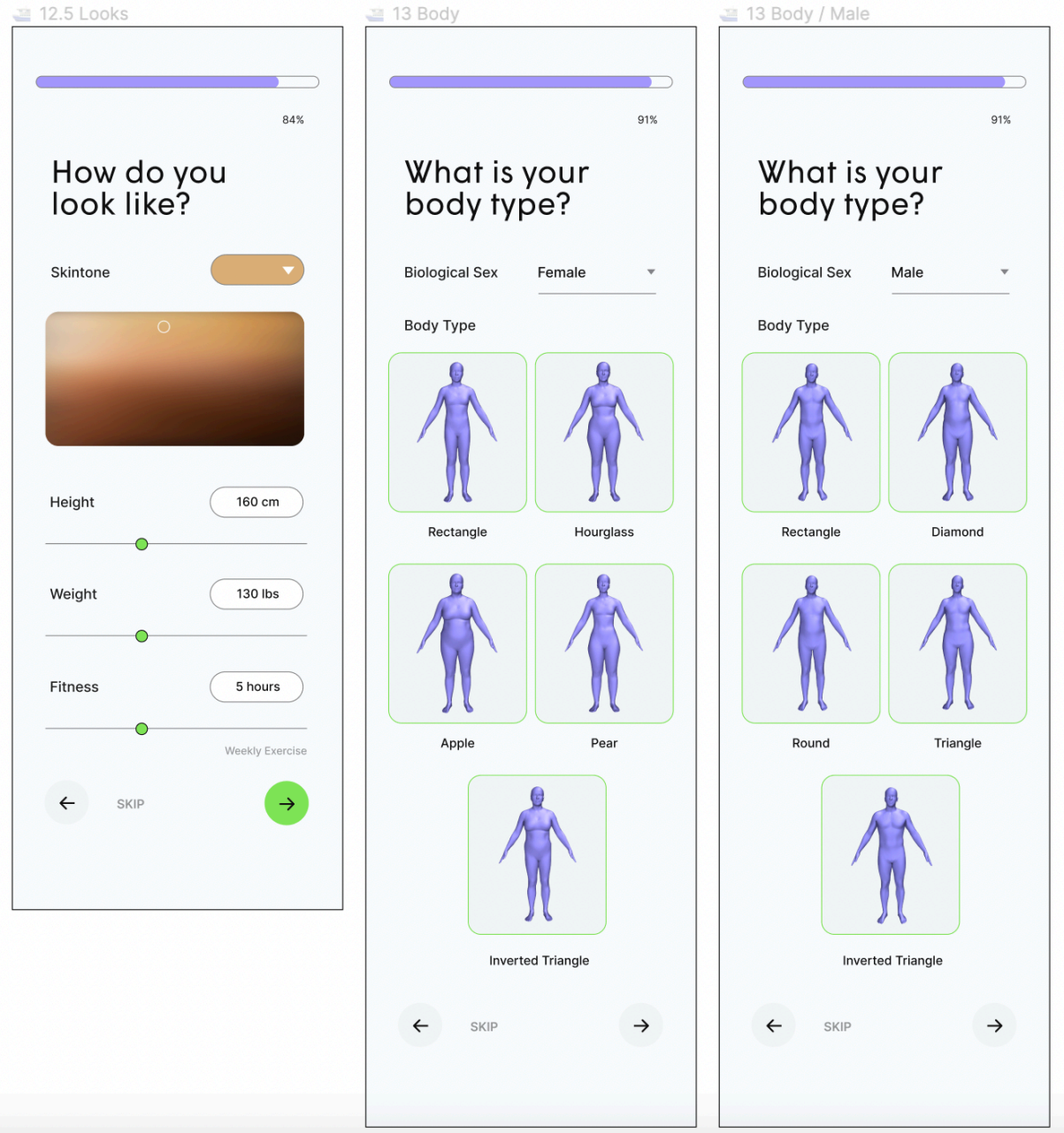


Figure iv.B.3.3: *B.3 Onboarding III / Representation — Body Analysis*

B.4 Onboarding IV / Social Media

In the final part of the onboarding process, LookBook offers users the option to connect their social media accounts focused on visual content sharing, namely Instagram, TikTok, and Pinterest. Once connected, LookBook utilizes a transformer sentiment analysis approach to examine how users interact with specific content on these social media applications. Sentiment analysis, also known as opinion mining, is the process of determining the sentiment or emotion expressed in a piece of text, such as positive, negative, or neutral. It involves analyzing the language, context, and tone of the text to infer the sentiment behind it. Transformer sentiment analysis involves training a transformer-based model on a large dataset that contains text examples labeled with their corresponding sentiments. The model learns to understand and classify the sentiment expressed in text by capturing the semantic meaning and contextual information within the input. This analysis looks into the user's reactions, such as saving or searching for certain aesthetics, to gain insights into their preferences and interests (Islam & Zhang, 2016).

Additionally, LookBook employs collaborative filtering techniques to recommend content to users based on the behaviors and preferences of similar users within the LookBook application. By analyzing the data gathered from social media usage, the system can identify patterns and similarities among users, allowing for tailored content recommendations based on shared interests and preferences.

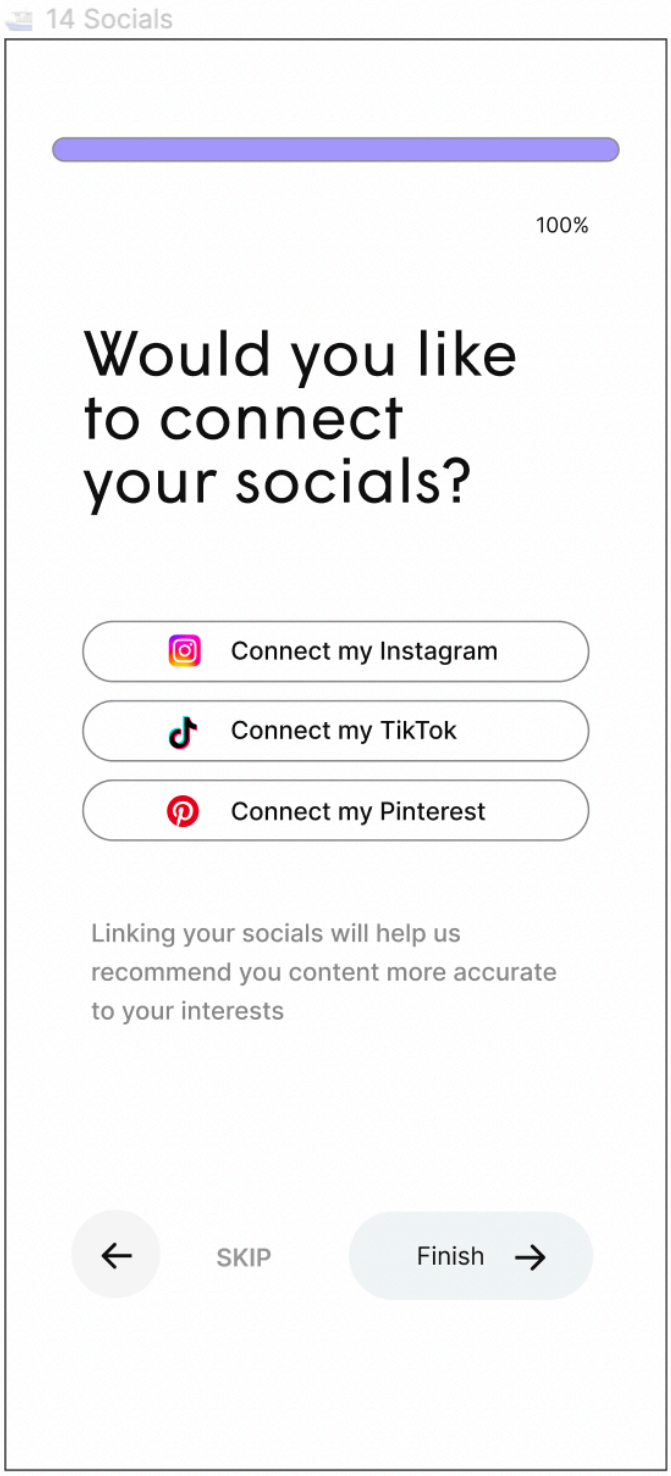
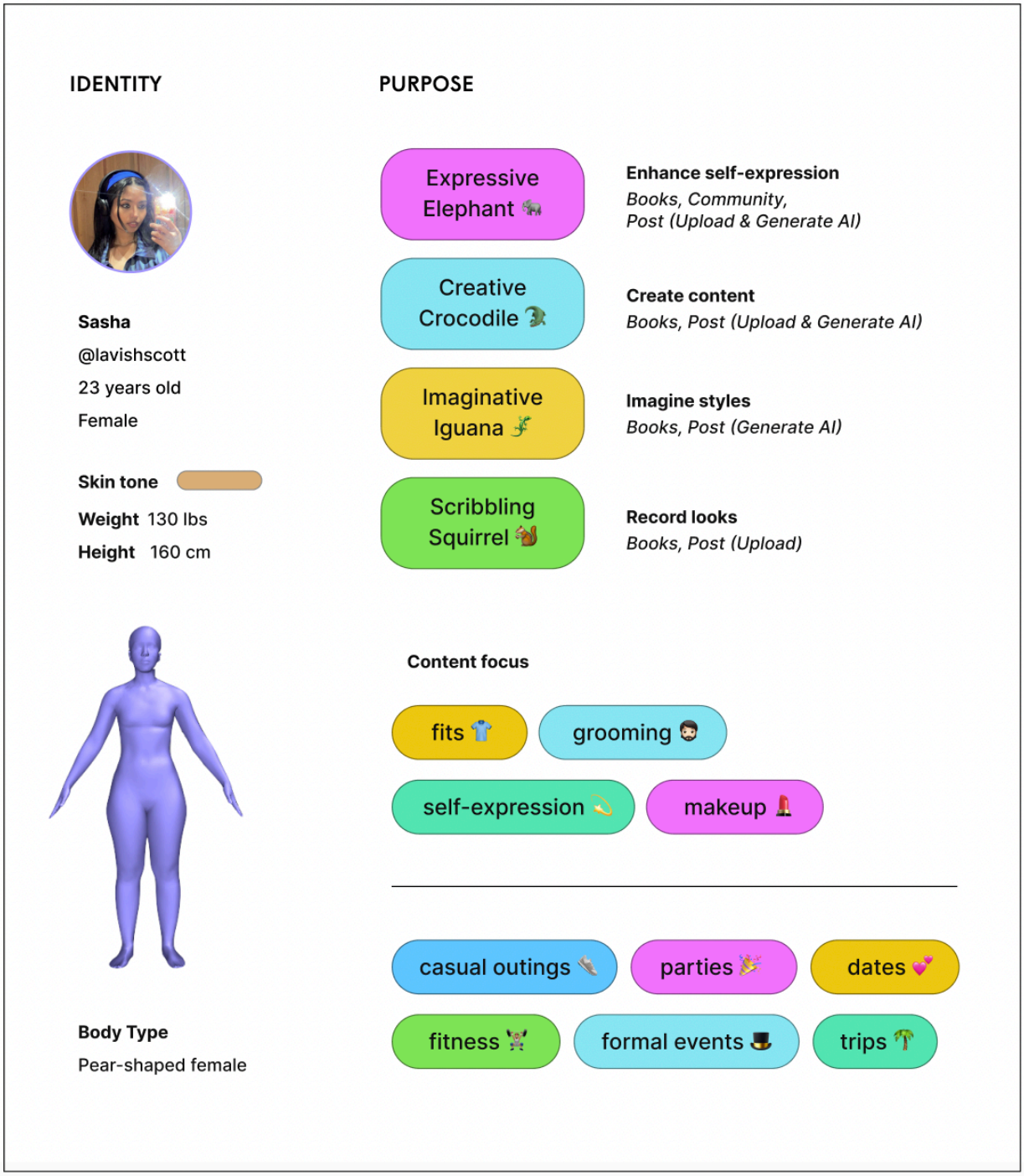
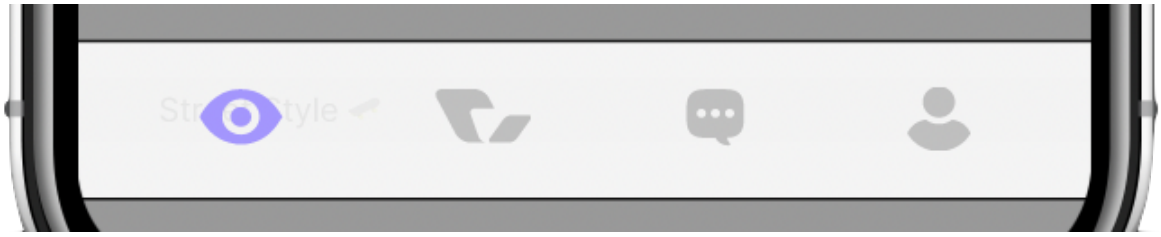


Figure iv.B.4: *B.4 Onboarding IV / Social Media*

The figure below provides aoverview of the persona using the application, capturing their identity, purpose, and preference data. This summary emphasizes that the subsequent sections will showcase the in-application experience tailored specifically for this user. It is important to note that for the purpose of this paper, it is assumed that the persona has already been actively using the application for a considerable period.



C.0 Menu Bar



A menu bar at the bottom of the screen will be present throughout the application, providing easy access to different sections of the app. The menu tab consists of four icons that represent specific sections within the app:

1. *Dash:* represented by an eye, corresponds to the Dash section. Tapping on this icon will take the user to the Dash, where they can view a personalized feed of content, including posts, images, and videos from other users and Clubs they follow. The Dash is designed to keep users updated on the latest and most relevant content based on their interests and preferences.
2. *Books:* represented by an open book, corresponds to the Books section. Tapping on this icon will direct users to the Books section, where they can explore, create, and organize their own curated content collections. This section allows users to gather and categorize various types of media, such as images, videos, and text, into cohesive books based on their themes, narratives, or styles.
3. *Community:* represented by a speech bubble, corresponds to the Community section. When users tap on this icon, they are taken to the Community, where they can engage in conversations, participate in discussions, and connect with other users who share similar interests. This section provides a platform for users to share ideas, ask questions, and build a sense of community within the app.
4. *Profile:* represented by a silhouette, corresponds to the Profile section. Tapping on this icon will bring users to their own profile, where they can view and manage their personal

information. In addition, users can access their own Books, Clubs, and Following from their profile.

By having a consistent menu tab across all screens, users can easily switch between different sections of the app and access the features and content they desire. This ensures a seamless and intuitive user experience, allowing users to navigate through the app effortlessly and engage with the various functionalities it offers.

C.1 Dash

After completing the onboarding process, users will be greeted with the home page, also referred to as the Dash, when they open the application. The Dash is designed to resemble a bookshelf, where each row represents a Genre selected by the user. A Genre is defined as categories, styles, or trends that users can input. Users can scroll horizontally to explore the content within each Genre. The content is consisted of Pages and Books. Pages are can be a photo, video, or community text discussions. Books, on the other hand, are collections of categorized Pages curated by users.

Within the Dash, the first shelf will display trending Pages and Books that are relevant to users with similar profiles. This helps users discover popular content that aligns with their interests. The remaining three shelves are dedicated to Genres that users can customize according to their preferences.

To save interesting Pages or Books, users will find a plus button located at the bottom right corner of each Page or Book. Clicking on this button allows users to add the content to their personal collection of Books.

The application may request permission to access the user's location data. This information will be utilized for collaborative filtering, enabling the app to recommend trends and content that are popular in the user's specific area. This feature enhances the relevance and localized experience for the users.

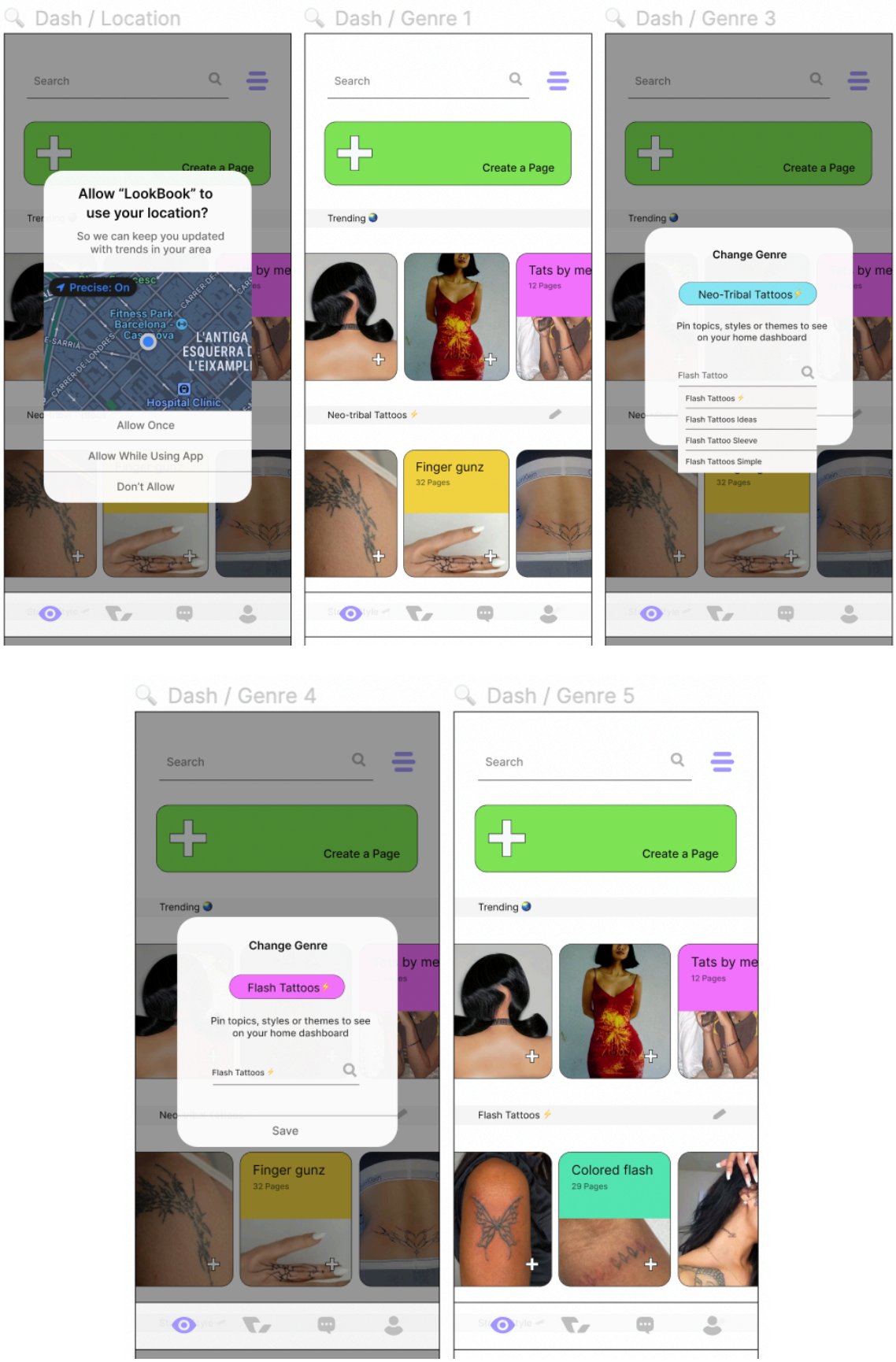


Figure iv.C.1: *C.1 Dash*

Content Prioritization

User engagement, recency, and feedback will be used as important signals in determining the prioritization of content. Pages and Books that receive high levels of user interactions, such as saves, shares and views, will be given more prominence within the platform. This approach ensures that content is driven by user preferences.

Additionally, LookBook prioritizes raw and user-generated Pages and Books to alleviate user fatigue caused by platforms that heavily promote sponsored content and highly curated, edited images that perpetuate an idealized version of beauty. To achieve this, the algorithm aims to maintain a ratio where 75% of the content is raw and 25% is altered or filtered.

To implement this algorithm, the system can employ a combination of criteria and scoring mechanisms to evaluate the nature of the content. Here is a potential algorithm:

1. Content Evaluation
    a. Identify the type of content, such as photos or videos.
    b. Assess the level of alteration or filtering applied to the content. Highly curated and heavily edited images often exhibit characteristics like perfect symmetry, flawless skin, or unrealistic proportions, which can be indicative of sponsored or idealized content.
    c. Measure the degree of visual modification, such as changes in color, lighting, or digital enhancements.
    d. Determine the extent of curation and editing, considering factors like composition, aesthetics, and artistic manipulation.
2. Scoring Mechanism
    a. Assign a score to each piece of content based on the above evaluations.
    b. Raw and user-generated content receives a higher score, indicating its authenticity and unaltered nature.
    c. Altered or filtered content receives a relatively lower score, reflecting its departure from the original capture.

3. Prioritization
    a. Sort the Pages and Books based on their scores, placing higher-scoring raw and user-generated content at the top.
    b. Ensure that at least 75% of the prioritized content consists of raw content.
    c. Within the remaining 25% of altered or filtered content, further prioritize less heavily curated and minimally edited pieces.

Additionally, NLP algorithms that analyze language patterns, phrases, and keywords commonly associated with sponsored content will be applied. Specific cues such as "ad," "sponsored," "in collaboration with," or brand mentions can indicate the presence of sponsorship. NLP models assess the overall context and tone of the content, as sponsored content often exhibits characteristics like excessive promotional language, exaggerated claims, or a consistent focus on a particular brand or product.

By analyzing these contextual cues, NLP models can identify content that aligns with typical sponsorship patterns. The algorithm also examines the profiles of the Authors to determine if they have a history of sponsored partnerships or collaborations with brands, especially useful when a user connects their social media accounts to LookBook. This analysis involves examining past posts, captions, or explicit disclosures made by the Author. By considering these factors, the algorithm gains insights into the Author’s relationship with sponsored content and can make informed judgments about the authenticity of their posts.

Training NLP models on labeled datasets containing examples of disclosed sponsorships enables them to recognize patterns and linguistic cues indicative of sponsorship disclosure. However, it is important to acknowledge that this approach may not capture all instances of undisclosed sponsorships or more subtle forms of promotion. The algorithm serves as a helpful tool in prioritizing user-generated content over sponsored content, but continuous monitoring and refinement are necessary to adapt to evolving promotional strategies and to address any limitations of the detection system.

By implementing these algorithms, the application can prioritize raw and user-generated content while still allowing for a small percentage of altered or filtered content to

provide diversity and creative expression. This approach promotes a more authentic and inclusive environment, reducing the prominence of heavily sponsored and highly curated content that contributes to user fatigue and reinforces unrealistic beauty standards.

C.2 Dash / Search

Within the dash, there is an anchored top bar that consists of a search tab and a filter icon for enhanced user navigation.

When users utilize the search tab and enter specific words or terms, the application employs a combination of NLPs and CNNs. These techniques allow the application to match the entered keywords with relevant images, Pages, and Books within the platform's database. Through NLP, the application understands the meaning and context of the entered words, enabling it to retrieve relevant content. The CNNs analyze the visual elements of images, Pages, and Books, and compare them with the keywords to ensure accurate matches. As a result, users are presented with Pages and Books that are directly relevant to the terms they have entered in the search tab. This feature enhances the search experience and assists users in discovering content that aligns with their interests and preferences.

C.3 Dash / View A Page

When users tap on a Page, if it is a photo or video, they will be directed to a dedicated screen where they can view the content in full. On this screen, they will find an enlarged photo or video as the main focus. Below the visual content, they will see the user who posted it, along with the number of Books in which the Page has been saved, displayed in the left-hand corner. In the right-hand corner, there will be a button allowing users to add the Page to one of their Books, as well as a share arrow icon for easy sharing with other users.

A short description written by the author of the Page will be provided underneath, offering additional context or information about the content. Genres, which are added by the user to categorize the Page, will also be displayed. If the photo or video is not originally

posted by the user, an optional source link can be added to provide access to the original source.

Additionally, two columns will be featured below the post. The "Books" column will showcase the Books in which the Page has been saved by other users, allowing for social proof and the discovery of related collections. The "Related Pages" column will display media that is visually similar to the Page being viewed, providing users with the opportunity to explore related content.

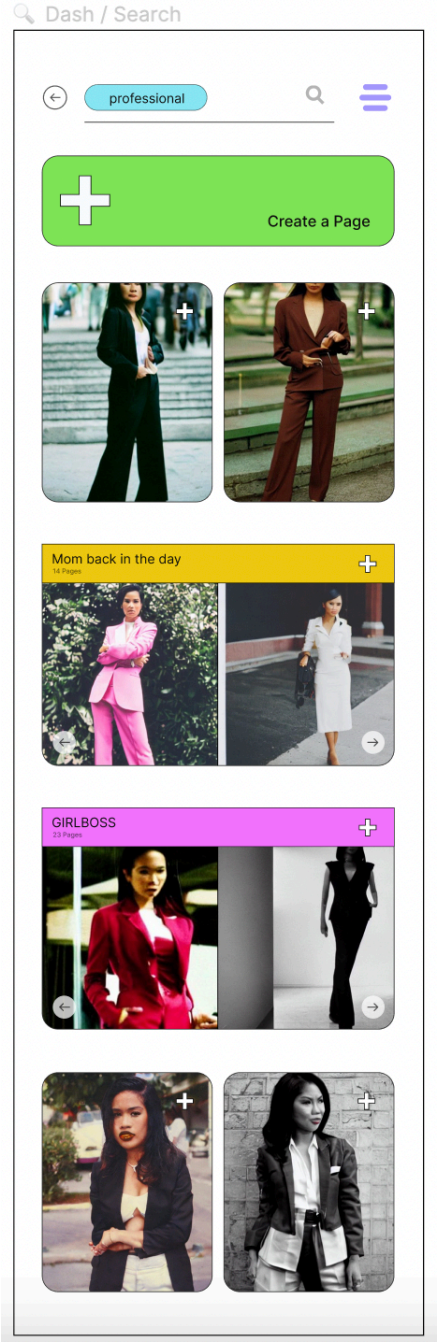


Figure iv.C.2: *C.2 Dash / Search*

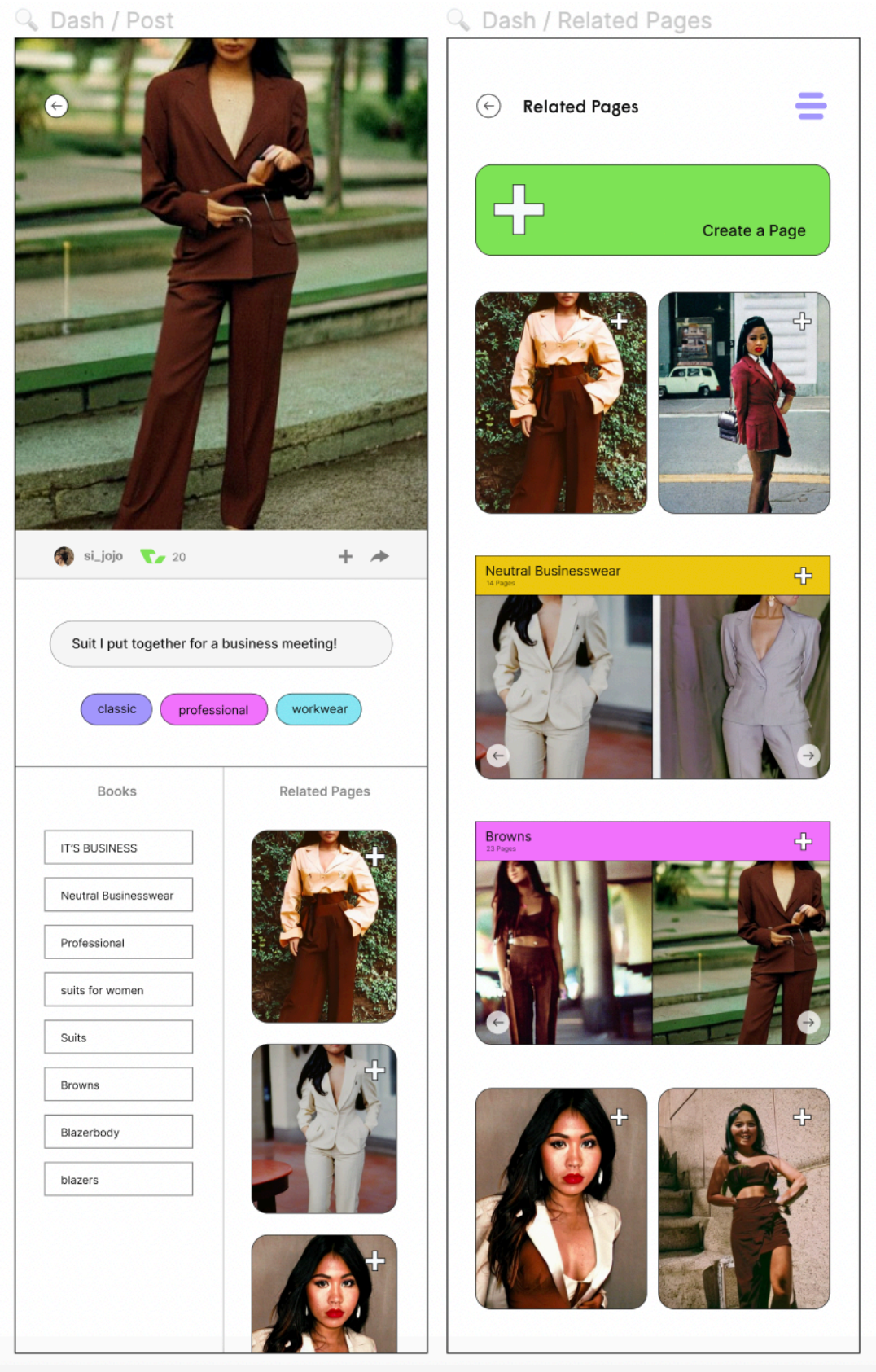


Figure iv.C.3: *C.3 Dash / View A Page*

C.4 Dash / Filter

When users tap on the filter button, they are shown the Dash Filter, divided into four parts: the Personalization Slider, the Media Finder, the Genre Manager, and the Content Blocker.

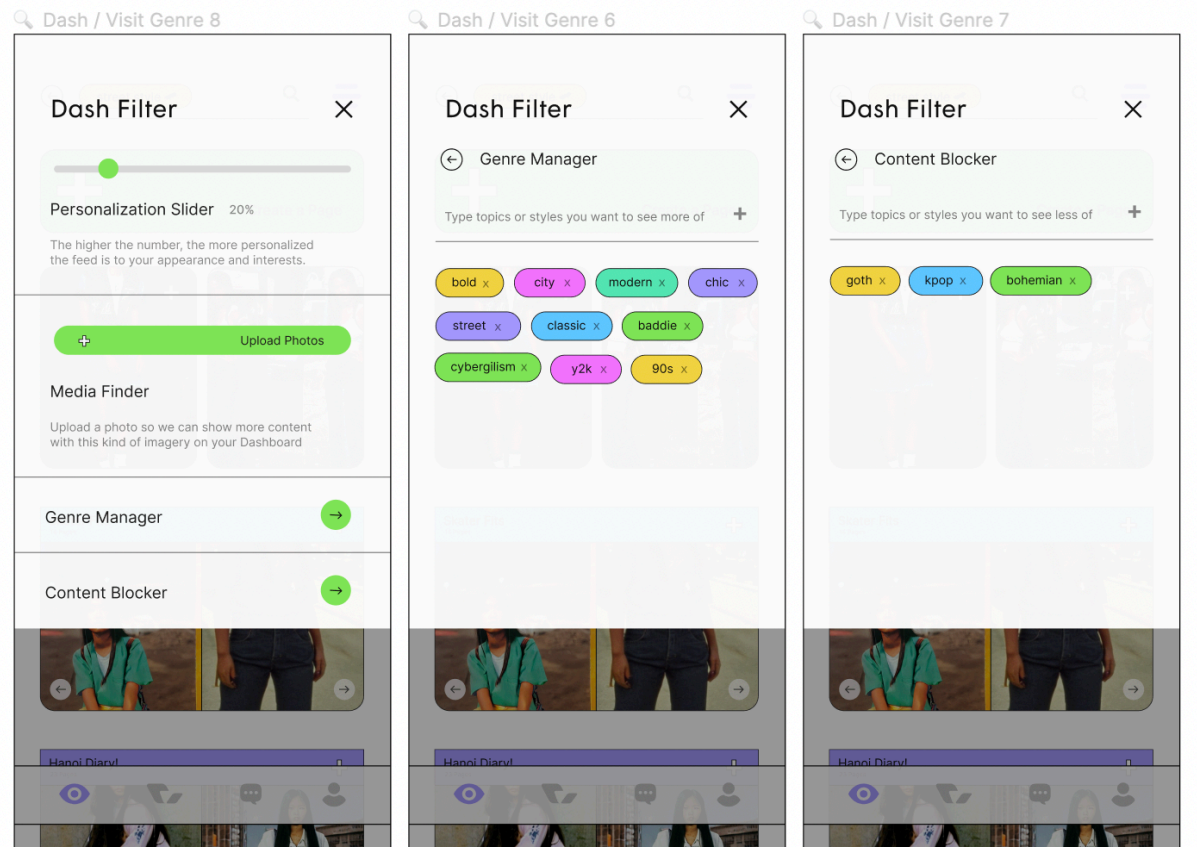


Figure iv.C.3: *C.4 Dash / Filter*

1. Personalization Slider

The Personalization Slider is a key feature in the application that allows users to adjust the level of personalization in the content displayed on the Dash. This slider serves as a mechanism to address the issue of filter bubbles and promote exposure to diverse appearances and styles. By adjusting the slider, users have control over the extent to which the content is tailored to their individual preferences and characteristics.

When the percentage on the Personalization Slider is set to a higher value, the content shown on the Dash is filtered to align with the user's physical characteristics, interests, and preferences.

a. *Physical Characteristics*: The algorithm takes into account the user's physical characteristics, such as facial features and body type, to recommend content that aligns with their appearance and style.
b. *Interests and Preferences*: The algorithm considers the user's engagement with different types of content, analyzing the Pages and Books they interact with the most. This helps to identify their preferences and interests.

This level of personalization ensures that users are presented with content that closely matches their unique preferences and aligns with their specific interests. By leveraging factors such as physical characteristics, user interests, and personal engagement patterns, the algorithm identifies and prioritizes content that is highly relevant and tailored to each individual user.

Conversely, when the percentage on the Personalization Slider is set to a lower value, the content shown on the Dash takes a different approach. Rather than heavily emphasizing personalization, the algorithm aims to showcase a balanced weight of diverse physical characteristics and styles. The algorithm utilizes a comprehensive filtering mechanism that takes into account factors such as physical appearance and styles exhibited in Pages and Books. To incorporate physical appearance, the algorithm leverages the FairFace dataset mentioned earlier and the Shape of You (SoY) system, which estimates body shape and body type on media. The algorithm on a low-value Personalization Slider feed will operate according to the following steps:

a. *Feature Extraction*: The algorithm extracts relevant features from each post, such as physical appearance attributes (e.g., ethnicity, facial features) and style-related information (e.g., clothing, accessories).
b. *User Attribute Mapping*: The algorithm maps the user's physical appearance attributes and style preferences to numerical values or feature vectors (Uesato, Asai & Yamana, 2015).
c. *Similarity Calculation*: The algorithm computes the similarity between each post's features and the user's attributes. This will be done using the cosine similarity technique.

d. *Attribute Weighting:* The algorithm assigns a 60/40 weight towards the attributes. Physical characteristics will be given a 60% weight in score, while style preferences will be given a 40% rate.
e. *Score Calculation*: The algorithm calculates a relevance score for each post by combining the similarity scores of its attributes to create a sum of a weighted average. The weights reflect the importance of each attribute in determining the overall relevance.
f. *Ranking and Selection:* The algorithm ranks the posts based on their relevance scores, from highest to lowest. The posts with the highest scores, indicating a closer match to the user's attributes and preferences, are selected for display.

By carefully selecting and arranging content, the algorithm maintains a fair representation of various physical characteristics and styles on the screen. It avoids over-representation of specific attributes and strives to provide users with a more comprehensive view of diverse appearances and styles.

2. Media Finder

Under this option, users can upload a photo and have the application show more of this kind of imagery on the Dash. CNNs will be used to analyze the visual features and characteristics of the image and use the cosine similarity calculation in order to match this to media with similar characteristics. As users interact with the recommended photos on the Dash, the algorithm can collect feedback on which photos are more relevant and appealing to the user. This feedback can be used to refine and improve the recommendation system over time, adapting to the user's preferences and evolving image preferences.

3. Genre Manager

Under the genre manager, users have the ability to input specific Genres that represent styles or topics they are interested in seeing more of on the Dash. These Genres act as preferences for the algorithm to consider when selecting and presenting content.

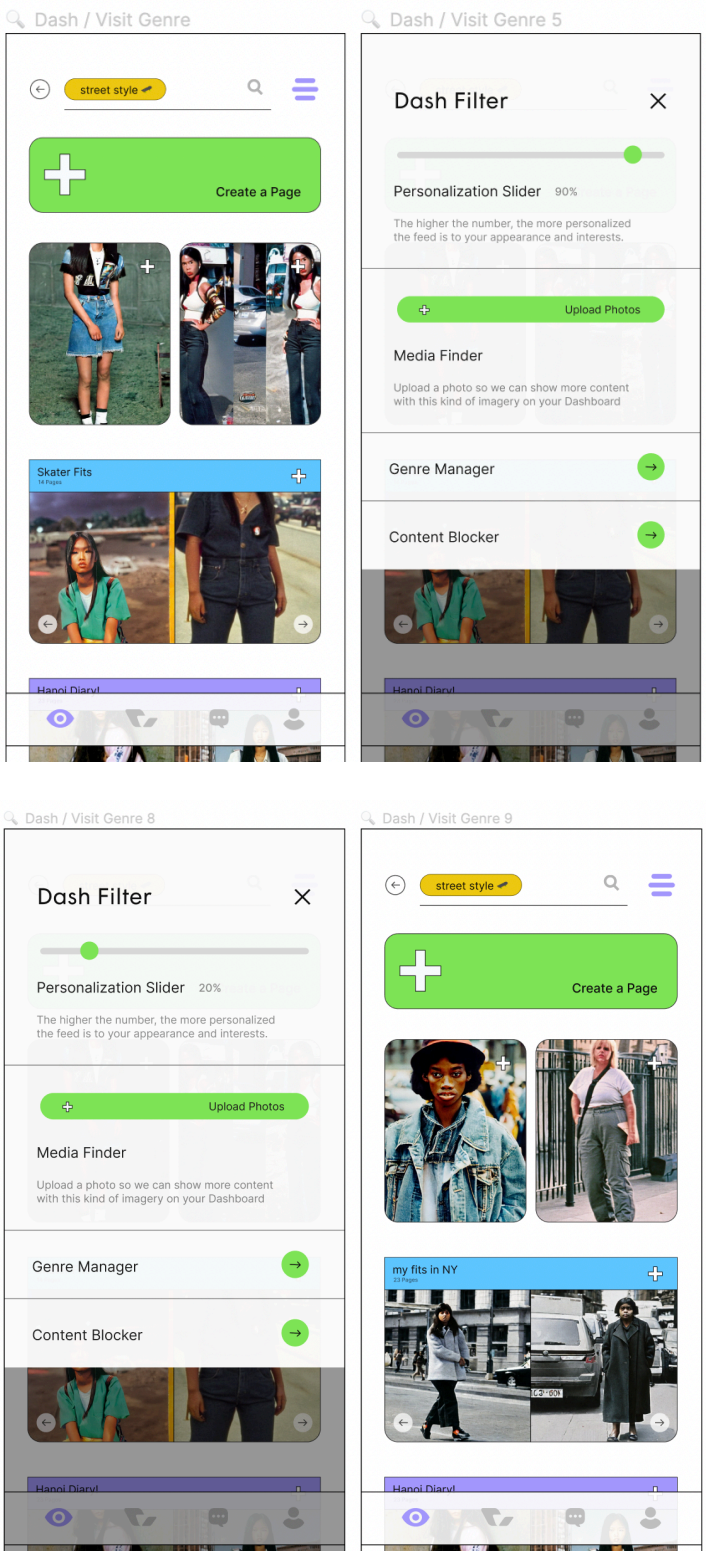


Figure iv.C.4.5: *C.4 Dash / Filter — A comparison of how a slide would look if the slider is high value vs. low value under the Genre of "street style"*

When a user adds keywords or styles to the Genre Manager, the algorithm will prioritize showing content that aligns with those Genres. It will take into account factors such as keywords, descriptions, and other attributes of the content to determine the relevance to specified Genres. Additionally, the algorithm will also consider the engagement patterns and preferences based on the content the user interacts with most frequently. It will take into account past interactions, such as saves, shares or view time, to further personalize the content recommendations on the Dash.

The following is a description further illustrating the operations of the Genre Manager through NLPs, CNNs, and CVs working together in enabling its system:

a. *NLPs:* NLP models are employed to analyze the textual input provided by the user in the form of Genres or keywords. These models can process and extract meaningful information from the text, identifying specific styles or topics that the user wants to see more of.
b. *CNNs and CVs:* CNNs are utilized as part of the CV component to analyze and process the visual content, particularly images. These networks have the ability to learn and recognize visual patterns, attributes, and characteristics associated with different Genres or styles. They can be trained on labeled datasets containing representative images for each Genre.
c. *Matching and Filtering:* The NLPs provide the textual representation of user-specified Genres, while the CNNs analyze and extract visual features from the images. The algorithm then matches the Genres or keywords to the corresponding images based on their visual content. This matching process allows the system to filter and present content that aligns with the user's specified Genres or styles.

4. Content Blocker

The Content Blocker works in the opposite way compared to the Genre Manager. Instead of specifying desired Genres, keywords, or styles, users can input elements they wish to exclude from their Dash due to lack of interest or relevance.

To achieve this, NLP models are utilized to extract textual information from the specified keywords, Genres, or styles. These models analyze and understand the content that users aim to avoid or block. Concurrently, CNNs and CVs come into play to associate keywords with images. This integration enables the filtering algorithm to identify and remove content that matches the specified criteria, ensuring that such undesired content is not displayed in the user's feed. By combining NLPs, CNNs, and CVs, the system can effectively implement the Content Blocker and enhance the user's ability to curate their personalized feed.

It should be noted that the Genre Manager and Content Blocker both operate independently from the other filter settings. For example, when the Personalization Slider is set to a low value, indicating a preference for a more diverse range of content, the Genres inputted by the user will still be taken into account and applied on the Dash.

C.5 Create a Page

Within the Dash interface, a prominent "Create A Page" button is strategically placed to encourage users to actively contribute their content to the application. The user can choose to create a Page either through the “Upload” tab or the "Generate” tab.

1. Upload

Upon tapping on the “Create A Page” button, users are directed to the "Upload" tab, where they can seamlessly upload a photo or video of their choice. In addition to the media file, users are prompted to provide supplementary information to enhance the categorization and discoverability of their Page.

The user will be prompted to include a concise yet descriptive short description that provides context or additional details about the uploaded content. They will also have the option to input relevant keywords or tags that are associated with the Page, aiding in its classification and alignment with similar content. If the uploaded media is a repost from another source, the user will be prompted to specify the original source to provide proper attribution.

Furthermore, users will be able to select the Book in which they wish to place their Page. This feature allows users to organize their content into curated collections and facilitate easier navigation for themselves and other users. By associating their Page with a specific Book, the content becomes more discoverable within the application's ecosystem.

The information extracted from both the uploaded media and the accompanying textual input play a crucial role in categorizing and indexing the Page, making it relevant and discoverable to other users. This holistic approach ensures that user-generated content is appropriately labeled and effectively reaches the desired audience within the application.

2. Generate

Under the "Generate" tab, users are guided through a series of steps to generate an image based on their desired visualization.

The process starts with the user forming a clear idea of what they want their image to depict. To enhance the accuracy of the generated image, users have the option to provide image references that serve as visual cues for the desired output. Users are also prompted to include a verbal description or prompt that further describes the specific details, composition, or mood they wish to see in the generated image. This verbal prompt serves as a textual guidance for the algorithm to understand and interpret the user's intent. By combining the user's conceptualization, image references, and verbal prompt, the system is better equipped to generate an image that aligns with the user's vision.

Additionally, the physical attributes inputted during the onboarding process, such as height, weight, skin tone, and body shape, is utilized in conjunction with the generated image. By incorporating the user's physical attributes into the image generation process, the generated images can provide a visual representation of how the desired style would look on someone with similar characteristics. Although not an exact replication of the user's appearance, it aims to offer a closer approximation to help users visualize themselves in different styles or garments.

To facilitate the image generation process, Generative Adversarial Networks (GANs) will be employed. GANs are a class of machine learning models consisting of two

components: a generator network and a discriminator network. The generator network is responsible for generating new images based on the given inputs, while the discriminator network evaluates the generated images for their authenticity. GANs will utilize the user's inputs, such as the idea, image references, and verbal prompt, to guide the image generation process (Pan, et al., 2019).

In conjunction, Conditional Generative Adversarial Networks (cGANs) will be utilized alongside the traditional GANs to incorporate the user's specified physical attributes into the image generation process (Pan, et al., 2019). The generator network in a cGAN receives the user's specified physical attributes as conditional input. This conditioning helps guide the image generation process to produce images that align with the desired attributes. For example, the conditional input can include information about the user's height, body shape, or other relevant characteristics.

By training the cGAN on datasets that includes images with corresponding physical attributes, the generator learns to generate images that match the desired style while taking into account the provided conditioning information. This allows the generated images to exhibit similar physical characteristics to those specified by the user.

Supplementing the GANs are other technologies and techniques to enhance the image generation process. These include NLPs to understand and interpret the user's verbal prompt and CV techniques to analyze and extract relevant features from the provided image references.

By combining the power of GANs with complementary technologies like cGANs, NLP and CV, the system can generate images that closely align with the user's intentions and preferences.

To further allow the system to improve its image generation process, a feedback mechanism is implemented. This involves the use of a sad face and a happy face emoji placed next to the generated images. These emojis serve as a simple and intuitive way for users to express their satisfaction or dissatisfaction with the generated images. By tapping on the sad face or happy face emoji, users can provide feedback to the AI system regarding whether the generated image aligns with their preferences and desired visual

representation. This creates a collaborative feedback loop between users and the AI system, fostering a more personalized and tailored image generation experience.

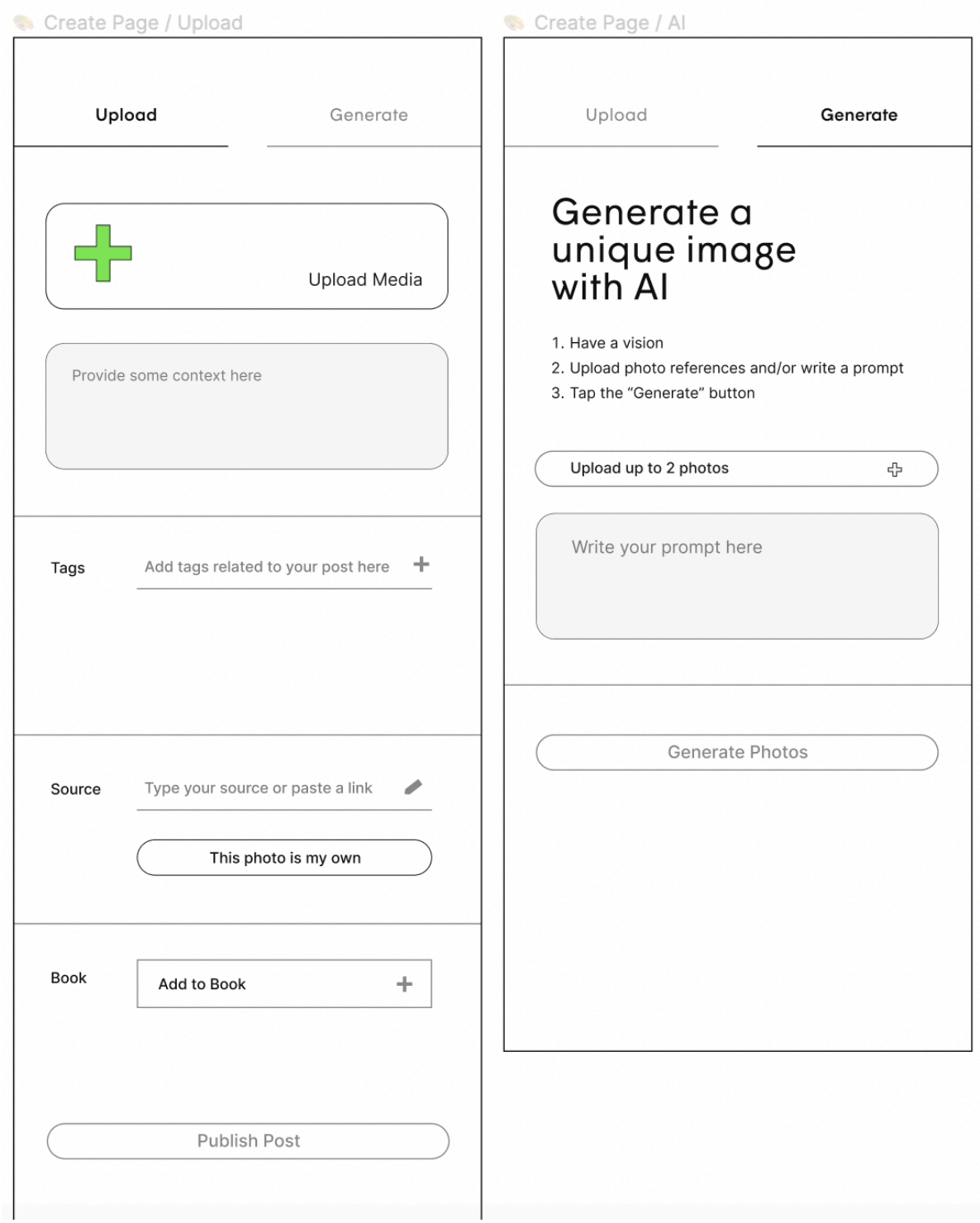


Figure iv.C.5: *C.5 Dash / Create a Page — Upload vs. Generate*

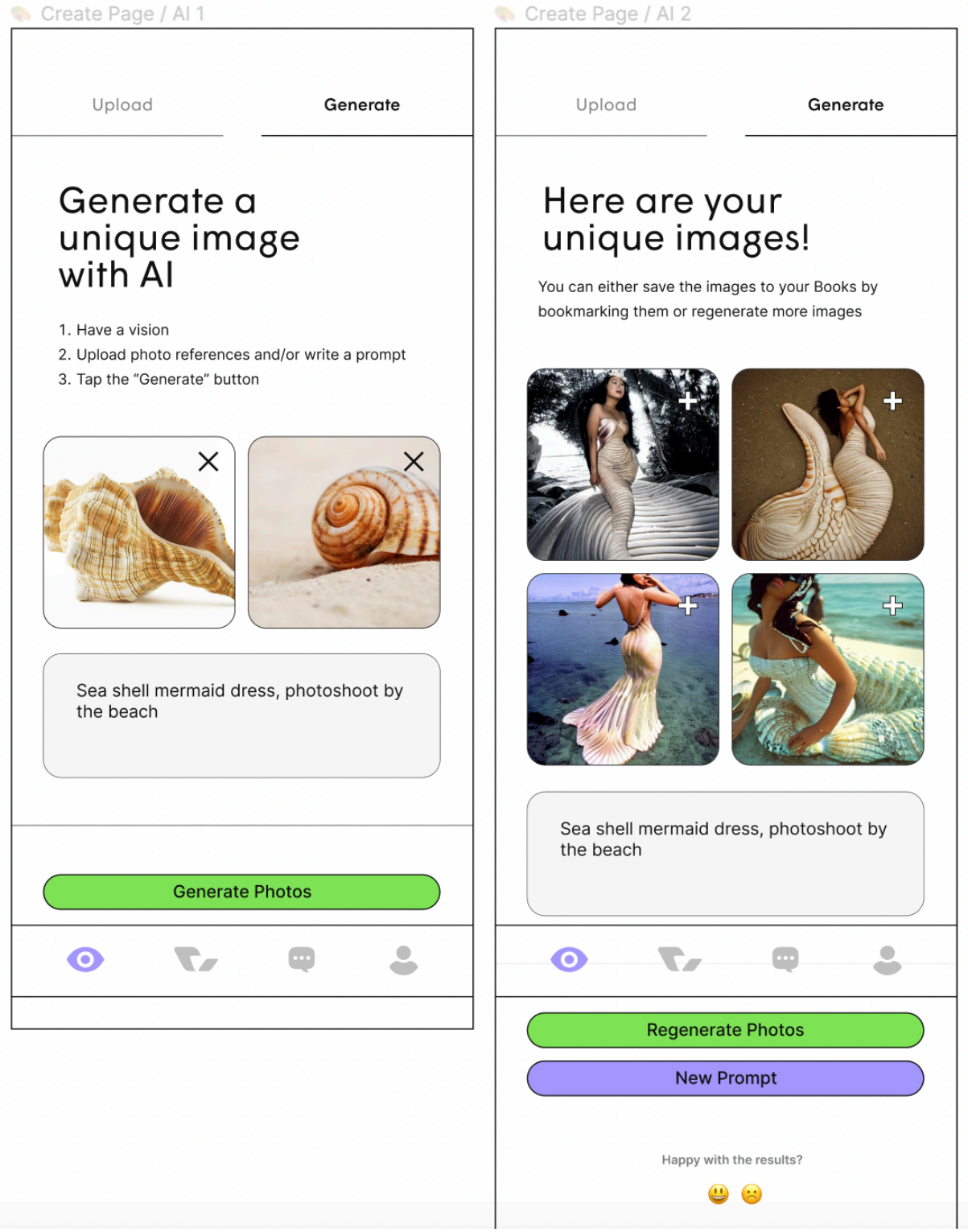


Figure iv.C.5.5: *C.5.5 Dash / Create a Page — Sample AI Generation*

D.1 Books

The Books section of the application offers users the ability to collect and organize content according to their preferences. The landing page of Books is designed with four distinct components:

1. *Search:* At the top of the screen, users will find a search bar where they can enter specific keywords to search for Pages within Books or locate content within specific Books. This search functionality allows users to quickly access the desired content they are looking for.
2. *Creator Buttons:* Below the search bar, there are creator buttons that provide users with direct access to pages where they can create their own Books. This feature empowers users to curate and assemble content based on their individual interests and preferences.
3. *Featured Books:* This section showcases curated collections of Books that have been specially selected by the application. These collections may highlight popular or trending content, specific themes, or noteworthy contributions from users. By featuring these Books, the application aims to inspire users and provide them with a starting point for exploring diverse and interesting content. Alternatively, the Featured Books may also incorporate Books deemed popular in the Weekly Challenge to gamify the experience of the application.
4. *Weekly Challenge:* This section invites users to participate in a weekly challenge that encourages users to create Books based on a given theme or topic, fostering creativity and engagement within the community. Users can contribute their own unique collections of content and potentially be recognized for their creative contributions.

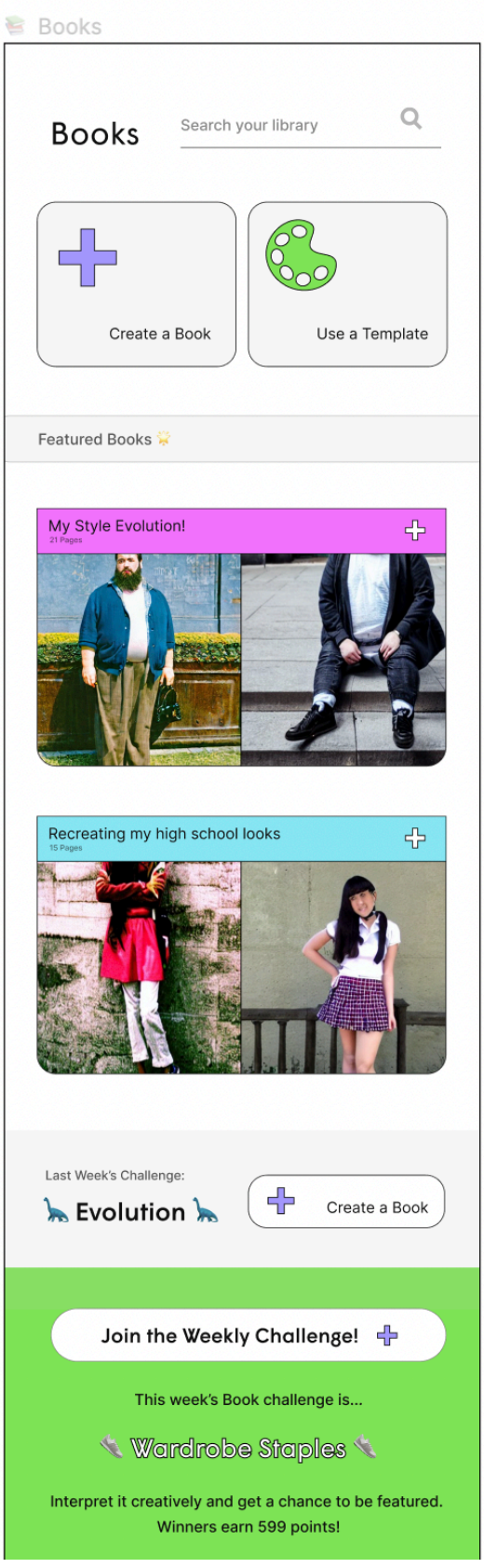


Figure iv.D.1: *D.1 Books*

D.2 Books / Create a Book

Upon selecting the "Create a Book" option, users are directed to a screen where they can provide essential information about the content they intend to collect within the Book. This step involves inputting details such as a title and relevant tags that are associated with the Book's theme or topic. By specifying these tags, users enable the application to categorize and index the Book, making it easier for other users to discover and explore.

Users are prompted to create descriptions in the form of bulleted points. These descriptions serve as concise snippets of information that will be strategically distributed throughout the Book, enhancing engagement and facilitating a meaningful connection between the viewer and the content. By organizing the descriptions in this manner, users can ensure that the Book provides a visually compelling and informative experience for those who scroll through its pages.

The privacy options for the Book offer users the flexibility to determine its accessibility. They can choose between three options: public, private, or limited to Authors only. Selecting the public option allows the Book to be visible and accessible to all users of the application. The private option restricts access to the Book, making it visible only to the Author. Lastly, the Authors-only option allows the contents of the Book to be visibly only to the users given access to contribute.

In the Authors section, users can invite other users to join and add Pages. This feature allows multiple individuals to contribute and participate in the creation and editing the Book.

The information provided during the creation process plays a vital role in categorizing and indexing the Book within the application's database. By incorporating relevant details and thoughtful descriptions, users can ensure that their Books are accurately classified and increase the chances of their content being discovered and appreciated by other users.

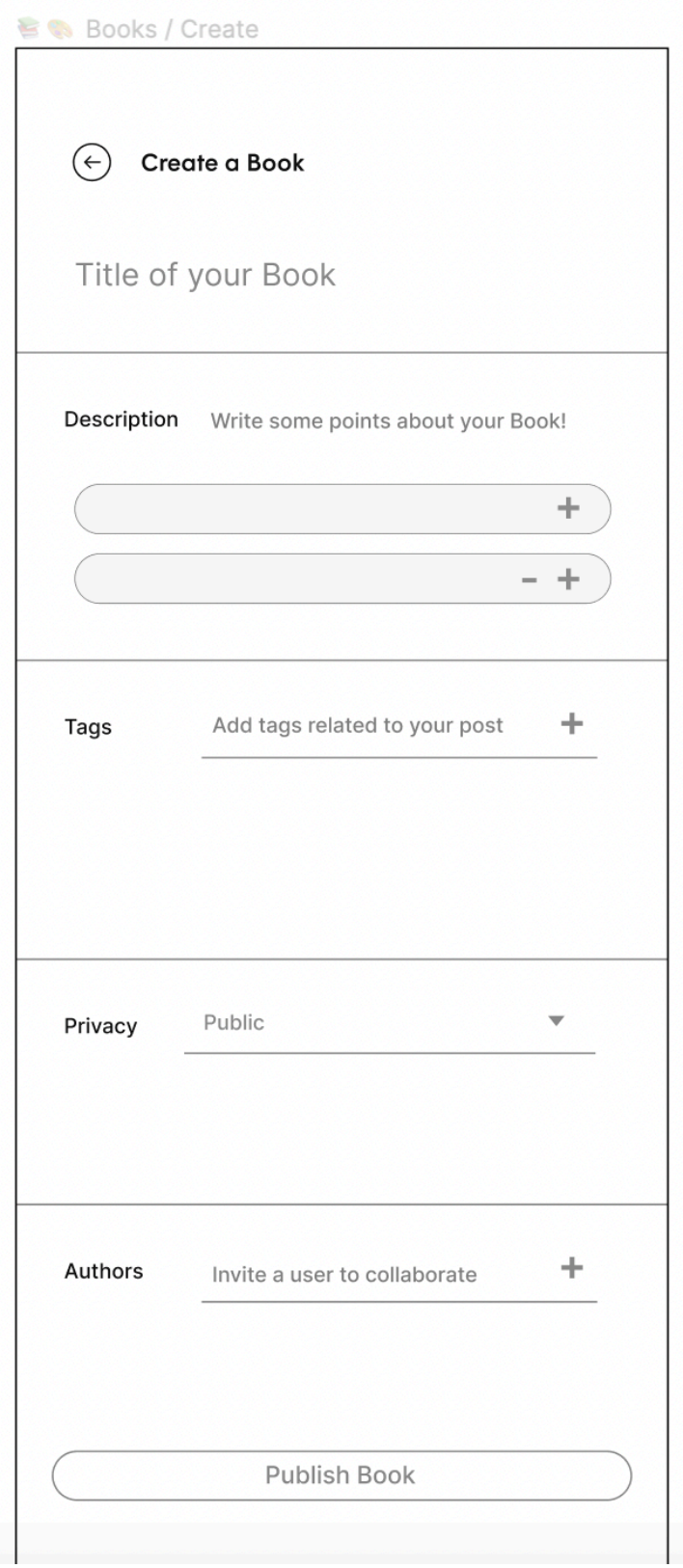


Figure iv.D.2: *D.1 Books / Create a Book*

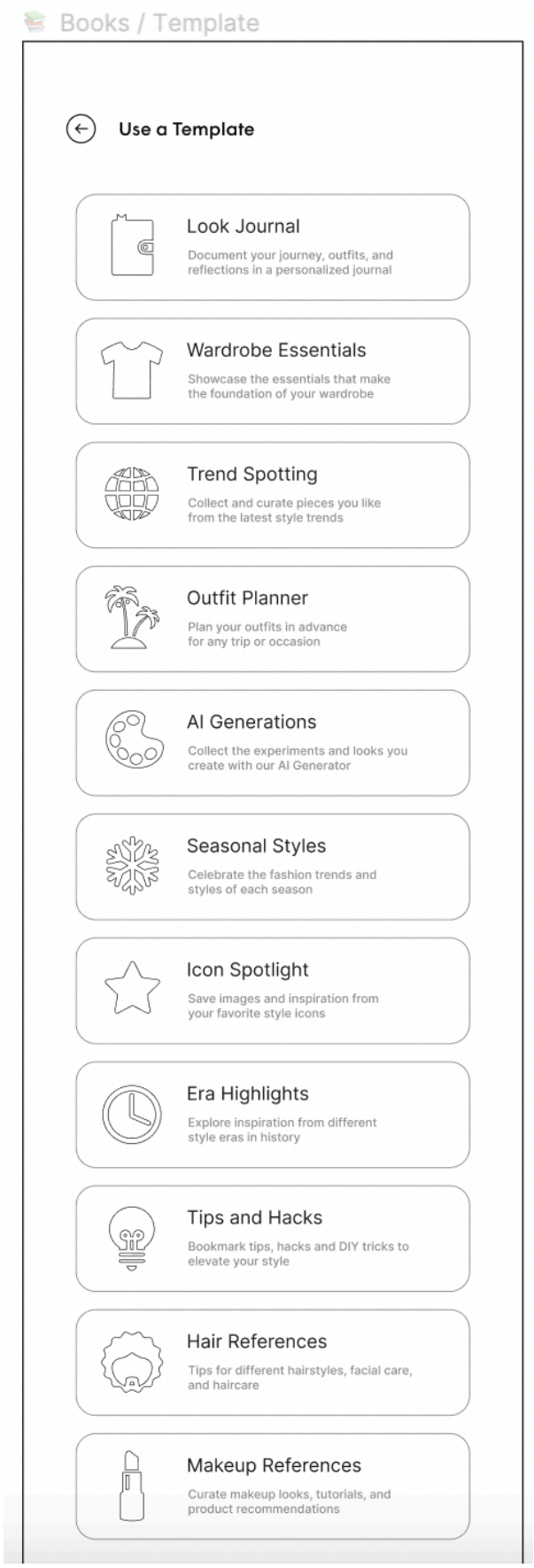


Figure iv.D.3: *D.3 Books / Use a Template*

D.3 Books / Use a Template

The "Use a Template" feature of the application offers users a range of pre-designed templates that serve as creative starting points for creating Books. These templates are designed to assist users in understanding the functionality and potential of Books while inspiring them to express themselves and explore their creativity.

Each template is carefully crafted to provide users with a structured framework for organizing their content and ideas. The templates feature opening questions or choices that prompt users to think about specific aspects of their Book, such as its theme, purpose, or narrative.

Upon creating a new Book, users are directed to the Book containing a header, body and footer.The header of the Book displays key details, including the title and usernames of the Authors. The header also features intuitive buttons that allow users to edit the book's information, perform searches within the book, and easily share the book with others. The footer contains tags or genres associated with the book. These tags help categorize the book and provide a quick summary of its content. Users have the flexibility to modify these tags whenever they desire, enabling them to refine and adapt the book's representation as needed.

Since the book is initially empty, the body includes a call-to-action button for users to Create a Page within the Book. To assist users in this process, the system recommends Pages it deems related to the information inputted by the user upon crafting the Book. This system leverages NLPs to understand the textual information provided by the user when crafting the book along with CNNs to analyze and process the images associated with the pages. The CNNs are capable of extracting visual features and identifying relevant keywords that are then attached to the images.

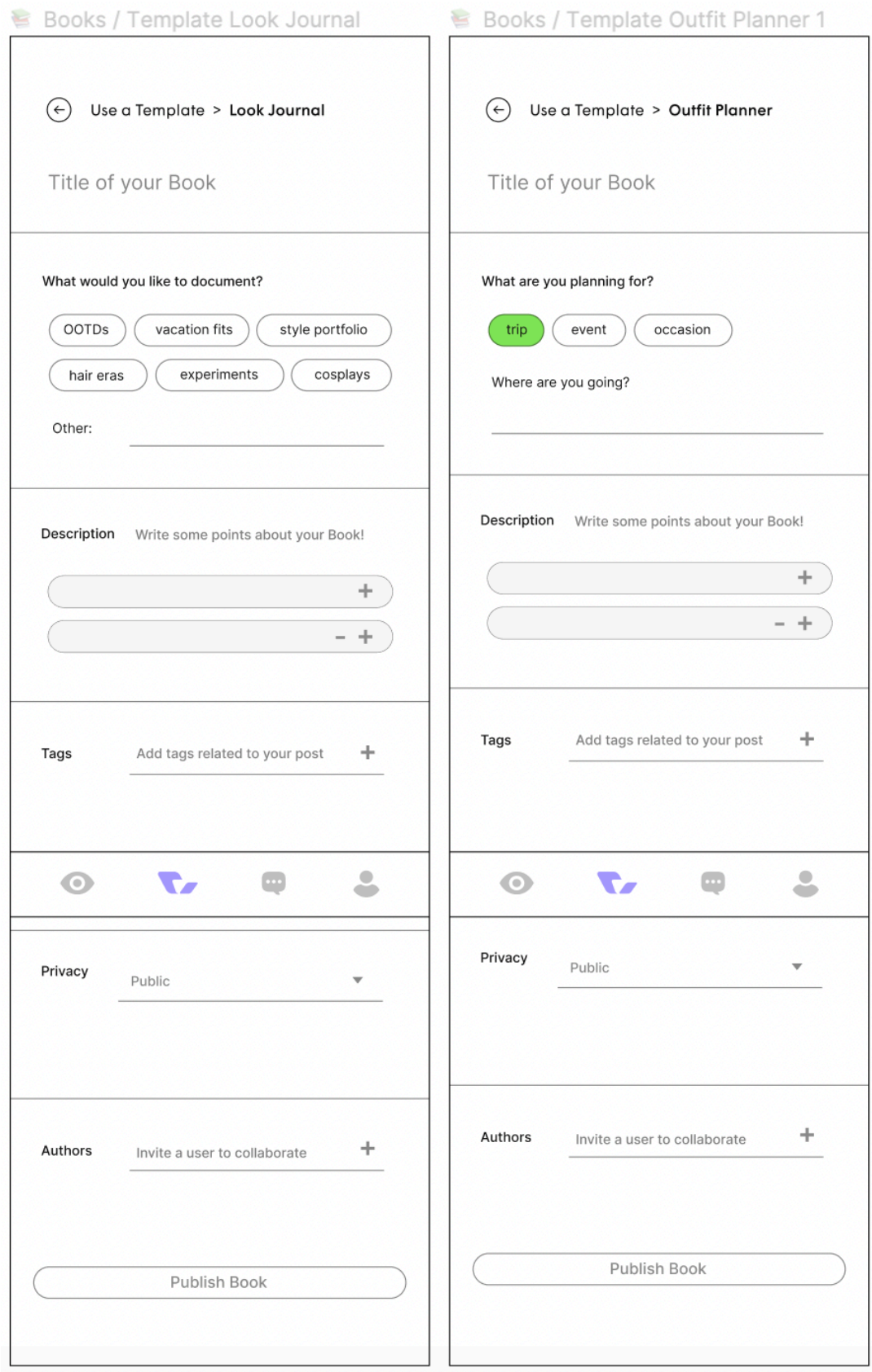


Figure iv.D.3.5: *D.3 Books / Sample Templates*

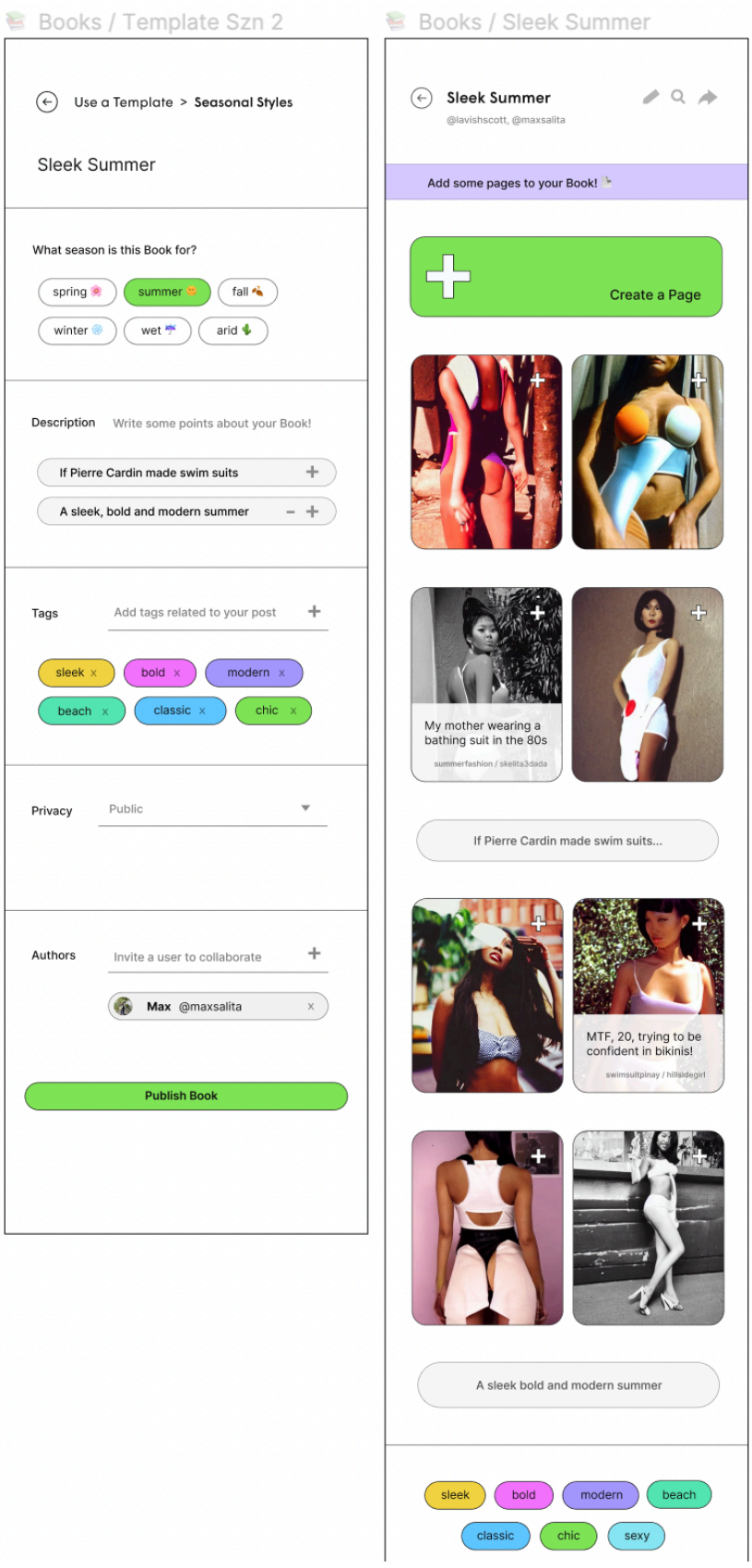


Figure iv.D.4: *D.4 Books / Sample Template: Seasonal Styles*

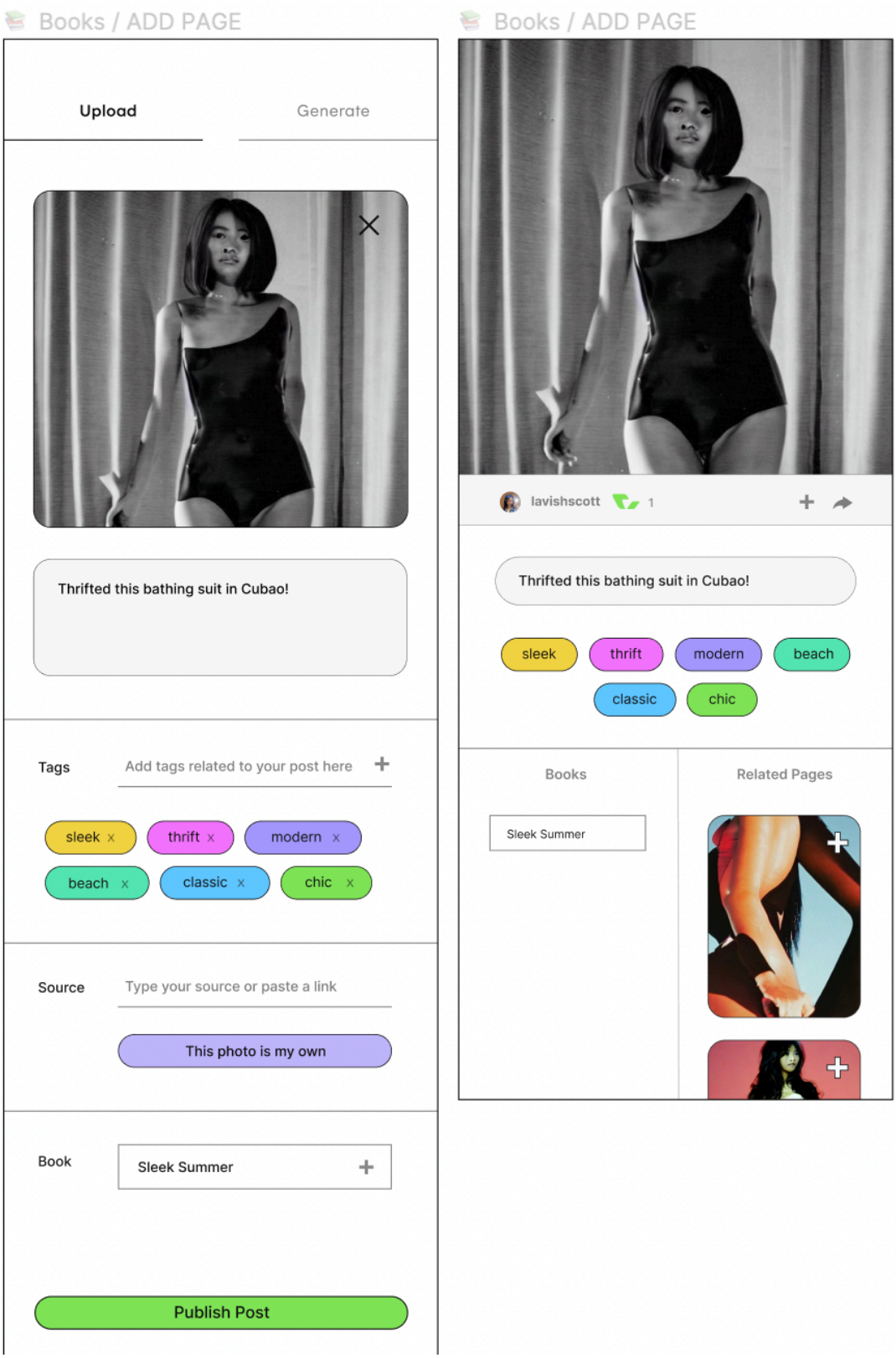


Figure iv.D.5: *D.5 Books / Create a Page on a New Book*

E.1 Community / Feed

The Community feature of the application offers users a platform for engaging in discussions, sharing ideas, and exchanging thoughts with other users. This interactive forum fosters a sense of community and facilitates meaningful conversations within the user base.

The main feed of the Community is populated with posts from various communities called Clubs. Users become part of these Clubs based on interests, preferences, or affiliations. By being a member of specific Clubs, users receive posts and updates that are relevant to their areas of interest.

Users also have the option to save posts from the Feed to their Books, alongside images or videos they discover from the Dash. This feature allows users to curate and organize content from the Community that they find interesting, informative, or inspiring.

When users open a Post, they are presented with an opportunity to engage in discussions and express their thoughts by leaving comments. This fosters a sense of community and enables users to connect with others who share similar interests or perspectives. To encourage positive interactions and highlight valuable contributions, users have the option to click on the heart button to show their support for comments they find insightful, helpful, or engaging. This serves as a form of endorsement or appreciation for the comment and signals its quality to other users.

The algorithm responsible for curating the Feed strikes a balance between displaying highly engaging posts and comments and ensuring visibility for recent posts. It follows a 50/50 ratio to maintain fairness and provide opportunities for both highly engaging content and recently posted text-based content to be seen by users.

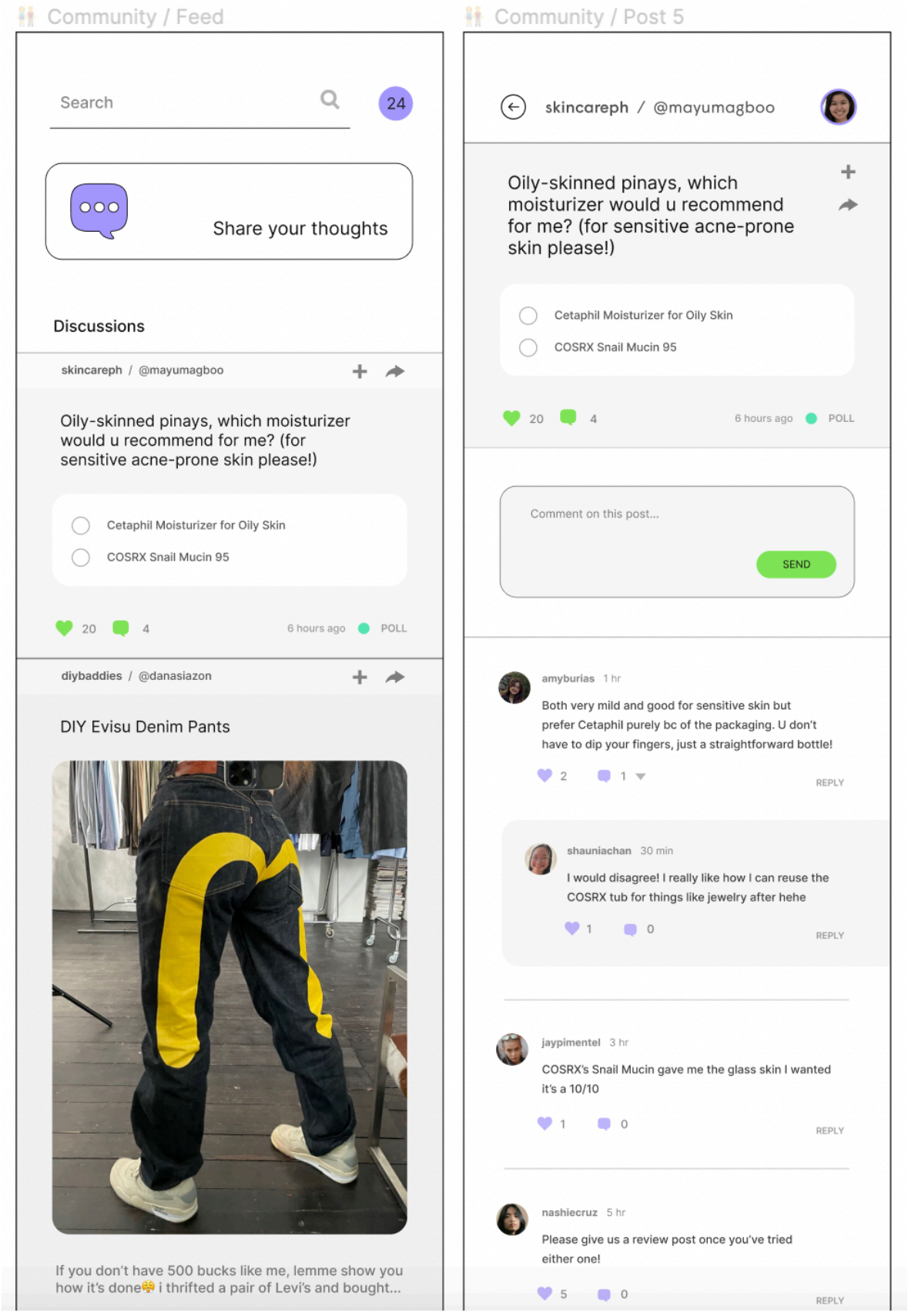


Figure iv.E.1: *E.1 Community / Feed*

E.1.5 Community / Interactions

Located in the header of the Feed, users will find a search bar and an Interactions button, represented by a circular icon displaying a number. The number is a visual indicator of received interactions. By tapping on the Interactions button, users can access tabs of the following:

1. Notifications: This section displays interactions initiated by other users on the user's own Posts. It includes notifications for comments, likes, and shares received on their content. By exploring this tab, users can stay updated on the engagement and feedback they receive from the community, allowing them to actively participate in conversations and respond to user interactions.
2. Messages: The Messages tab represents the number of unopened messages waiting in the user's Inbox. This section enables users to access and manage their private conversations with other users. By tapping on this option, users can engage in one-on-one or group conversations, fostering direct communication and interaction within the community.
3. Club: This tab serves as a gateway for users to access their clubs. Clubs are communities within the platform where users can connect with like-minded individuals, share common interests, and engage in discussions. By tapping on the Club option, users can explore and participate in their respective clubs, accessing a dedicated space for community interactions and content sharing.

These options within the Interactions tab provide users with convenient access to various forms of engagement and communication within the platform. By centralizing these features, users can efficiently manage their notifications, messages, and club activities, facilitating seamless interaction and enhancing their overall user experience.

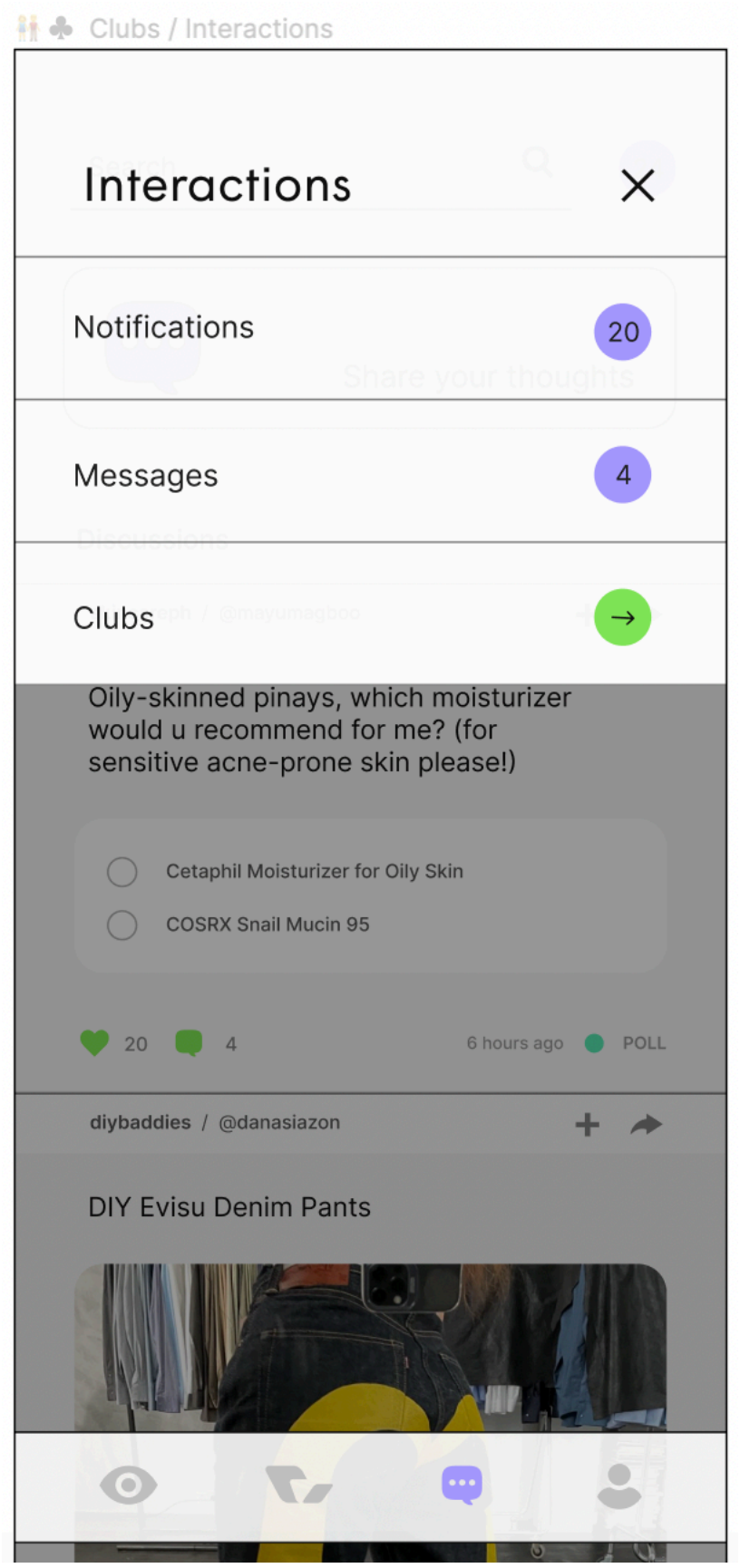


Figure iv.E.1.5: *E.1 Community / Feed*

E.2 Community / Share

The Feed features a prominent call-to-action button that encourages users to share their thoughts by creating a text post. When users tap on this button, they are directed to a dedicated screen where they can compose their text post. This screen provides additional buttons and options to enhance the post, such as formatting options (bold, italicize, strikethrough), bullet points, and the ability to include media, links, or polls within the post.

As users craft their text post, they are required to select a Club to which the post will be associated. By associating the post with a Club, other members of that Club can discover and engage with the post, fostering community interaction. Additionally, users have the option to assign tags to their post, indicating the specific type or category of the post. These tags help users identify the nature of their post and provide them with suggestions and ideas for the kind of posts they can create.

Furthermore, users have the ability to add the text post to a Book, allowing them to curate and organize their content according to their preferences. They can choose the privacy settings for their post, determining whether it is visible to the public or restricted to Club members only.

In summary, the process of creating a text post in the Feed involves composing the post with various formatting options, assigning it to a Club, adding relevant tags, and optionally including it in a Book. These features provide users with flexibility, creative expression, and control over the visibility and accessibility of their text posts within the community.

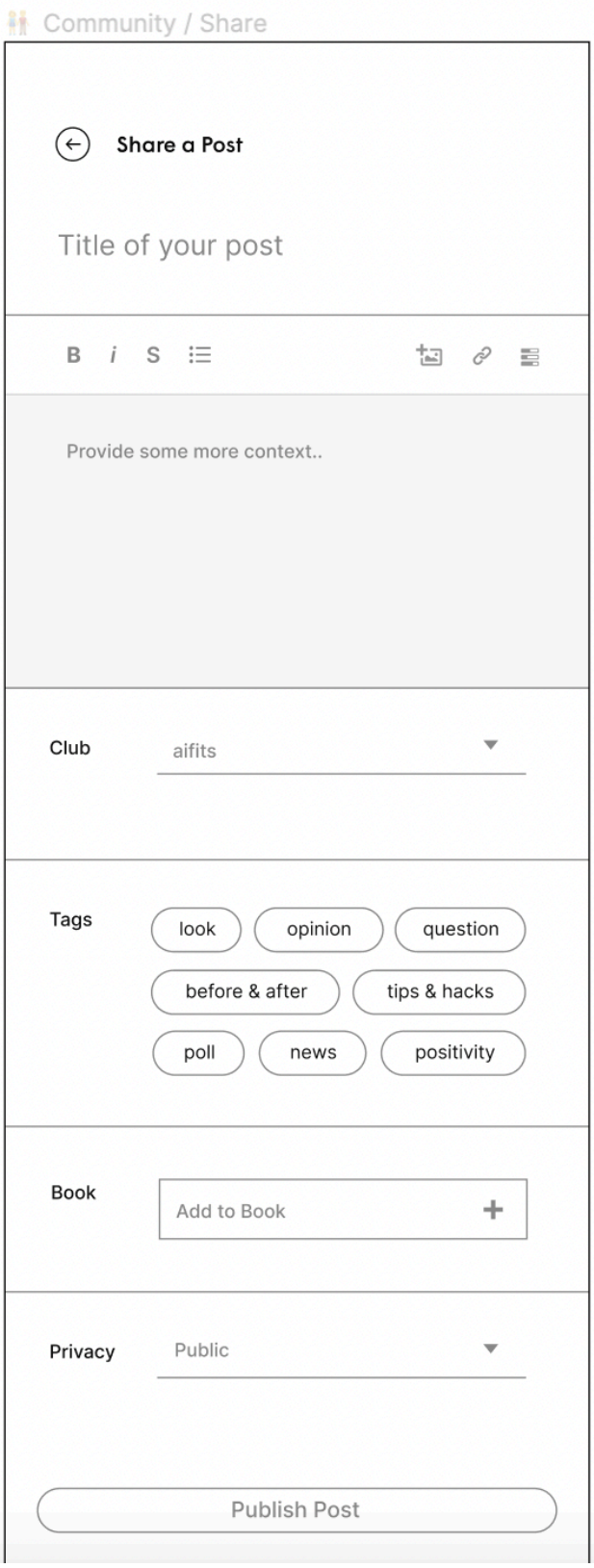


Figure iv.E.2: *E.2 Community / Share*

E.3 Community / Clubs

When users tap on the Clubs button in the Interactions tab, they are directed to a screen that features three tabs, providing different categories of Clubs:

1. *Trending Clubs:* This tab showcases Clubs that are currently experiencing high engagement and growth. The algorithm recommends these Clubs based on the user's profile and interests, ensuring that users have access to trending and popular communities.
2. *My Clubs:* In this tab, users can find a list of Clubs that they are already a member of. It allows users to easily navigate and participate in discussions within the Clubs they have joined.
3. *Pending Clubs:* This tab displays Clubs that are awaiting confirmation for the user's membership. Clubs may have different membership settings, such as requiring administrator approval or allowing users to join freely. The Pending Clubs tab keeps track of the Clubs where the user's membership status is pending.

The header of the page includes a back button, allowing users to navigate back to the Interactions tab. Additionally, a search bar is provided to help users find Clubs that align with their specific interests.

In the footer, there is a button that encourages users to start their own Club, enabling them to create and manage their own communities within the platform.

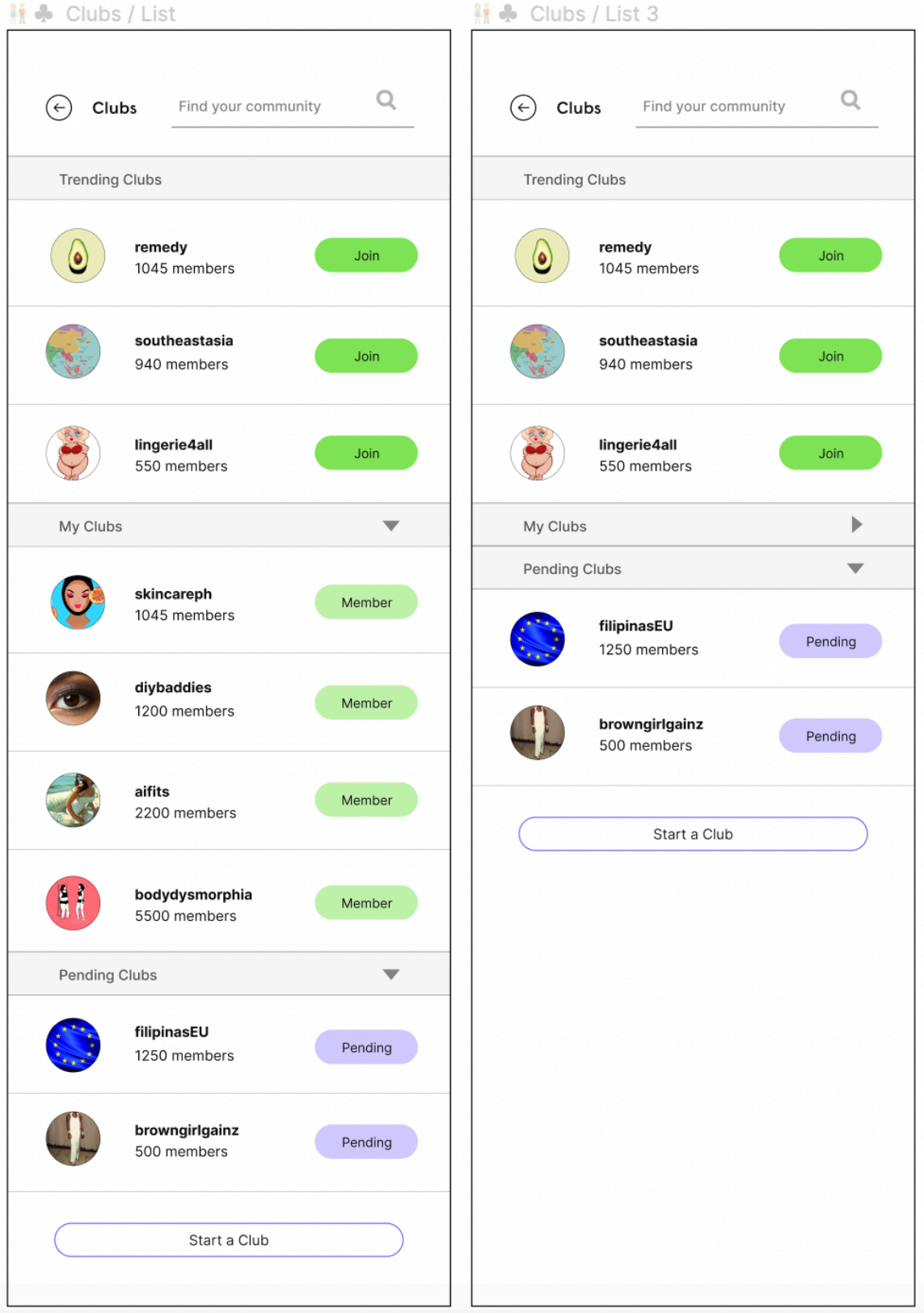


Figure iv.E.3: *E.2 Community / Clubs*

E.4 Community / Sample Club

Upon tapping on a Club, users are taken to a dedicated Club screen. The header of the Club screen provides essential information about the Club, including the title, a concise description, and relevant tags or Genres that give users an idea of its focus. It also displays the number of members and the total count of Posts within the Club.

Below the header, there are prominent call-to-action buttons that allow users to share a Post within the Club or utilize the AI Q&A feature, which is available for premium Clubs.

Additionally, users can navigate the Discussions section of the Club. This is where users can explore and participate in various discussions taking place within the Club. Additionally, a search feature is provided, enabling users to search for specific content or topics within the Club discussions. This feed follows the same balanced algorithm earlier, where 50% of the displayed posts are selected based on their high engagement, while the other 50% are arranged chronologically, ensuring a mix of popular and recent posts are showcased to users. This approach allows for both quality and timely content to be featured.

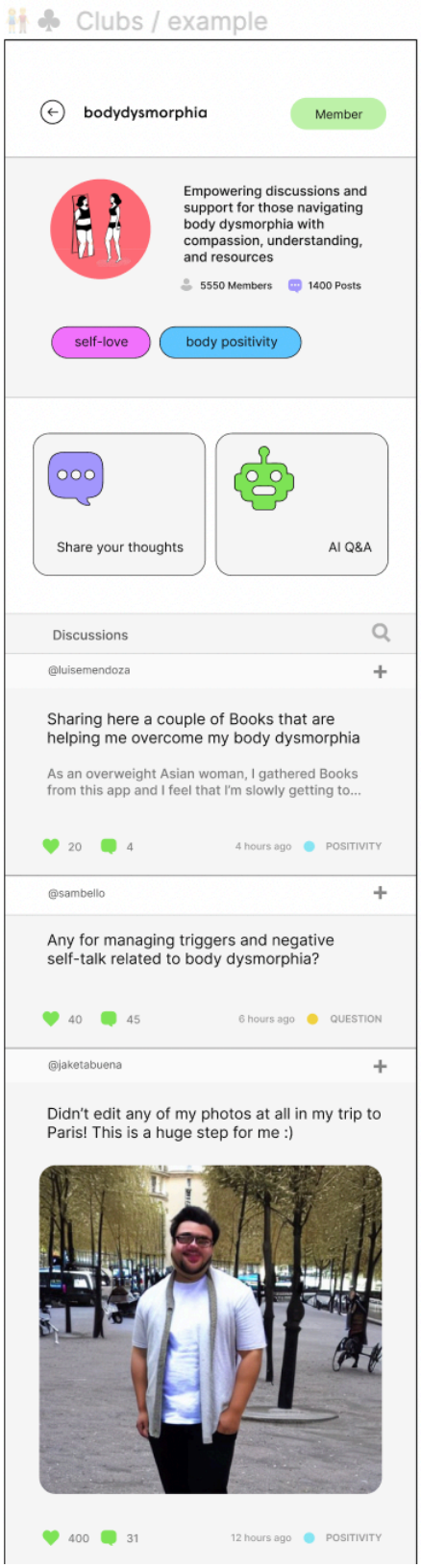


Figure iv.E.4: *E.4 Community / Sample Club*

E.5 Community / Sample Club

Premium Clubs have the advantage of offering the AI Q&A feature, which provides users with a valuable tool for obtaining answers to their questions. When users ask a question, the AI analyzes and summarizes the collective insights shared in the Club's discussions. The AI then presents the answer in the form of bulleted summaries, providing concise and relevant information.

To ensure transparency and credibility, the AI also provides a list of all the Posts it used as references to generate the answer. Users can easily access these referenced Posts by tapping on the respective buttons associated with each post. This allows users to delve deeper into the discussions and gain a more comprehensive understanding of the topic.

The AI Q&A feature utilizes several technologies to enhance its functionality and provide accurate answers to user questions within the Club. These technologies include:

1. NLP (Natural Language Processing): NLP techniques are employed to understand and interpret the user's intent with the question.
2. BM25 (Okapi BM25): BM25 is a ranking function commonly used in information retrieval systems. It considers various factors such as term frequency, document length, and term rarity to calculate a relevance score for documents in order to find the most useful and related information to the question asked. This then uses a special formula to decide which posts are most important and should be shown first based on factors like how often certain words appear and how long the posts are (Niu, et al., 2016).
3. BERT (Bidirectional Encoder Representations from Transformers): BERT is a language model that has been trained to understand questions and provide accurate responses based on the information available (Acharya, et al., 2022).

By combining these technologies, the AI Q&A feature aims to extract relevant information from the discussions within the Club and generate summarized answers that address the user's query effectively.

Figure iv.E.5: *E.5 Community / Sample Club*

E.6 Community / Messages

The Messages button within the Interactions tab provides access to the Inbox, where users can view ongoing conversations with other users. When visiting other users' profiles, message buttons are available to facilitate direct communication between users.

During messaging exchanges, users have the ability to send various types of content. This includes images, videos, Books, or voice messages. Furthermore, users can send Genres, which are clickable tags representing specific topics or categories of interest. These tags provide a convenient way to share and explore related content within the conversation.

To facilitate instant messaging, the application will utilize real-time communication protocol WebSocket. This protocol allows for bidirectional communication between the user's device and the server, enabling real-time message delivery and updates (Guan, Hu & Zhou, 2019).

Lastly, LookBook will employ encryption algorithms like SSL/TLS (Secure Sockets Layer/Transport Layer Security) to establish secure communication channels between users. SSL/TLS protocols provide encryption and authentication mechanisms, ensuring that data transmitted between the sender and receiver is encrypted and protected from unauthorized access or tampering (Kambourakis, Rouskas, & Gritzalis, 2002).

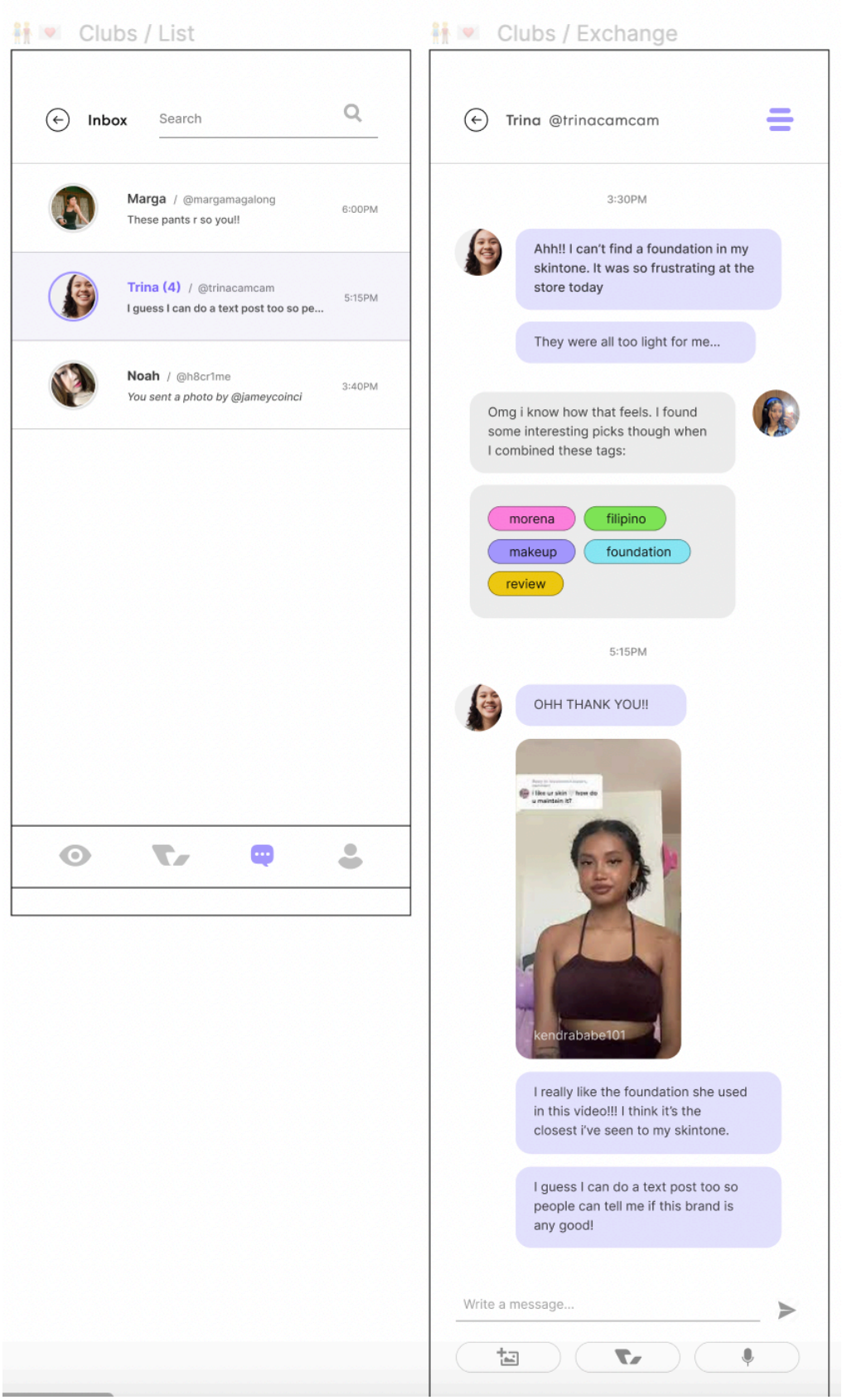


Figure iv.E.6: *E.6 Community / Messages*

F.1 Profile / My Profile

When users access their own profile, it is divided into two sections. The first section is the header, which displays information about the user such as their name, username, profile photo, and a brief bio. Users have the option to easily edit this information by tapping on the green pencil icon next to their name and username.

It also showcases the number of awards the user has received for reaching interaction milestones, as well as the number of points they have earned through their interactions within the application. These points and awards contribute to a gamified experience, motivating users to actively engage with the application. Implementing this system would involve backend logic and algorithms for tracking user interactions and calculating points.

The second section consists of tabs that highlight the user's Books, Clubs, and Following list. The Books tab allows users to showcase their own created Books, providing previews of the content within each Book. The Clubs tab displays the Clubs that the user is a member of, while the Pending Clubs section is visible only to the user, showing Clubs where membership confirmation is pending. The Following list showcases the users and Books that the user is currently following. User profiles are represented by circular icons, while Book profiles are represented by square icons. To promote a healthy environment, follower counts are not visible, discouraging comparison and competition within the application.

The user information, including the name, username, profile photo, bio, awards, points, books, clubs, and followers, would be stored and managed in a database for data storage and retrieval.

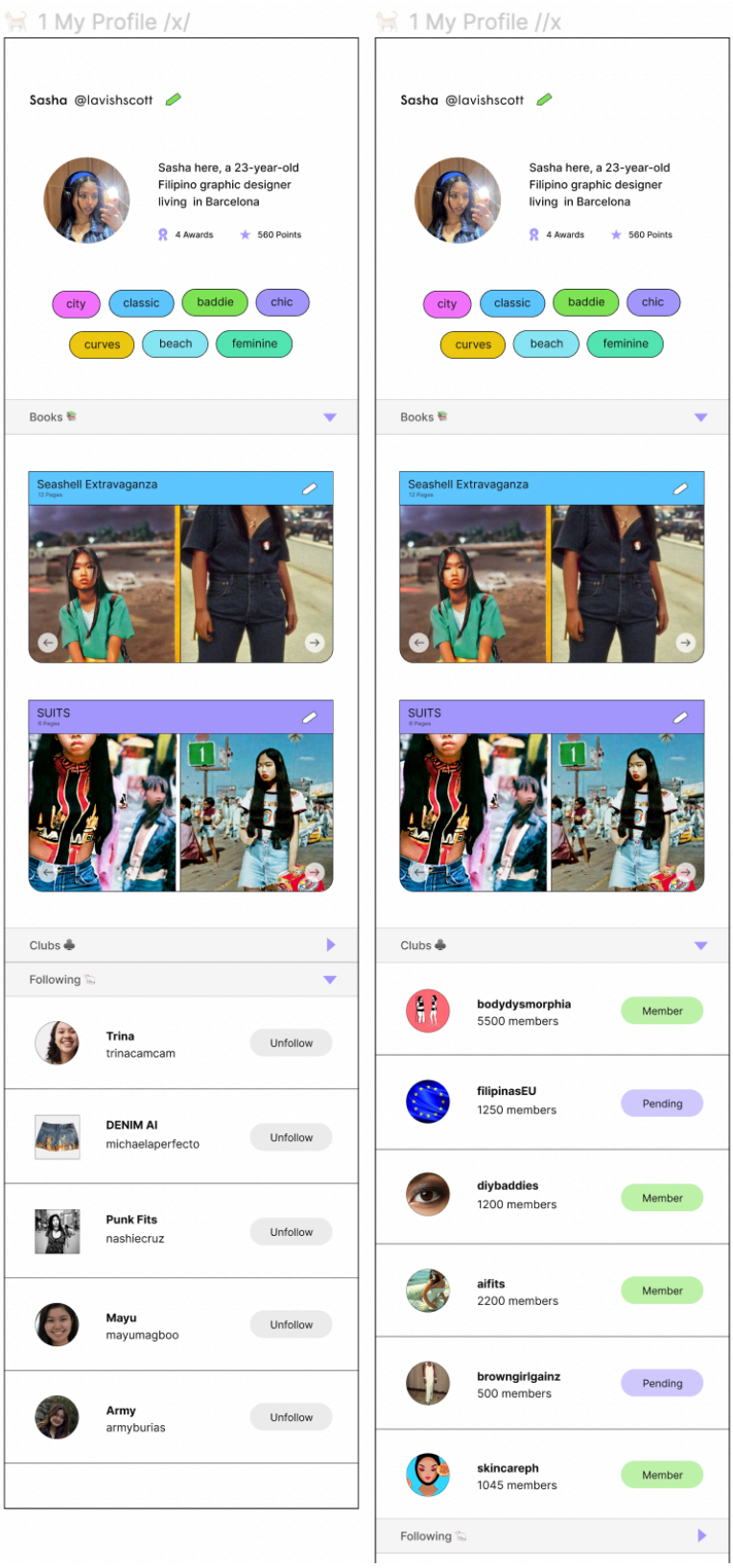


Figure iv.F.1: *F.1 Profile / My Profile*

F.2 Profile / Friend’s Profile

The profiles of other users follow a similar format, with a few notable differences. Instead of the green pencil icon for editing, there are icons available for messaging or following the user. These icons provide options for users to directly communicate with the profile owner or to follow their activities and updates. By tapping on the messaging icon, users can initiate a conversation with the profile owner, while the following icon allows users to start following their posts and updates. These icons enable users to engage and connect with each other within the application.

Once the user chooses to follow another user, they will start seeing that user's content on their Dash. The content will be displayed if it is relevant to the Genre the user has pinned to their shelf. This ensures that the user receives content that aligns with their preferred Genres and allows them to discover and engage with the posts of the users they follow.

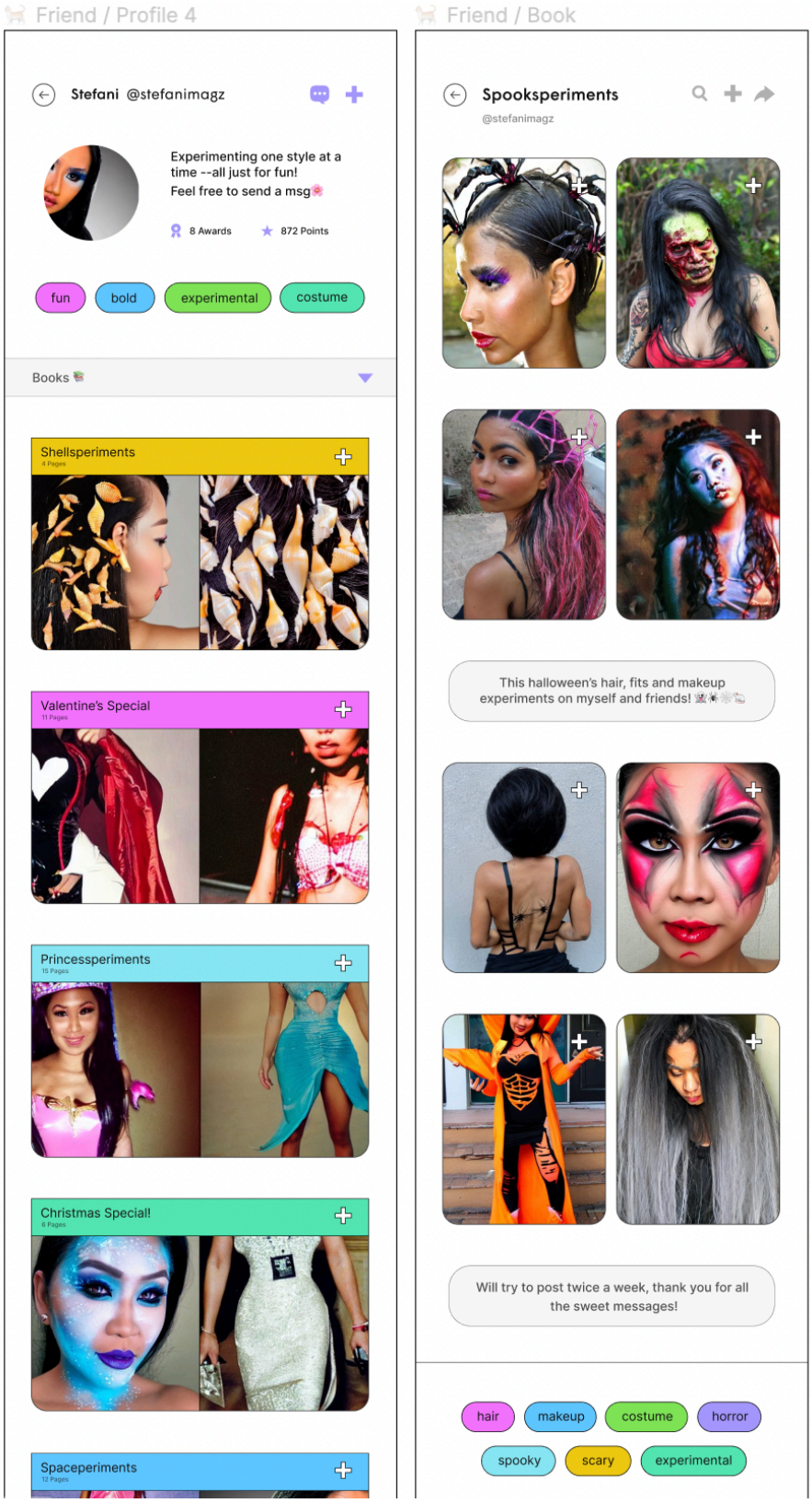


Figure iv.F.2: *F.2 Profile / Friend's Profile*

XII. Iterations

The application has undergone multiple iterations and revision processes to reach its current prototype. Throughout the development stages, various changes and improvements have been made to enhance the user experience.

A. First Prototype

In the first iteration of the application, the menu tab consisted of the following:

1. *Dash:* featured a two-column infinite scroll feed where users could view and interact with media posts. Each post had a bookmarking button denoted by triangles in the upper right corner, allowing users to save the post to a Book for later reference.
2. *Create:* provided users with options to either post text, upload images or videos, or to generate AI-generated images, adding a unique aspect to the app. Users could experiment with creating visually appealing content using the AI image generation feature.
3. I*nbox:* allowed users to access their messages and engage in direct communication with other users.
4. *Profile:* provided users with a personalized space where they could view and manage their own information, such as bio, profile picture, and activity history.

Despite these features, the first iteration of the application struggled to differentiate itself from similar platforms. The overall user experience felt similar to Pinterest, with a two-column scrolling feed and recommendation posts when creating new Books. While the inclusion of the Dash Filter and the AI image generation feature added some innovation, it was not enough to set the app apart significantly. As a result, further iterations and revisions were necessary to enhance the application's uniqueness and address the shortcomings of the initial prototype.

Documentation of the first prototype are Figure iii.A.1 up until Figure iii.A.4.o in the Annex section of this paper.

Figure iii.A.2: *Sitemap of the first iteration's prototype*

B. Second Prototype

The second prototype of the application was developed after conducting a brainstorming session, which involved reviewing related literature and market research content. This process led to the identification of various questions and potential solutions that could be addressed within the application. The outcome of this session was an outline that divided the application into four main sections: Dash for discovery, Community for engagement, Books for curation, and Profiles for expression.

Figure iii.B.1: *a screenshot of the brainstorming session to re-structure the features of the application*

This iteration is identical to the latest prototype with a few key differences. In this iteration, the onboarding process was more structured, presenting users with straightforward questions. Similar to the first prototype, this iteration includes sliders that allowed users to adjust a 3D visualization of their bodies. The Dash section retained the

two-column infinite scroll feed from the previous iteration. In terms of Books, the display format was updated to showcase long rectangles with a preview image and the title.

C. Professional Comments

In order to gather valuable feedback and insights for further improvement, consultations were conducted with professionals in the field of design and technology. These professionals were presented with a comprehensive deck (slides are available on Figure iii.B.4 in the annex) showcasing the application's features, design, and functionality. Additionally, they were provided with access to the second prototype of the application, allowing them to explore and interact with its various components.

The objective of these consultations was to engage in constructive discussions and seek expert opinions on potential areas of improvement for the application. Professionals were encouraged to provide their insights, suggestions, and recommendations based on their expertise and experience in the field.

1. *Chris Fussner is a* cultural strategy and business development consultant with a focus on web3 technology, medicine technology, art curation, web entertainment, and complex systems. Notable clients include Art Dubai, Structo3D, Validose, and Kumu. He is the founder of Tropical Futures, a studio dedicated to exploring topicality through its practices and aesthetics. Previously, Fussner served as a cultural strategist and researcher at Parsons School of Design, contributing to the development of the new Strategic Design & Management curriculum.
2. *Brandon Tay is* a Shanghai-based animator, visualist, and video artist with a diverse background in Singapore and Melbourne. His expertise extends to motion graphics work for renowned brands like MTV Asia and Australia, Sci Fi Channel Asia, and Tiger Translate. Tay's notable achievements include projection mapping projects featured at prestigious venues across Asia.
3. *Fletcher Bach* is an interactive artist, designer, technologist, and educator. Bach has an extensive portfolio that includes the creation of interactive installations, objects, experiences, and exhibits for notable clients such as NASA, Samsung, The New

York Times, FILA, and others. In addition to their professional endeavors, Bach contributes as part-time faculty at The Rhode Island School of Design, where they engage in discussions on topics related to code, interfaces, and computations.

The comments from professionals were categorized into four distinct areas: the onboarding process, the Dash functionality, AI image generation, and the overall framing of the application.

1. Onboarding

Fussner provided valuable feedback on the importance of establishing a proper opening for LookBook, where the user is introduced to the application's purpose and features. This initial interaction should aim to create a connection with the user and provide a clear understanding of what LookBook is about.

Tay raised some insightful points about the onboarding process, suggesting that it could be more conversational and less categorical to avoid overwhelming users due to the extensive information required. Additionally, Tay recommended integrating selfie biometrics more seamlessly within the application.

Tay also emphasized the significance of addressing body image concerns and distorted self-perception. He suggested exploring the implementation of 3D body scanning technology, allowing users to capture images of their body from different angles.

These comments provide valuable insights for improving the onboarding process, integrating selfie biometrics, and considering the implementation of 3D body scanning technology within LookBook.

To address the feedback and enhance the onboarding process, several changes were implemented in LookBook. The aim was to create a more enjoyable and engaging experience for users, while also considering inclusivity and promoting a positive body image. The new onboarding process incorporated elements of fun and lightheartedness. Colors and emojis were introduced to add vibrancy and create a playful atmosphere, making the initial interaction more enjoyable for users. Instead of simply inputting

information, users were presented with choices between two options or given the opportunity to select characters that resonated with them. This approach personalized the onboarding experience and allowed users to engage with the application in a more relatable way.

Regarding physical representation, the classification of users was revised to focus on similarities in overall face shape when capturing the selfie. This approach aimed to avoid categorizing users based on race or ethnic group and instead emphasized overall shared features. For body representation, users were no longer required to provide exact measurements. Instead, they were asked to provide their height and weight, along with images of body shapes that closely resembled their own.

2. Dash

Based on Tay and Fussner's feedback regarding the Dash, there was a shared interest in moving away from the conventional infinite scroll approach and exploring more innovative ways to present the feed. They highlighted the homogeneity of social media platforms and suggested looking into niche applications that provide unique and visually engaging feed experiences. Tay specifically mentioned Are.na, a platform focused on creative research, as an example. Are.na takes cues from early web exploration to provide users with a sense of exploration and discovery, encouraging them to manually explore and engage with the content.

To address the feedback provided by Tay and Fussner and introduce more innovative ways of presenting the Dash, LookBook drew inspiration from the concept of a "Book" and implemented changes to the home page layout. The objective was to move away from the conventional infinite scroll and create a more engaging and visually appealing experience. The new Dash design adopted a bookshelf-like interface, with rows of categorized content that could be horizontally scrolled. This approach allowed for multiple topics to be explored simultaneously, providing users with a diverse and curated feed.

The bookshelf metaphor not only provided a unique visual representation but also aligned with the application's overall theme and purpose. Additionally, the feedback from led to the adoption of terminology within the application. A "Page" was introduced to represent an individual post, while a "Book" referred to a collection of these pages. Categories or styles were relabeled as “Genres." This terminology helps users understand and navigate the functionalities of the application more intuitively, enhancing user recall and promoting familiarity.

3. AI image generation

As Bach reviewed the prototype featuring a Southeast Asian female persona, he highlighted the presence of racial biases and stereotypes that tend to sexualize images of this ethnic group. He pointed out a common trend in platforms that use GANs to generate photos, where individuals from certain nationalities or ethnic groups are often depicted wearing traditional clothing, limiting the portrayal of modern perspectives. Bach raised the important question of how to avoid these biases and stereotypes within the application.

To address these concerns, the decision was made to remove the option of explicitly asking for specific ethnic groups during the onboarding process. Instead, the application focuses on capturing the user's overall physical features, including facial characteristics, body shape, and skin tone. By showing images that share these overall similarities, the application aims to provide representations that align with the user's physical attributes, irrespective of their ethnic group.

Bach also posed a question regarding the goal of AI generation, questioning whether the objective is to create an exact replica of oneself or to generate representations of one's community. Although the initial goal was not explicitly defined in the second prototype, it was understood that the aim was not solely to produce an exact replica. Rather, the intention was to see someone in the generated content who resembles the user, thereby encompassing both a sense of personal identification and representation within their broader community.

Bach's observations and inquiries prompted the consideration of biases, stereotypes, and the overarching objectives of AI generation within the application. By removing explicit ethnic group categorizations and focusing on overall physical attributes, LookBook aims to foster a more inclusive and personalized experience that respects diverse identities and promotes a sense of community representation.

4. Framing

Bach highlighted the unique positioning of LookBook towards fashion and style, noting that it sets itself apart from existing market offerings. He recognized the absence of a similar application that combines fashion and AI technology in such a way.

In terms of feature importance, Bach emphasized the complementary nature of the features, stating that there is no hierarchy among them. He suggested that highlighting different features could be tailored to specific audience segments or how audiences would use the application. For example, the application could have users who mostly browse and users who mostly create to share their posts. Additionally, he mentioned that designers and creatives are an untapped audience that would be very interested in exploring the application.

Another approach suggested by Bach was a phased rollout, where additional features would be introduced as updates over time. This would allows users to become familiar with the core functionalities of the application before expanding its capabilities gradually.

Furthermore, Bach recommended emphasizing the socially innovative aspect of LookBook, emphasizing its inclusivity. The application's ability to use technology to help individuals who may not fit the traditional beauty standards see themselves in styles they desire was seen as a compelling proposition. Rather than focusing solely on the technological aspect, it was advised to position LookBook as a trailblazer in the industry, offering something genuinely new and socially impactful.

Fussner expressed enthusiasm for the concept of LookBook empowering users to have control over their own algorithms. He noted the growing awareness among people

regarding data usage by applications and corporations, and he appreciated LookBook's transparency in handling user data. Fussner suggested emphasizing the datasets on which the application is trained and how this training benefits user experience. This transparency enables users to reflect on the content they consume and how it influences their perception of reality.

From a business development perspective, Fussner suggested prioritizing the AI generating features over curation in the application. This aligns with Bach's recommendation of a phased rollout, focusing on the most viral features first when it comes to marketing. By doing so, LookBook can capture users' attention and create a strong initial impression.

Fussner also agreed with Bach's observation that the average user may not possess in-depth knowledge of the technological framework or machine learning algorithms behind the application. In light of this, he supported Bach's suggestion of highlighting the social innovation framing of LookBook. Instead of emphasizing the technical aspects, the focus should be on how LookBook is doing something innovative and inclusive, allowing individuals to see themselves in the styles they desire. This approach can resonate more effectively with the target audience and convey the value and impact of the application.

Taking these recommendations into account, LookBook can prioritize the AI generating features, implement a phased rollout strategy, and highlight the social innovation aspect in its messaging and positioning. This approach can help attract and engage a wider user base while distinguishing LookBook from competitors in the market.

XIII. Recommendations

The section is a review of the current prototype and how it can be improved in terms of the application itself and future plans on the development of the application.

A. Application Improvements

1. Dash / Generate

   The feature in the application to be able to generate photos in the likeness of the user requires datasets that would be able to accurately depict any kind of user. The only

dataset that seems to cover a balanced weight of diversity is FairFace, but this is limited to facial features only.

To enhance the AI image generating feature of the application, it is crucial to incorporate diverse datasets that cover a wide range of body types, body shapes, hair textures, colors, and lengths. This includes representation for both male and female sexes, as well as non-binary individuals.

In addition to body-related features, the application would benefit from datasets that encompass different makeup techniques, colors, and styles. It is important to consider a diverse range of skin tones and ensure that the generated makeup looks can be applied to individuals with various skin tones. This will enable users to explore and experiment with different makeup styles that are representative of their individual preferences and identities.

Lastly, conducting phased tests is essential to enhance the accuracy and quality of the AI image generation feature in LookBook. These phases include data preprocessing, model training, validation, user testing, and iterative refinement. By carefully curating diverse datasets and incorporating user feedback, LookBook can iteratively improve the image generation process, ensuring it accurately represents various body types, hair textures, skin tones, and makeup styles.

2. Books / Challenges

To encourage users to create Books, a bi-monthly challenge where users are given a prompt can be implemented in LookBook. This extended timeframe, as opposed to the weekly challenge the current prototype suggests, allows users more time to develop their ideas and create high-quality content.

The featured section of the Books can then alternate between highly engaging Books and those that have shown notable contributions during the challenges. Additionally, the points system within the application should be revised to provide incentives for users' active participation and creation, ensuring that their efforts are recognized and rewarded.

3. Community / Feed

In order to enhance the content display on the Community Feed, it would be valuable to experiment with different ratio algorithms. The current prototype utilizes a 50/50 algorithm that combines recency and high engagement, and alternative ratios could be explored and tested to figure out what users are more likely to engage with.

Alternative algorithms could be explored to provide different user experiences. For example, implementing an algorithm that prioritizes the Clubs a user frequently visits or interacts with could ensure that posts from these Clubs are displayed first. This customization would allow users to see content that aligns more closely with their interests and preferences.

4. Community / Clubs

It is recommended to increase the accessibility of the Clubs screen by making it more prominently available, rather than requiring users to access it through the Interactions tab. This would allow users to easily navigate and engage with various Clubs as these play a crucial row in the appearance of the Community section within the application.

Furthermore, there is a need to clearly differentiate between Regular Clubs and Premium Clubs, beyond the current distinction of the AI Q&A feature. Additional incentives should be introduced to encourage users to create and participate in Premium Clubs. It is important to elaborate on what it means for a Club to be premium, whether it involves a paid subscription or fulfilling specific requirements.

For instance, one approach could be to require a certain number of posts within a Club to gather sufficient data for the AI Q&A feature. Alternatively, a point system could be implemented, where user engagement and activity within a Club contribute to earning points and becoming eligible for Premium status. These enhancements would provide users with more incentives and opportunities for engagement within the community.

Lastly, it is recommended to provide users with visual examples and detailed explanations on how to create and customize Clubs. Introducing administrator tools for Club owners and moderators would empower them to effectively manage these, possibly including features such as member management, content moderation, and analytics to track engagement and growth within the Club.

Additionally, incorporating AI programming for automatic post categorization or flagging could be beneficial. This AI-powered functionality could assist in organizing and monitoring the content within Clubs, ensuring a streamlined and well-maintained environment for users.

5. Point System

To enhance user engagement and make the application profitable, it is crucial to elaborate and specify the point and reward system. Different features and activities within the application should be assigned specific points, with higher points allocated to those that promote creation and user engagement. This incentivizes users to actively participate and contribute to the community.

Additionally, defining milestones within the application and translating them into awards or achievements can further motivate users to interact and explore the platform. These milestones can serve as goals for users to strive for, creating a sense of progression and accomplishment.

A possible strategy is to restrict access to advanced features unless they attain certain ranks. Users can either accumulate a required number of points through active engagement or choose to pay a fee to obtain a higher rank. Both approaches have their benefits, as increased points encourage continued engagement, while paid ranks and features generate monetary profit for the application. By developing a well-defined point and reward system, incorporating milestones and awards, and offering different avenues for users to achieve higher ranks and access advanced features, the application can foster increased user engagement and generate financial sustainability.

With that in mind, it is crucial to establish the various ranks and their corresponding point thresholds, as well as specify the types of interactions that contribute to earning points. Moreover, extending the visibility of points beyond the user profile to encompass the entire application would enhance motivation by providing constant reminders of progress. To further foster a motivational environment, implementing positive reinforcement when users reach specific point milestones can serve as an additional catalyst for engagement and encourage users to actively accumulate points.

B. Partnerships

LookBook is committed to promoting diversity and inclusivity within the field of artificial intelligence. To further this mission, LookBook seeks to establish partnerships with companies that are dedicated to providing diverse datasets, particularly focusing on recognizing a wide range of ethnic groups and physical characteristics. By expanding the availability of diverse datasets, LookBook aims to address the lack of diversity in facial recognition and AI datasets, ultimately aiming to eliminate human bias in technology.

An important aspect of LookBook's approach is to raise awareness about the potential harm caused by narrow datasets that only represent a small group of people. By highlighting the negative consequences such as false diagnoses in health and harmful stereotyping by machines, LookBook encourages users to contribute their photographs to companies involved in developing datasets for artificial intelligence. Prior consent from users would be sought before their photographs are shared for the purpose of expanding diverse dataset collections.

QOVES Studio is a potential partner for LookBook, as they have expertise in appearance-based artificial intelligence technology and actively seek solutions to enhance diversity within this field. Collaborating with companies like QOVES would contribute to the broader conversation and collective action towards creating a more inclusive technological landscape. However, LookBook remains open to partnering with other tech companies and studios that share the same commitment to diversity and inclusivity.

By forging strategic partnerships with like-minded organizations, LookBook aims to drive positive change in the AI industry, promote diversity in datasets, and ultimately mitigate the biases and limitations associated with current technology.

XIV. Conclusion

This research has presented LookBook, an innovative application that addresses the issue of technology reinforcing a standardized representation of beauty. Through a comprehensive research process involving futurization analyses, target market research, market research, and prototyping, LookBook has been developed as a transformative space where users can reshape their realities based on the content they consume.

The key findings of this study highlight the significance of LookBook's features in challenging traditional norms and empowering individuals to define their own beauty standards. The app grants users the agency to curate their feeds, choosing between seeing themselves represented or witnessing a diverse range of individuals. LookBook's Books feature provides curated content and promotes creativity, allowing users to explore and express their unique identities. AI generation techniques within LookBook enable users to see themselves represented through personalized visuals, fostering self-acceptance and promoting diversity. Additionally, the app's Clubs feature creates a supportive community for users to engage with others who share their interests, fostering connections and encouraging dialogue around diverse beauty.

In conclusion, LookBook represents a significant advancement in reshaping the beauty landscape. By leveraging its innovative features and personalized experiences, the app challenges societal beauty norms, promotes self-expression, and fosters a sense of community. Users are empowered to curate their timelines according to their preferences, ensuring representation and inclusivity. LookBook's emphasis on diversity, self-acceptance, and community engagement has the potential to shape a beauty culture that celebrates the beauty of all individuals. Through its transformative features, LookBook contributes to expanding the conversation around technology and its potential to move beyond a standardized representation of beauty. By offering users a platform to reshape their realities

and encouraging inclusivity, LookBook showcases the possibilities for technology to promote diversity and empower individuals in the beauty industry.

Moreover, LookBook contributes to the broader conversation of making technology more inclusive. By offering a platform that promotes diversity and challenges narrow beauty standards, LookBook expands the possibilities of technology beyond being trained on datasets that represent only a limited group of people. As technology continues to play a significant role in the beauty industry, embracing innovations like LookBook is crucial in prioritizing diversity, self-expression, and the well-being of individuals. Through such advancements, a more inclusive and empowering beauty landscape can be fostered to be inclusive of various groups.

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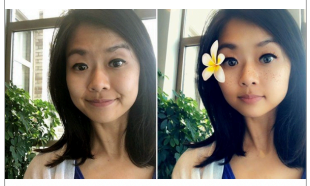
XVIII. Annex

i. Future Methodology

A. Headlines

Headline	Excerpt	Headline	Excerpt
www.dazeddigital.com **Which beauty subculture will you belong to in the metaverse?** From Romantic Radicals to Soul Alchemists and Shape Shifters, trend forecaster Geraldine Wharry predicts the subcultures that will reign supreme in our virtual future	The metaverse is evolving, becoming an increasingly large presence in our lives, and there is a new matrix of beauty and existence being architectured. The change is metaphysical and evolutionary, as well as social. “Imagine a world where we are not restricted by our anatomical make-up,” says Lauren Bowker, alchemist and founder of The Unseen Beauty. “What would beauty even mean in that world? If it can be anything in the world, what would you look for?” As the metaverse continues to expand and grow, beauty tribes will merge, shift and birth never before seen aesthetics, finding beauty in new forms of representation.	thingtesting.com **Why more health and beauty brands want your DNA | Thingtesting** A growing number of brands want consumers to hand over their DNA so they can tailor their nutrition and skincare products to our specific needs.	For Know Beauty, Vanessa Hudgens’ new skincare brand, it’s a cheek swab. The brand launched last summer with a novel proposal for a celebrity-founded brand: it would test your DNA in order to recommend a personalized line-up of products. It’s a step beyond the questionnaires other brands use to make product recommendations, and the brand says the results of the $95 DNA test can help people understand what kind of skin issues they are most prone to developing.

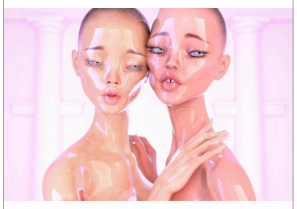


www.everydayhealth.com

What Is 'Snapchat Dysmorphia'? A Detailed Look at the Trend

Some experts are alarmed by a new trend in which people are requesting plastic surgeries to look more like their filtered selfies on Snapchat and Instagram. But what's really causing this phenomenon, and are you at risk? Learn more.

With filters on social media like Instagram and Snapchat, flattering lighting, perfect poses, and editing apps that can make you look like a thinner version of yourself (with perfect skin, to boot), we've entered into the era of selfie perfection. The trend, what some people are calling "Snapchat dysmorphia," is real — and getting more potent every year. 55$ of plastic surgeons say patients have requested cosmetic procedures to look better on social media — an increase of 13 percent from the year before.



www.dazeddigital.com

The new cosmetic surgery trend is androgynous and gender-neutral procedures

Gender-neutral plastic surgeries are growing more popular, according to one well-known plastic surgeon based in Los Angeles, California. Recently, Dr Alexander Rivkin, who pioneered the ' Five-Minute Non-Surgical Nose Job ', has been noticing patients v...

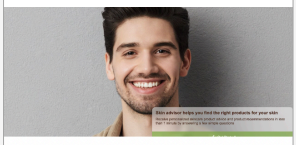
Gender-neutral plastic surgeries are growing more popular. Recently, Dr. Alexander Rivkin has been noticing patients veering away from extreme femininity and masculinity and moving in favour of a more androgynous look. For women, instead of slopes and softening, he is seeing more requests for sharp angles with straight jawlines and noses while men are requesting more lip and cheekbone enhancement. Using a combination of Botox and precisely placed filler, Dr Rivkin says clients are looking for a more modern, custom-tailored look that appears to be gender fluid in appearance.

www.gendereconomy.org

Highlighting Fenty Beauty's diversity-based business model

Colorism is deeply entrenched in the beauty industry, despite the high potential profits offered by racialized market segments. This case examines Fenty Beauty, an inclusive celebrity cosmetics line that has been praised by consumers and commentators al...

Fenty Beauty is an inclusive cosmetics company created by international celebrity Rihanna in partnership with LVMH, an exclusive luxury conglomerate. The brand has been a resounding success and is most recognized for the "Fenty Effect", a trend in which competitors began offering more inclusive cosmetic products in response to Fenty Beauty's successful 40-shade foundation line.



www.glossy.co

AI beauty tech goes after the male consumer

From virtual makeup try-on to skin analysis, AI beauty technology has long been targeted toward women. Now, brands are seeing AI's potential for the men's market.

The new tool also comes at a time when the use of AI and AR beauty tech has spiked during the pandemic. Estée Lauder Companies'-owned men's care brand Lab Series has an AI skin diagnostic tool on its mobile site, which uses a selfie to analyze eye dullness and puffiness, irritation and redness, uneven texture, dark spots, eye lines, and other lines and wrinkles. The tool then recommends a customized set of products to address the concerns. "Before there were so many stigmas, or it was just not looked at as something that was that important to guys," said Gustafson. "But in the U.S., especially in the past 3-5 years, it's become more acceptable for men to groom."

i-D i-d.vice.com

Fashion has reached peak trendcore, and we're all tired

Can't keep up with the endless trends being forecasted on TikTok? Here's a case for ditching all of them in favour of personal style.

Every other day of late, it feels like TikTok users and fashion writers (yours truly included) are scrambling over themselves to coin a new *something*-core, a new aesthetic or micro-trend that's sweeping across IRL and URL platforms alike. While they can often provide much needed entertainment, they often fall prey to a short life-cycle that is as faddish as the ever-increasing pace of TikTok's quick-cut algorithm. How do you know if a harmless trend is actually worth investing in, or simply a product of the merciless swinging of fashion's age-old pendulum?

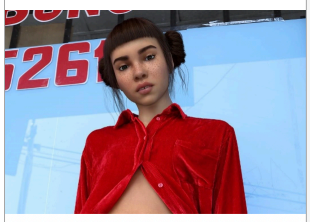
www.dazeddigital.com

Kylie Jenner got her make-up done by AI for her Dazed Beauty cover

What is beautiful? It's almost impossible to answer definitively, as the response differs between individuals, cultures, and eras. When we launched Dazed Beauty, we did so to redefine the language and communication that surrounds beauty in the media tod...

The 21-year-old tycoon has been paired with the engineers behind Beauty_GAN, who have created an AI that generates beauty images without human help.

By analysing 17,000 Instagram posts, the program lays bare what we as a society deem attractive. The AI has created hair and make-up looks for the youngest of the Kardashian-Jenner clan, for her spread in Issue Zero.

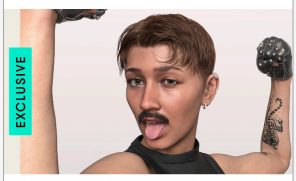


www.dazeddigital.com

Exploring mixed race identity in CGI influencers

Historically the It girls of the moment have reflected the true values of their time. 60s model Veruschka's flowing blonde tresses and chiseled bone structure represented the decade's youthful outlook. The 70s gave birth to the unconventional where powe...

19-year-old Brazilian-American Lil Miquela, aka Miquela Sousa, could be your average beautiful, woke celeb crush except for one crucial fact; she's not real. Created by the mysterious robotics company Brud, Miquela is one of a number of racially ambiguous CGI avatars taking over Instagram using a collage of mixed race identity. From her relatable self-help selfies to her strategic thirst trap posts, Lil Miquela's character has all of the self-awareness of influencers like the Kardashians, the Hadids, and twin DJs Simi and Haze.



www.voguebusiness.com

Shaping online avatars: Why our digital identities differ

A new research report from the Institute of Digital Fashion suggests people want more choices for diverse representation in online spaces.

The study aims to better understand what people want their avatars to look like and wear, and offer insight for fashion brands looking to cater to a customer that spends time and money in digital worlds, particularly Gen Z customers. Almost 60% feel there is a lack of inclusivity in virtual worlds and more than 40% describe their online clothing style as "surreal," meaning not the same as their in-person identities, the study found.90% of respondents identify outside the gender binary, a significant percentage. The concept of virtual worlds encompasses digital platforms within which users can create and present an identity in digital form.

medium.com

Flaws n' All: Young Thug and Hip-Hop Hyper-Masculinity

While Young Thug doesn't purport to overtly fight for gender equality or to shine a light on pressing social inequality, his prominence in

He frequently wears children's dresses as shirts, and notably appears in a lavish gown designed by Italian fashion designer Alessandro Trincone on the cover of his widely acclaimed 2016 release Jeffery. His 2016 wide-scale campaign with Calvin Klein features a mix of outfits including dresses and other womenswear. He casually declared in a promo video for his Calvin Klein fashion campaign, "in my world, you can be a gangster with a dress or you can be a gangster with baggy pants.

www.psfk.com

Shein's AI Program Matches Local Demand at Scale

Whenever Shein's AI engine picks up a change in demand or interest in some new trend, the supply chain can react in real-time.

Shein's AI engine can quickly pick up a change in demand or interest in new trends, and its supply chain can react in real-time, giving consumers more value and the brand much cheaper operating costs.

Figure. i.A

B. Trends

TRENDS	Politics or Economics	Social or Cultural	Science & Engineering
Individual The use of augmented reality technology on social media apps to digitally modify their faces to the ideal	Beauty corporation industry capitalizing off of selling the standards being promoted on these applications	The global wide access to social media and this technology will make the standard of beauty more similar across different cultures	Augmented reality beauty technology is advancing, hence becoming more seamless and accessible that it is difficult to identify what is real or fake
Social Increased interest in beauty diversity and inclusivity	Beauty brands making products that are suitable for people with different cultural backgrounds	There is an exchange of borrowing beauty techniques and routines from other cultures	Demand for technology to be trained to recognize more than just the Caucasian face, especially since AI is beginning to integrate with beauty
World Beauty as an economic driving force	Corporations keeping up with the demand of changing beauty standards in order to sell	Social awareness on overconsumption has caused a global increase in online thrift markets	Corporations using AI to generate trends in real time to meet the demands of the market
Synthesis	Beauty corporations are to incorporating tech, while being inclusive, in order to keep up with the demand for changing beauty standards	Beauty is becoming more social than ever with technology making things more global	Technology has to keep up with the pace of changing global beauty trends, while also keeping in mind the ideologies that are changing in these contexts

Figure i.B

C. Future Wheel

1. First Iteration

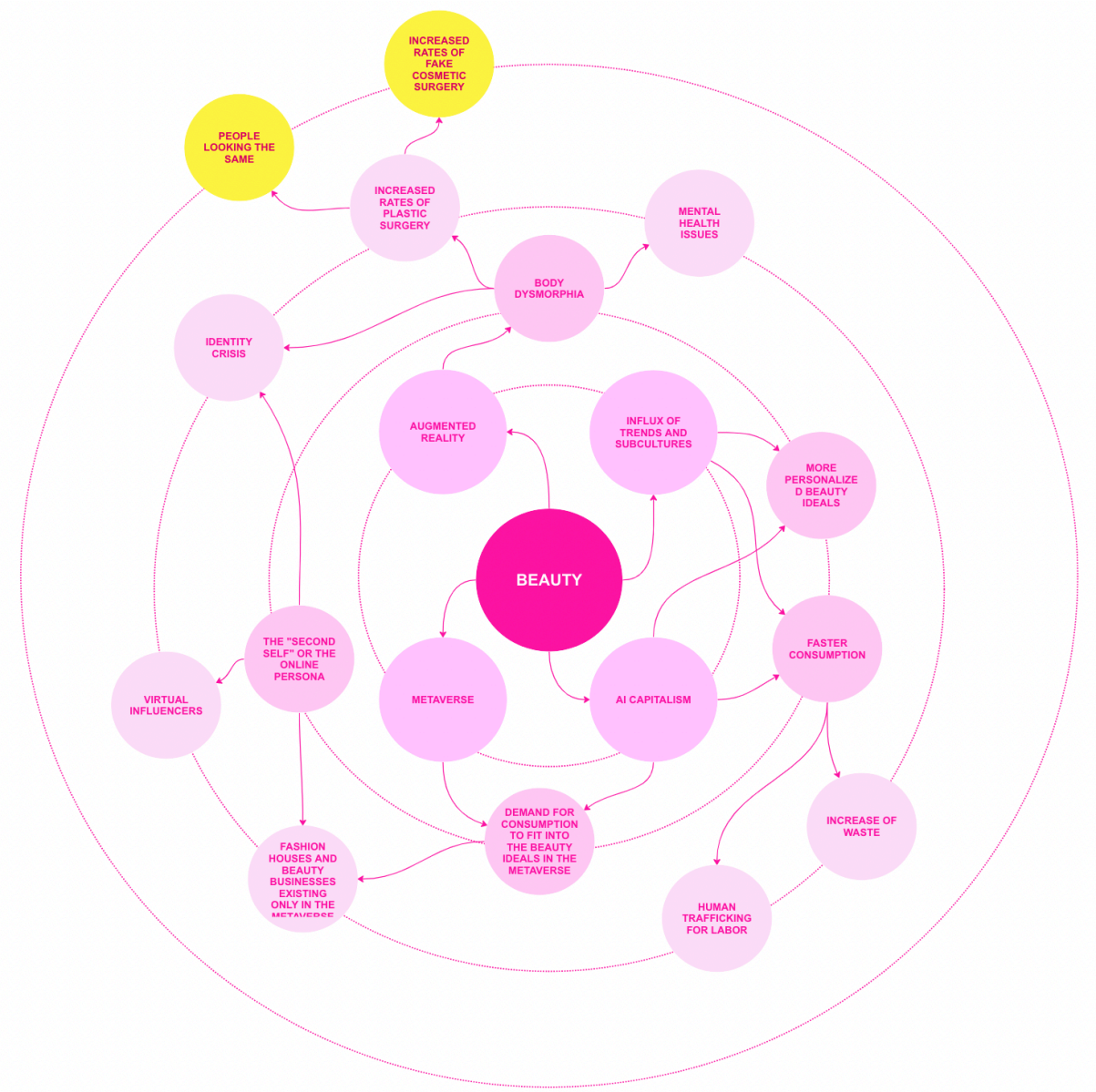


Figure i.C.1

2. Second Iteration

Figure i.C.2

ii. Market Research

A. Draft Tables

1. Mainstream Social Media Applications

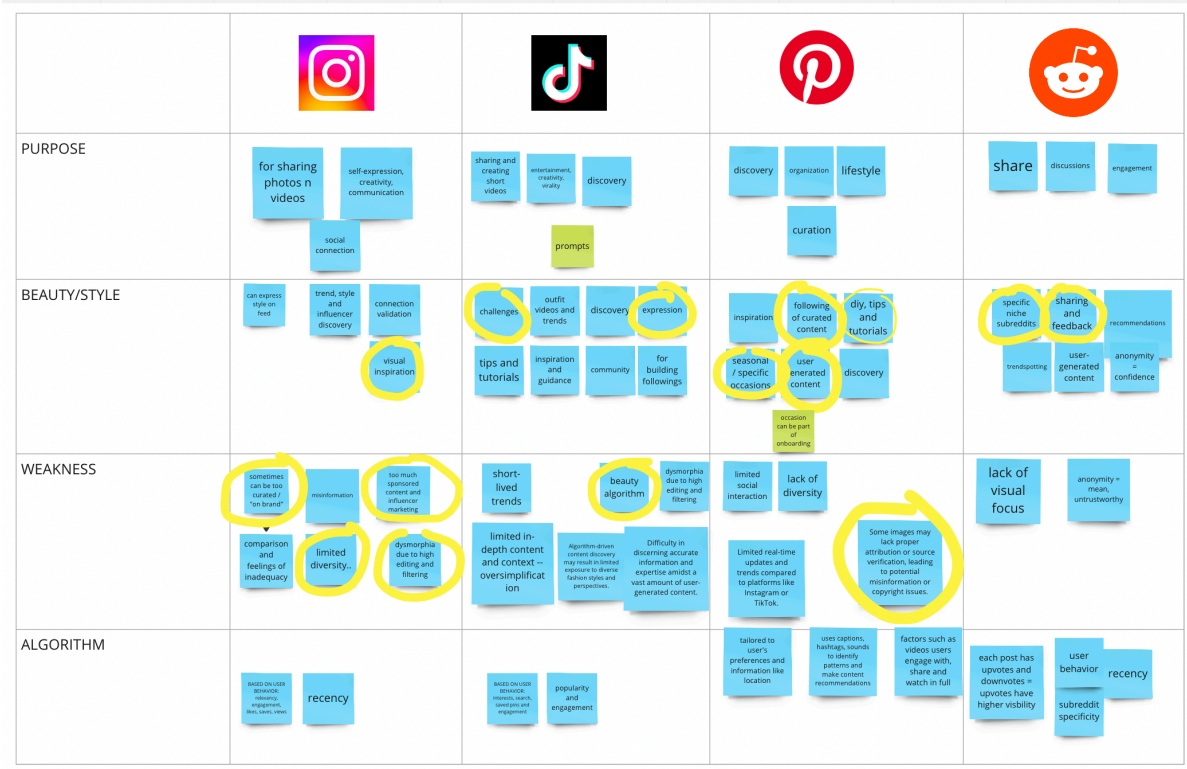


Figure ii.A.1

2. Style-Focused Applications

Figure ii.A.2

B. Final Table

1. Mainstream Social Media Applications

	Instagram	**TikTok**	**Pinterest**	**Reddit**
Core Purpose	1. Sharing photos and videos 2. Self-expression, creativity and communication 3. Content discovery 4. Social connections	1. Sharing and creating short-form videos 2. Creativity, entertainment and vitality 3. Content discovery	1. Lifestyle and creative discovery 2. Content organization and curation	1. Sharing content in communities 2. Forum discussions 3. Community engagement
Strong Points	1. Users can express individual style on their feeds 2. Trend, style and influencer discovery 3. Visual inspiration 4. Validation through engagement 5. User-generated content	1. Content challenges 2. Quick trend dispersion 3. Provides short-form DIY, tips and tutorials videos 4. Community-oriented 5. Easy way to build followings 6. User-generated content 7. Cultivates many niche communities that have previously been unrepresented	1. Various sources, such as user-generated content and web crawler-sourced content, for personalized visual inspiration 2. Can be used for specific and personalized occasions and styles 3. Provides DIY, tips and tutorials 4. Allows for following curated content	1. Cultivates many niche communities that have previously been unrepresented 2. User-generated content 3. User-led communities 4. Anonymity allowing users to be open and honest 5. Quick place for sharing, recommendations and feedback

Weak Points	1. Creates pressures for users to be curated, which leads to comparison and feelings of inadequacy 2. Difficulty in discerning accurate information and expertise amidst a vast amount of user-generated content 3. Excess sponsored content and influencer marketing 4. Causes dysmorphia due to high editing and filtering	1. Short-lived trends 2. Content, context, and information are oversimplified to fit the short-form content 3. Difficulty in discerning accurate information and expertise amidst a vast amount of user-generated content 4. Personalized content may result in limited exposure to diverse perspectives 5. Causes dysmorphia due to high editing and filtering 6. Prioritizes “attractive” faces and bodies to be shown first on feeds according to their algorithm	1. Limited social interaction 2. Lack of diversity as posts that are prioritized when searched are geared towards idealized beauty standards 3. Limited real-time updates and trends compared to platforms like Instagram or TikTok 4. Some content lack proper attribution or source verification that has lead to copyright issues	1. Lack of visual focus 2. Anonymity can cause users to be untrustworthy and abusive 3. Men sending unwanted advancements to women who post photos of themselves in communities 4. Certain communities can create an echo chamber of toxic beliefs

Algorithm Models	1. Prioritizes posts that receive most engagement, such as likes, saves, views, etc. 2. Prioritizes posts that use new in-application features	1. Tailored to user preferences and information, such as location, identity, and more 2. Uses captions, hashtags, and sounds to identify patterns and recommend content 3. Prioritizes “attractive” faces and bodies to be shown first for maximize how users like to engage with attractive images 4. Uses user activity data, such as the type of content users like to share and watch in full, in order to learn about their behavior	1. Prioritizes content based on the behavior of the user, such as searches, saved pins and engagement 2. Uses cookies to analyze the activity of users outside the application to recommend content 3. Recommends based on popularity and engagement	1. Users may upvote or downvote posts; posts with high upvotes have higher visibility 2. Posts with high engagement, such as upvotes, downvotes, and discussions, have higher visibility

Figure ii.B.1

2. Style-Focused Applications

	Acloset	**Stylebook**	**Trendabl**	**Pose**
Core Purpose	1. Wardrobe management 2. Uses AI for generating and planning outfits	1. Wardrobe management 2. Virtual clothing catalogue 3. Diary and tracker for outfits	Fashion-focused social network that aims to connect users through shared interests in style and fashion	1. Discovery of styles 2. Connecting users with similar interests 3. Marketplace for clothing
Strong Points	1. Utilizes AI to craft outfits, especially for users who find it difficult to style themselves 2. Outfit organization and categorization 3. Allows users to sell pre-loved clothes in an in-app marketplace	1. Virtual clothing catalogue 2. Allows users to plan and mix outfits 3. Records the usage history of outfits 4. Option to create lists	1. Allowed for browsing and shopping 2. Allowed users to discover trending styles	1. Recommended styles to users 2. Allowed users to browse and shop

Weak Points	1. Time consuming with how users must photograph and categorize their clothing items 2. UI design looks outdated and uninspiring	1. Time consuming with how users must photograph and categorize their clothing items 2. UI/UX may not be as intuitive for some users, requiring a learning curve to fully utilize features 3. Requires payment	1. Shutdown due to failure to retain a significant user base and the challenge to differentiate itself 2. Faced monetization challenges 3. Competed against Instagram, which was growing at the time of release	Lack of focus in terms of the purpose of the application — tried to be a social media network, fashion magazine and shopping platform all at the same time

Figure ii.B.2

iii. Iterations

A. First Prototype

1. Brainstorming

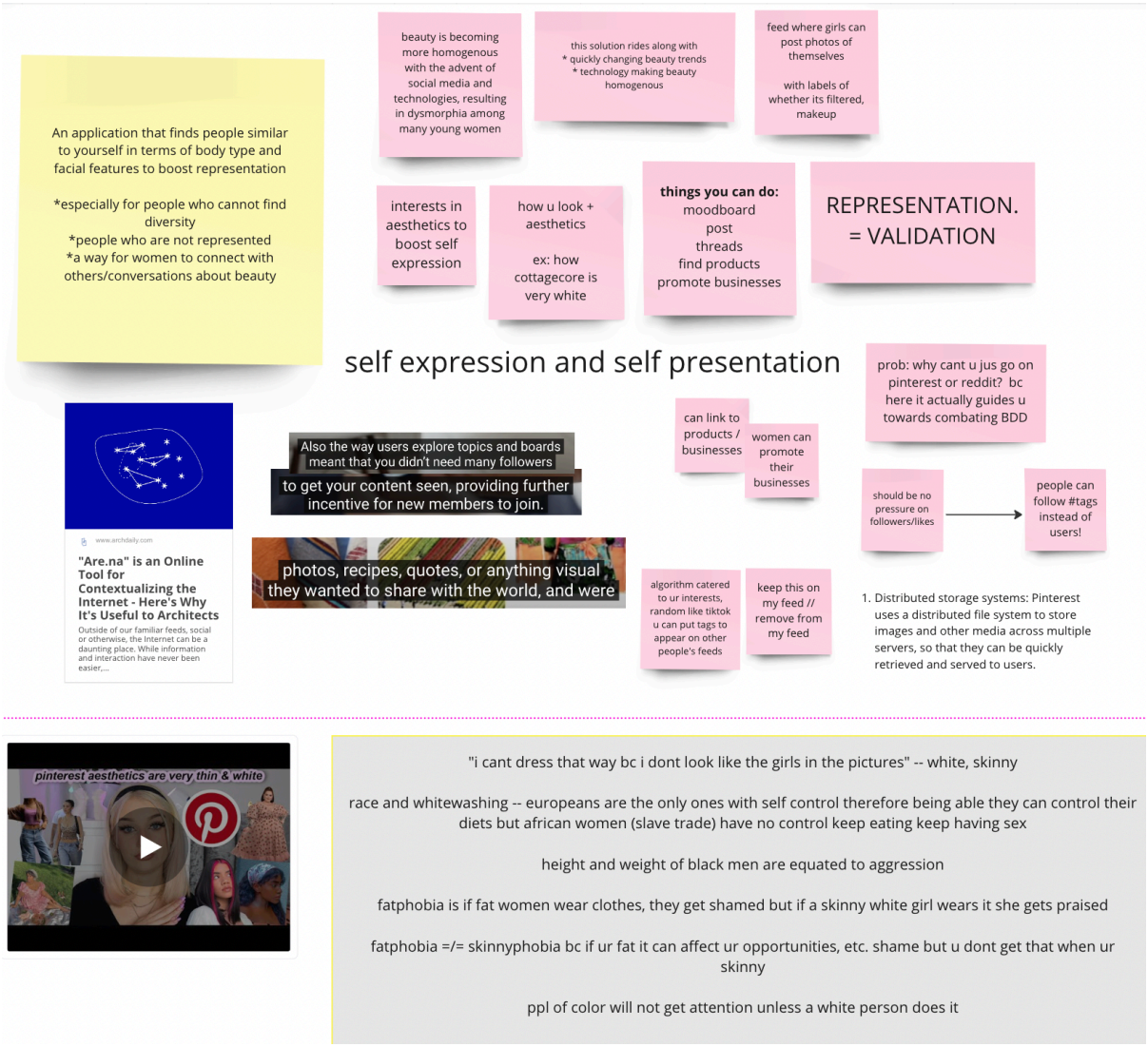


Figure iii.A.1

2. *Sitemap*

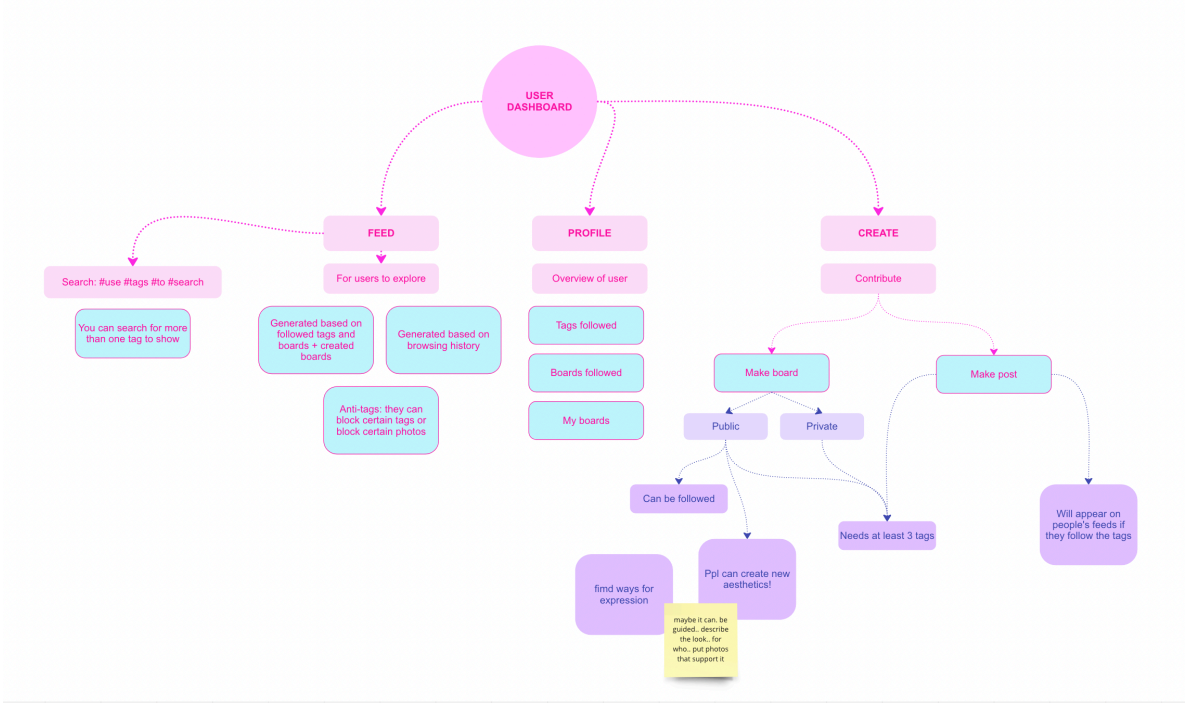


Figure iii.A.2

3. *Wireframes*

a. Opening

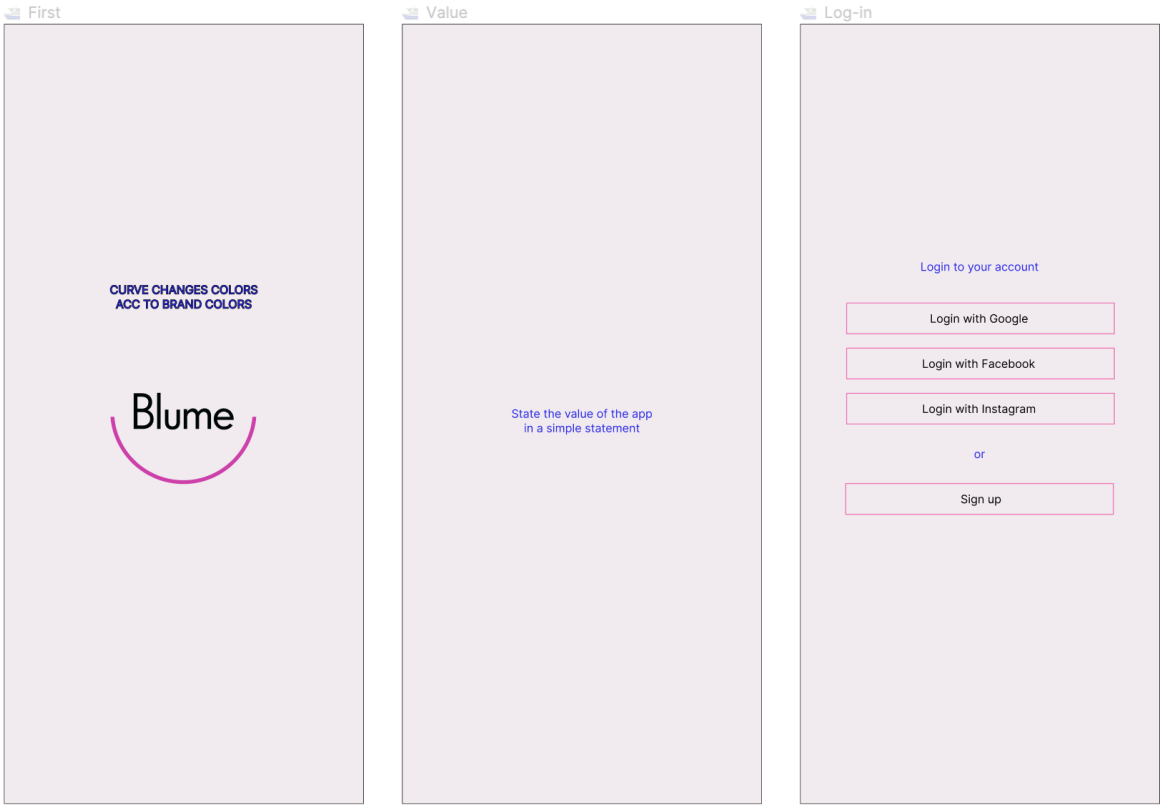


Figure iii.A.3.a

b. Onboarding

Figure iii.A.3.b

c. Feed

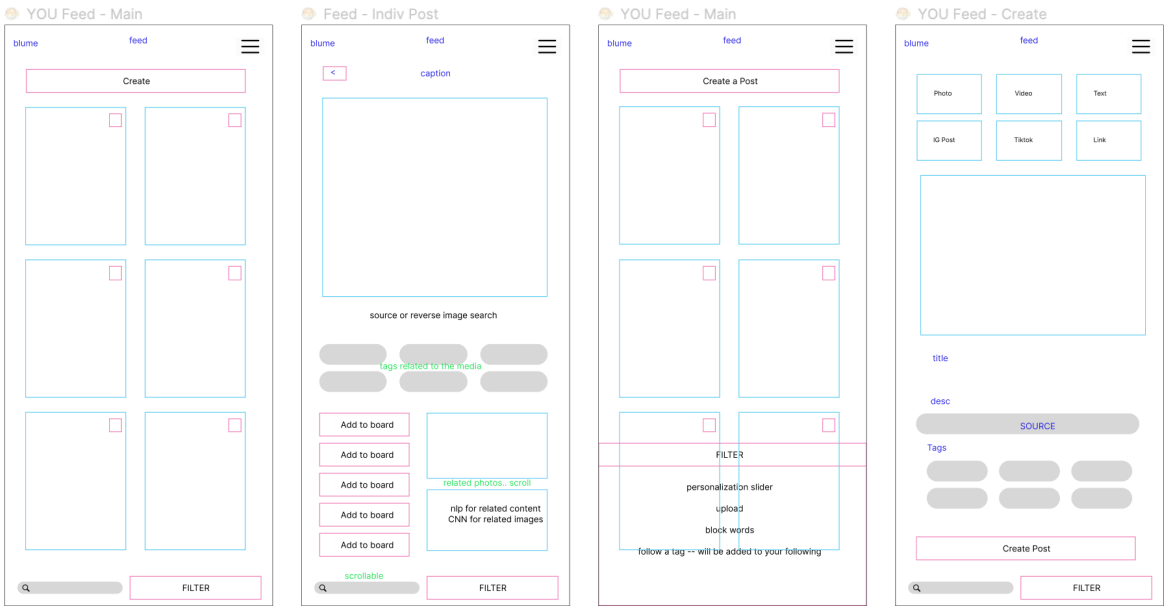


Figure iii.A.3.c

d. Community

Figure iii.A.3.d

e. My Profile

Figure iii.A.3.e

f. Friend's Profile

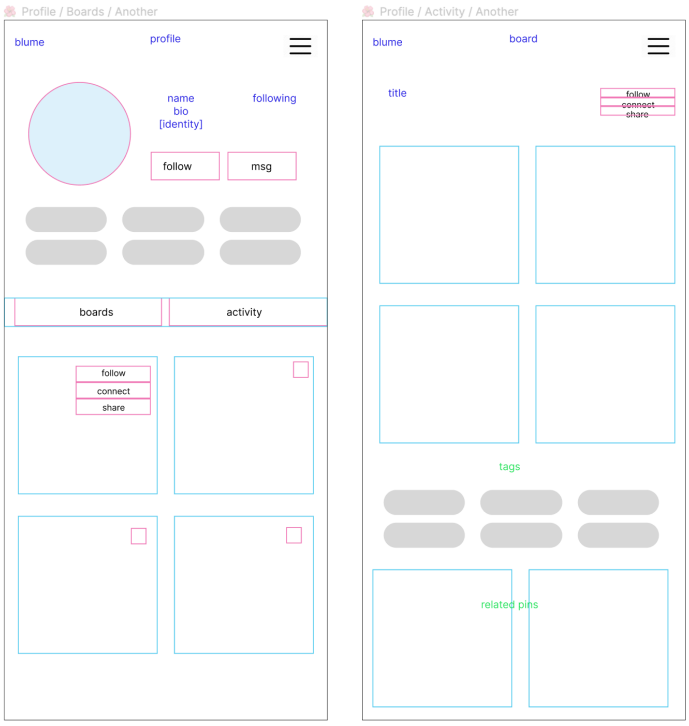


Figure iii.A.3.f

g. Message

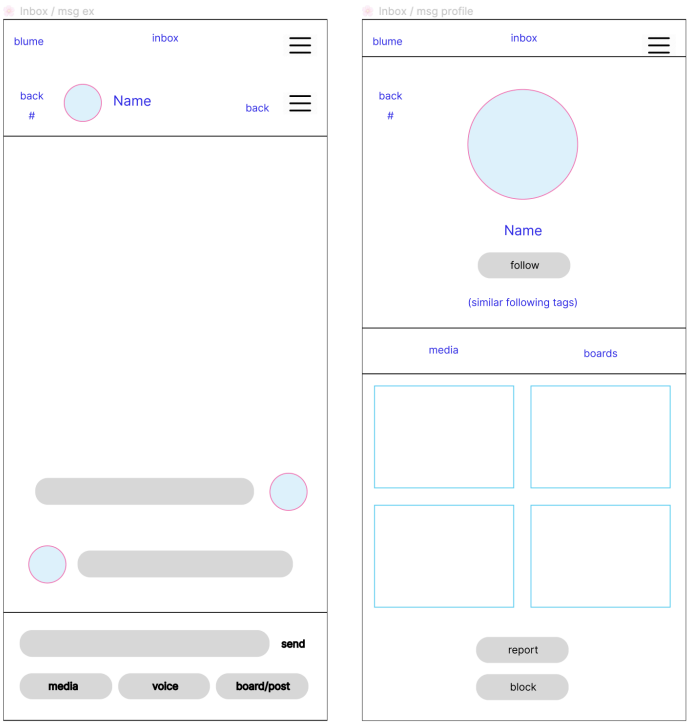


Figure iii.A.3.g

4. Prototype

a. Persona

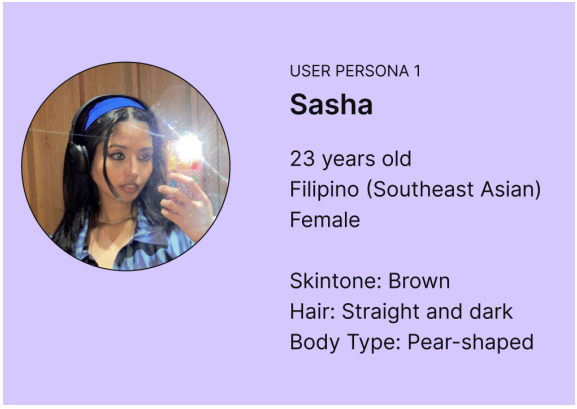


Figure iii.A.4.a

b. Opening

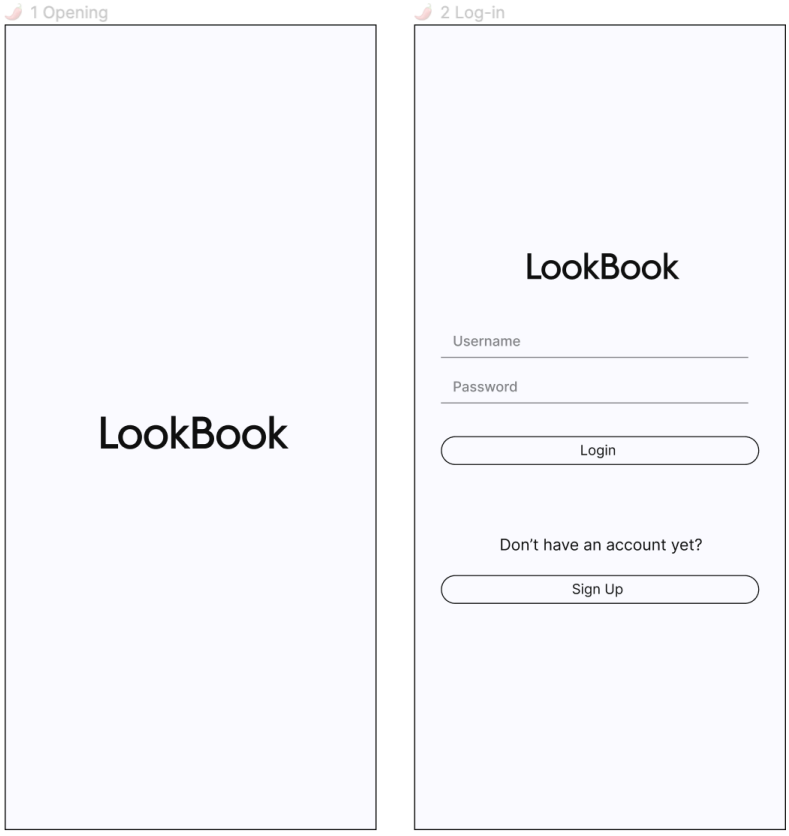


Figure iii.A.4.b

c. Onboarding / Verification

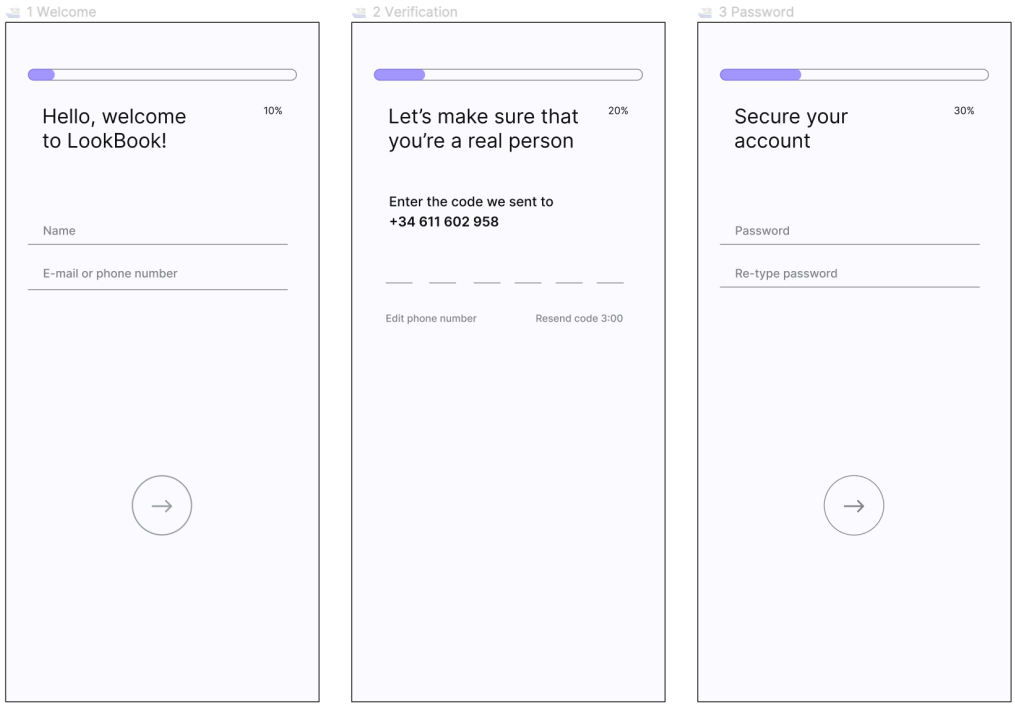


Figure iii.A.4.c

d. Onboarding / Identity

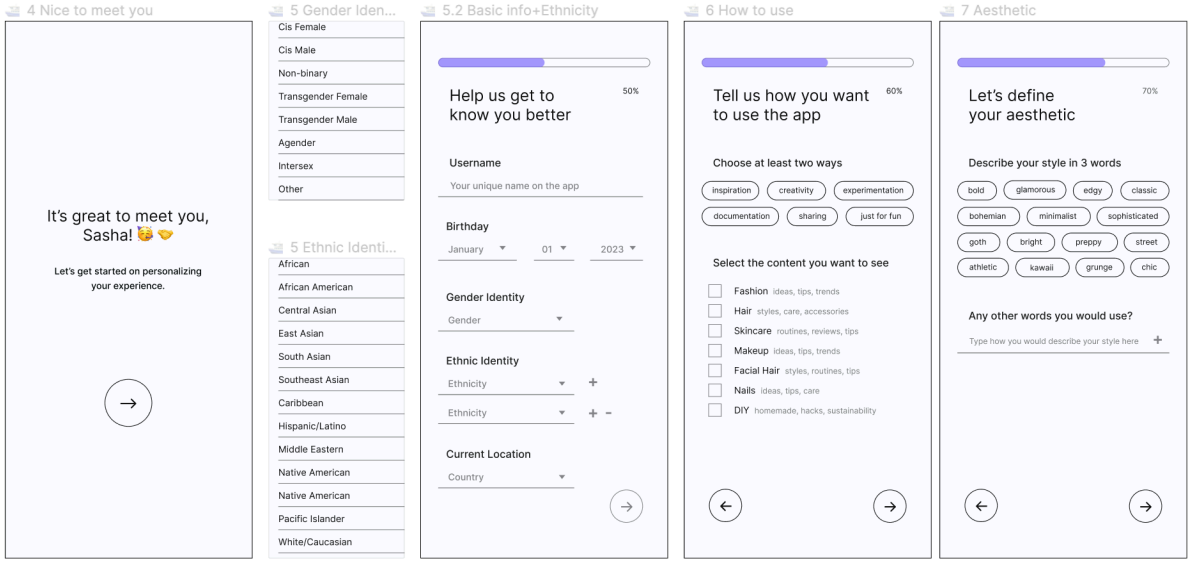


Figure iii.A.4.d

e. Onboarding / Aesthetic Definition

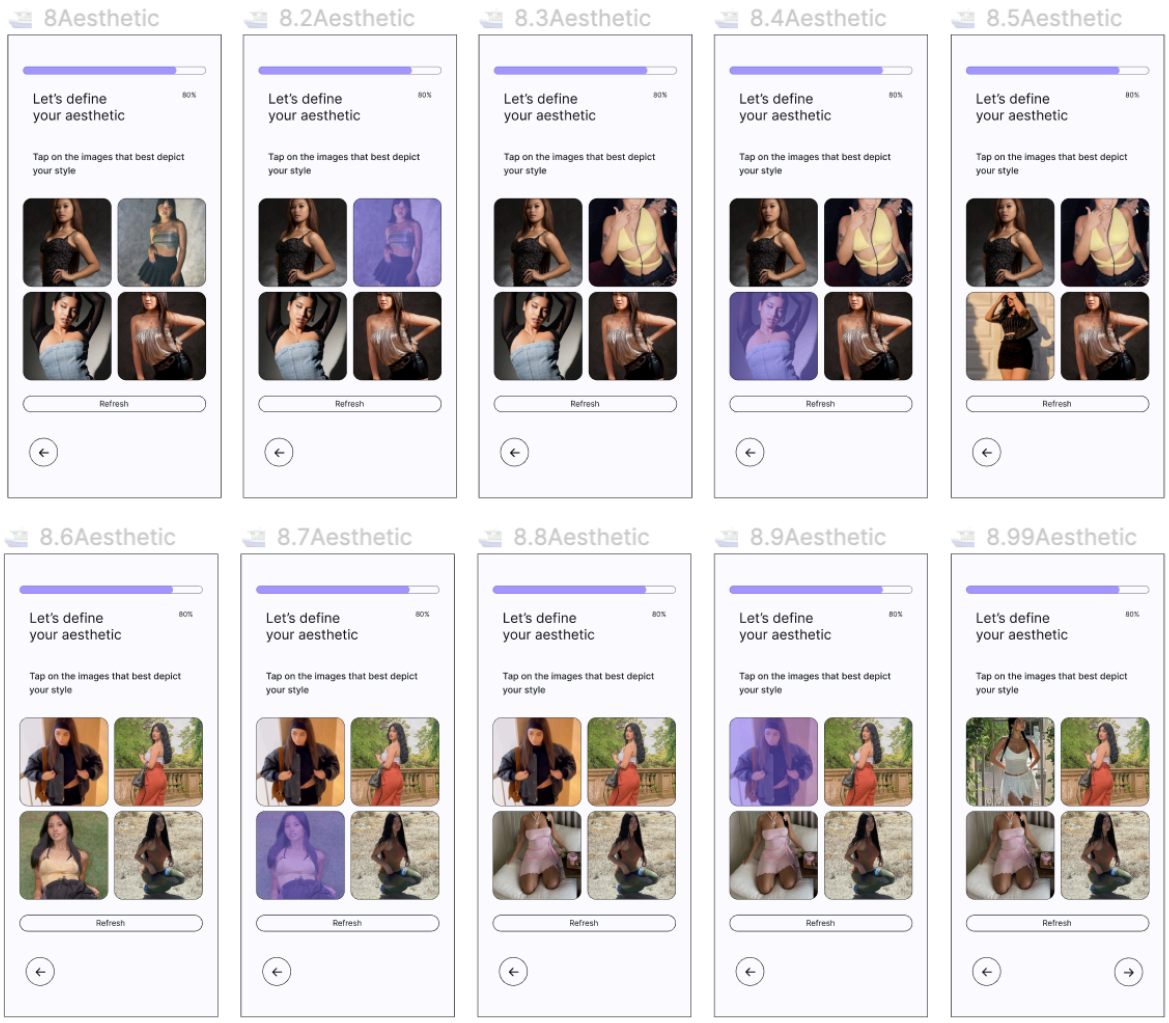


Figure iii.A.4.e

f. Onboarding / Physical Representation

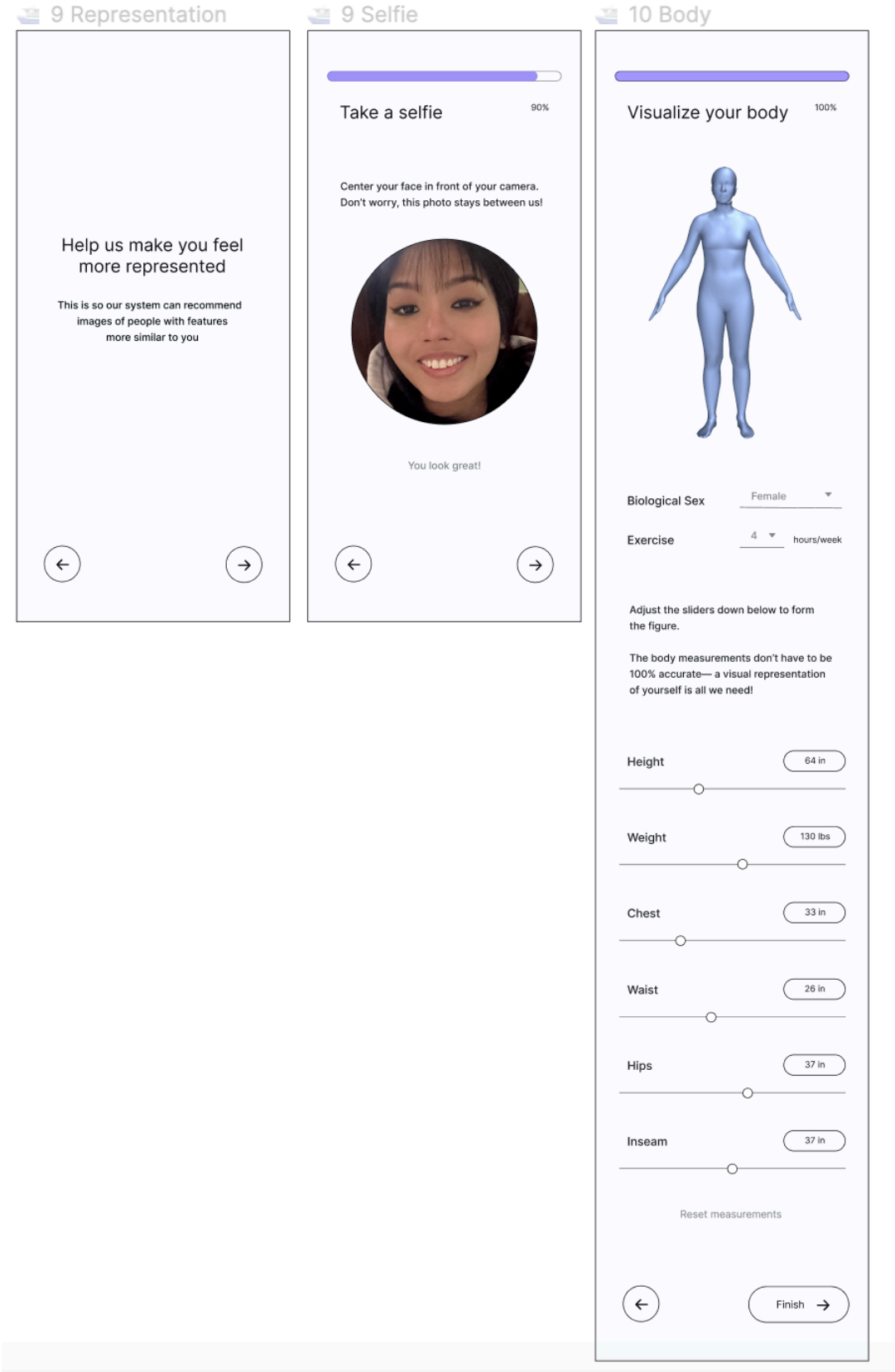


Figure iii.A.4.f

g. Dashboard / Home and Search

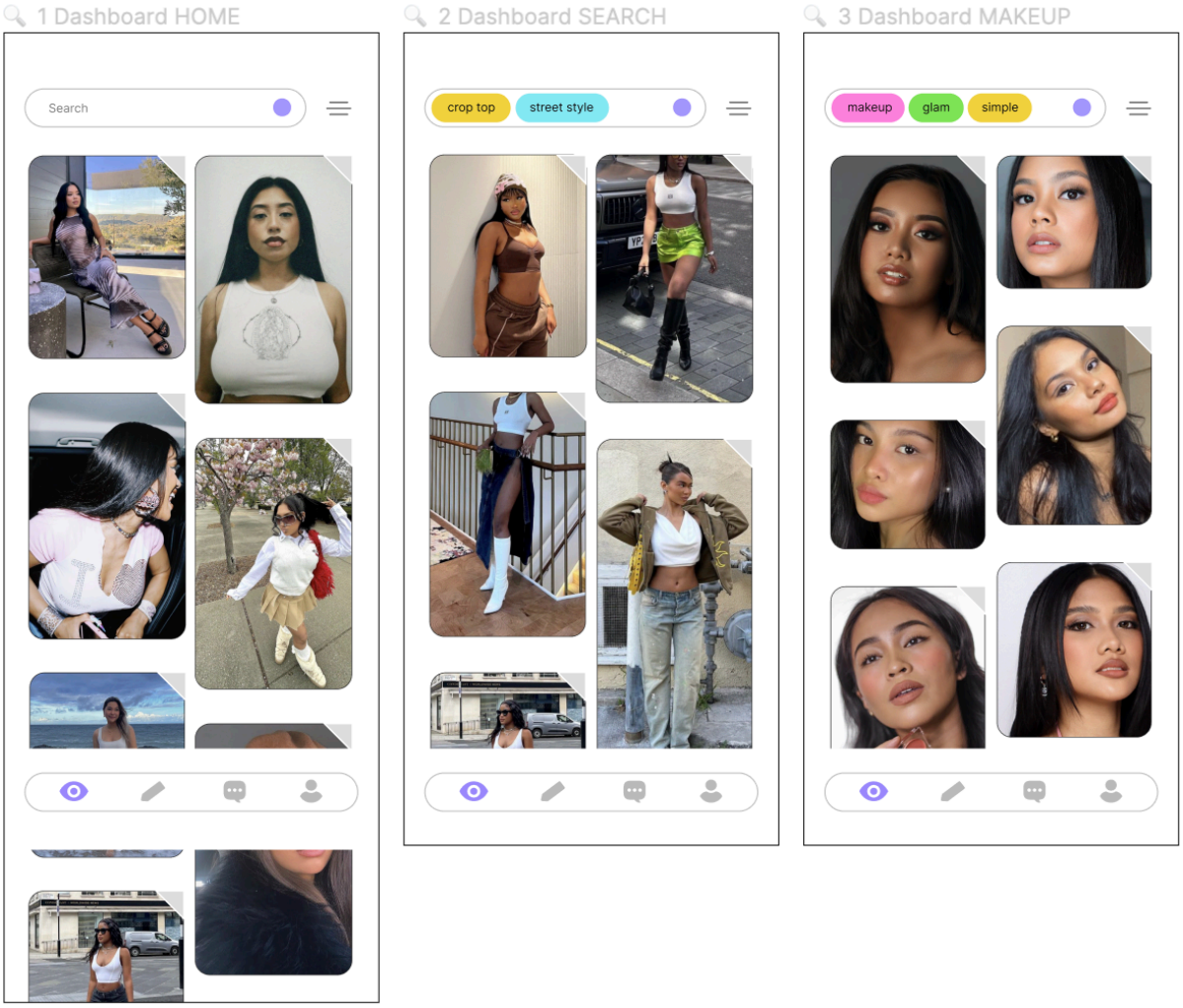


Figure iii.A.4.g

h. Dashboard / Post

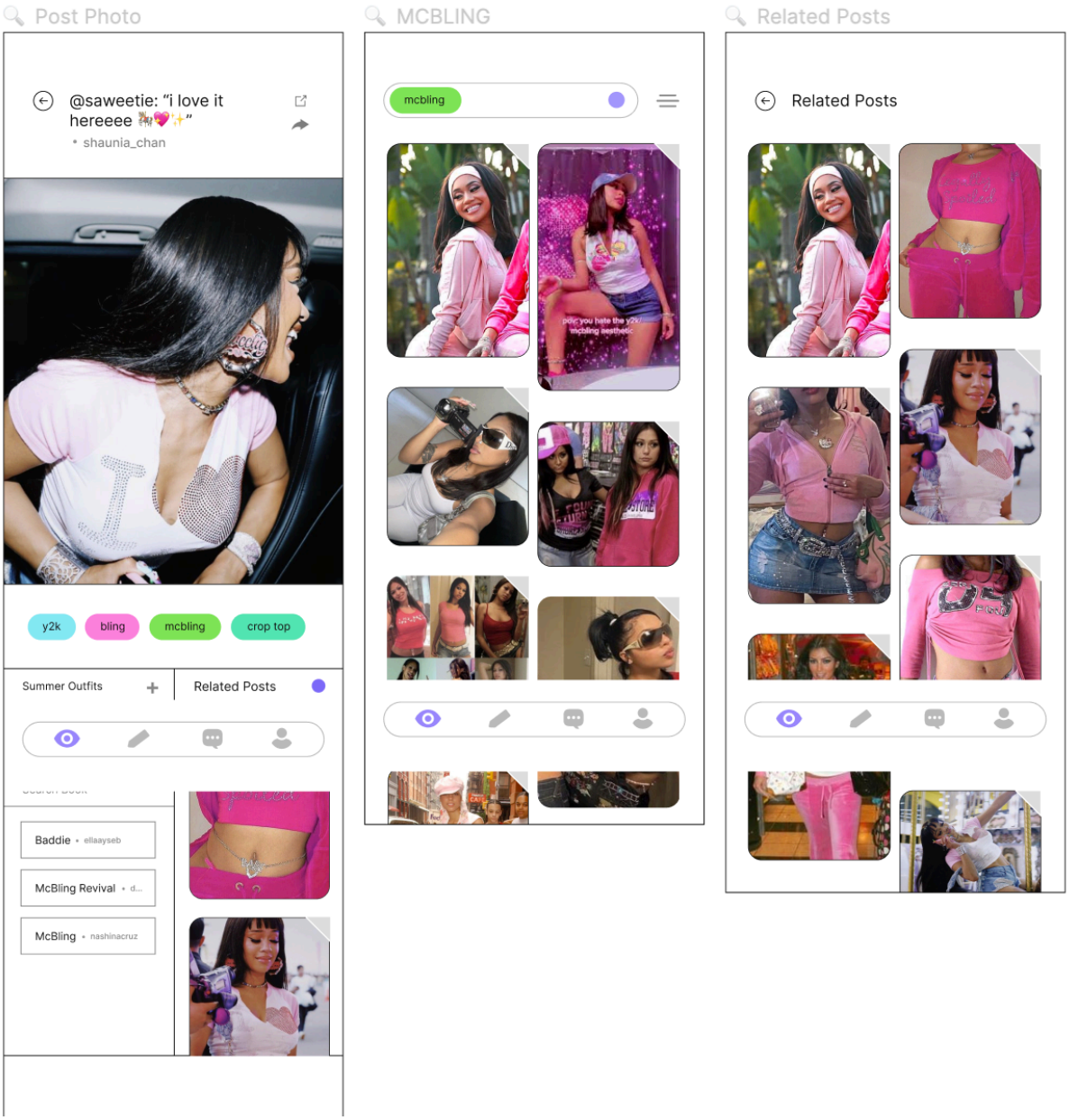


Figure iii.A.4.h

i. Dashboard / Filter Settings

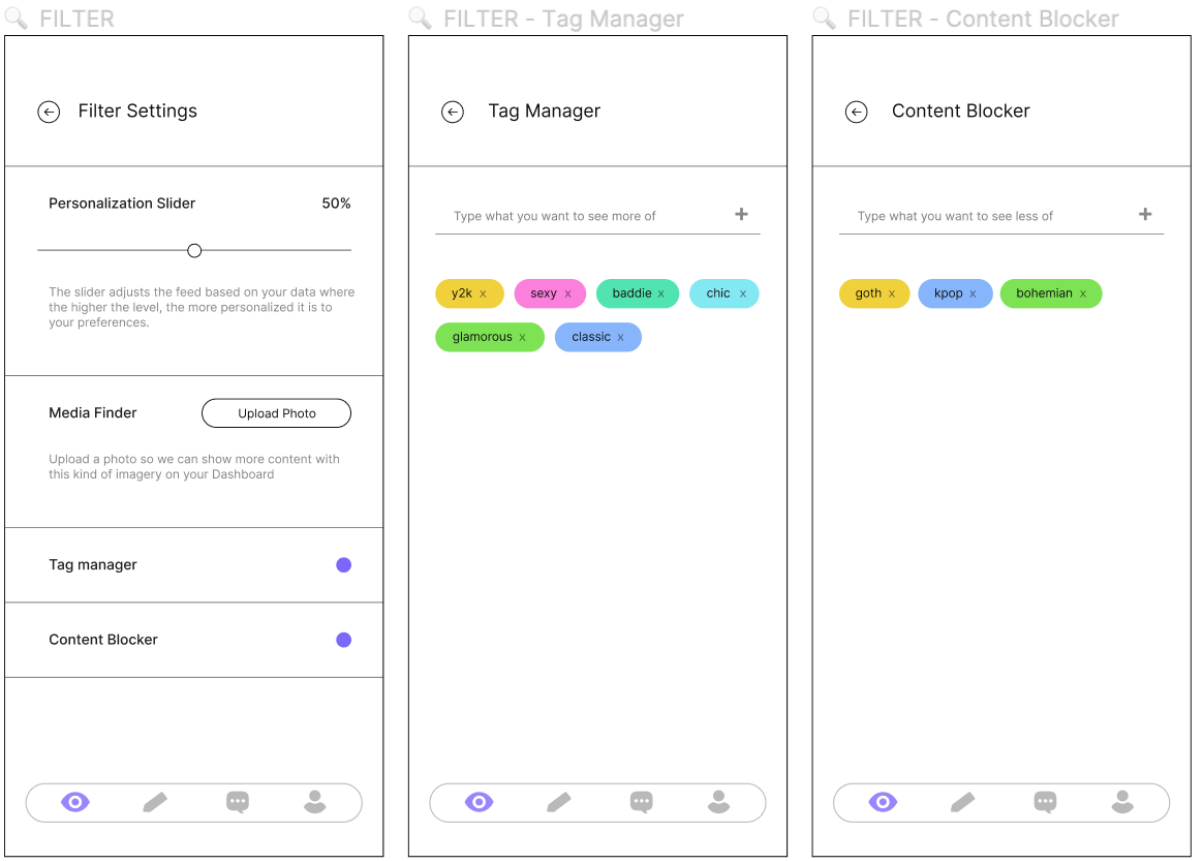


Figure iii.A.4.i

j. Create / Add Post

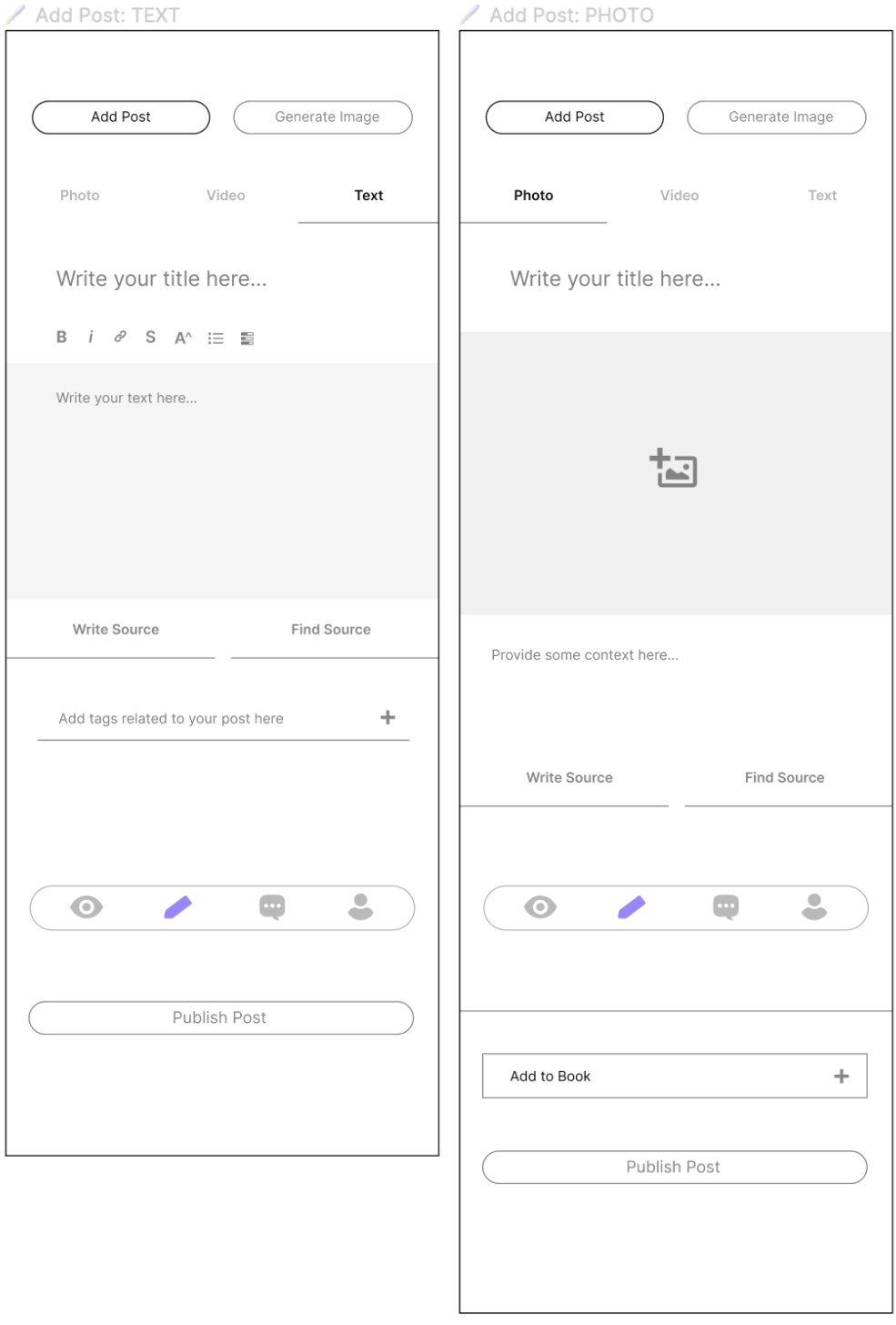


Figure iii.A.4.j

k. Create / Generate Image

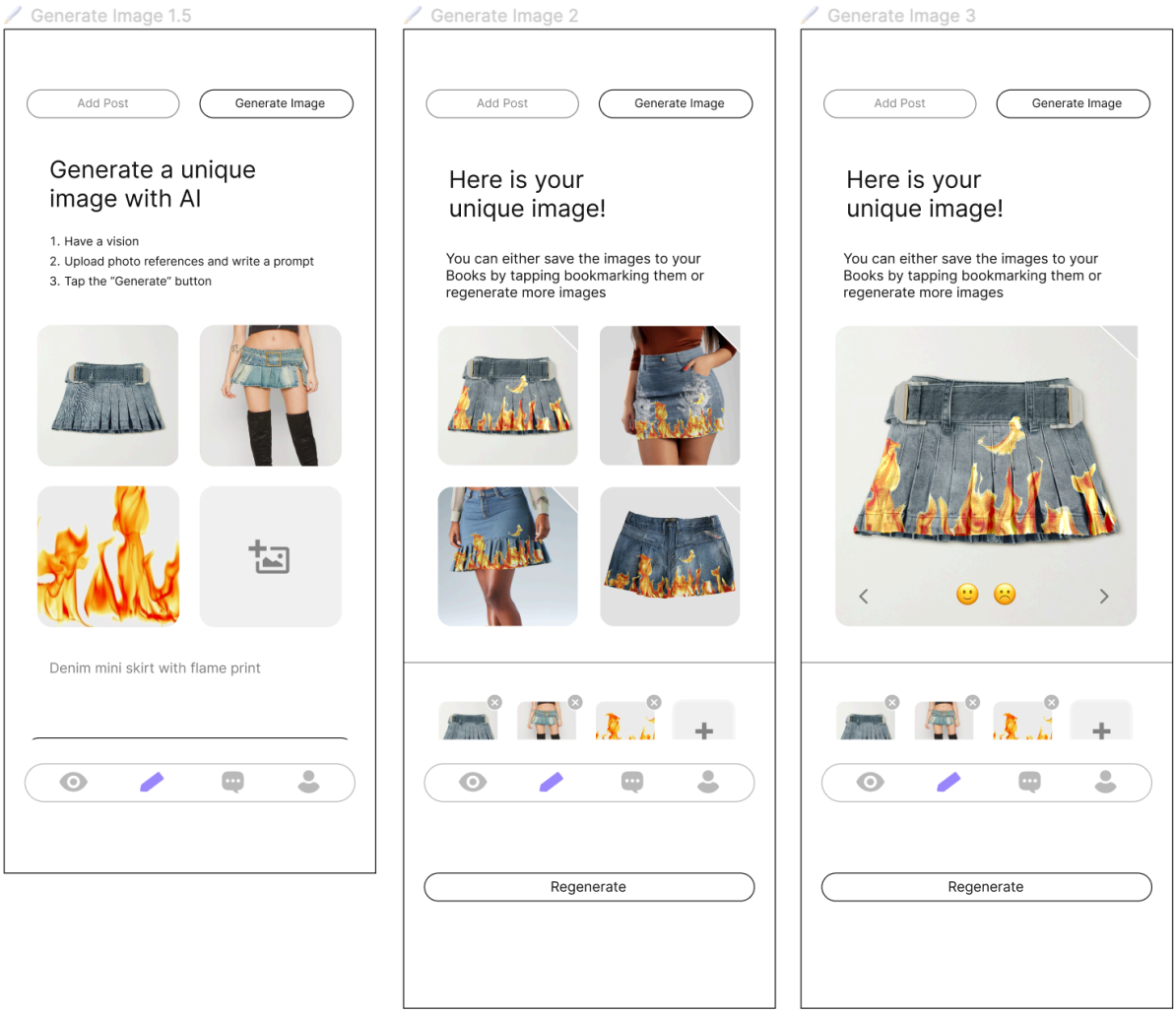


Figure iii.A.4.k

I. Message

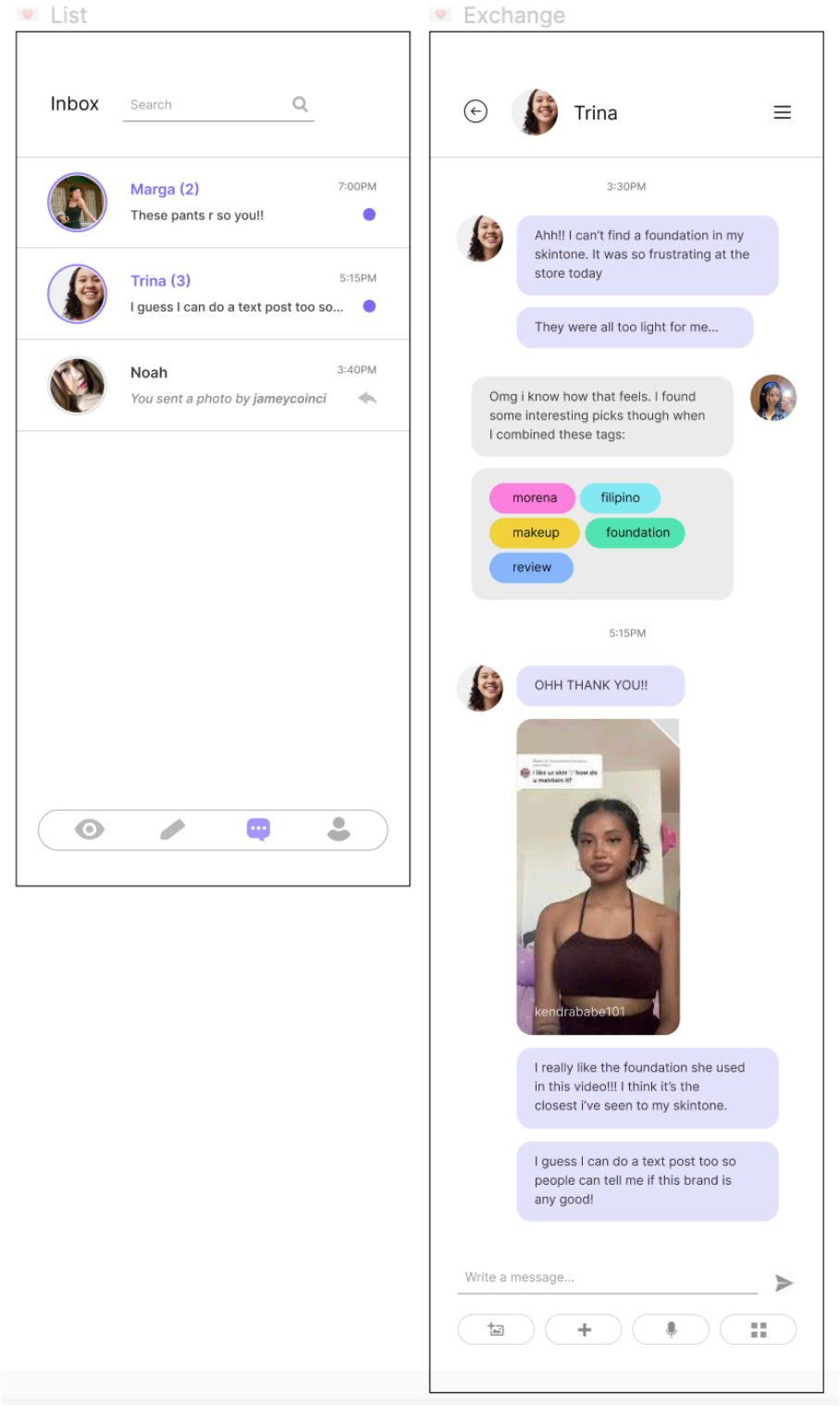


Figure iii.A.4.1

m. Profile

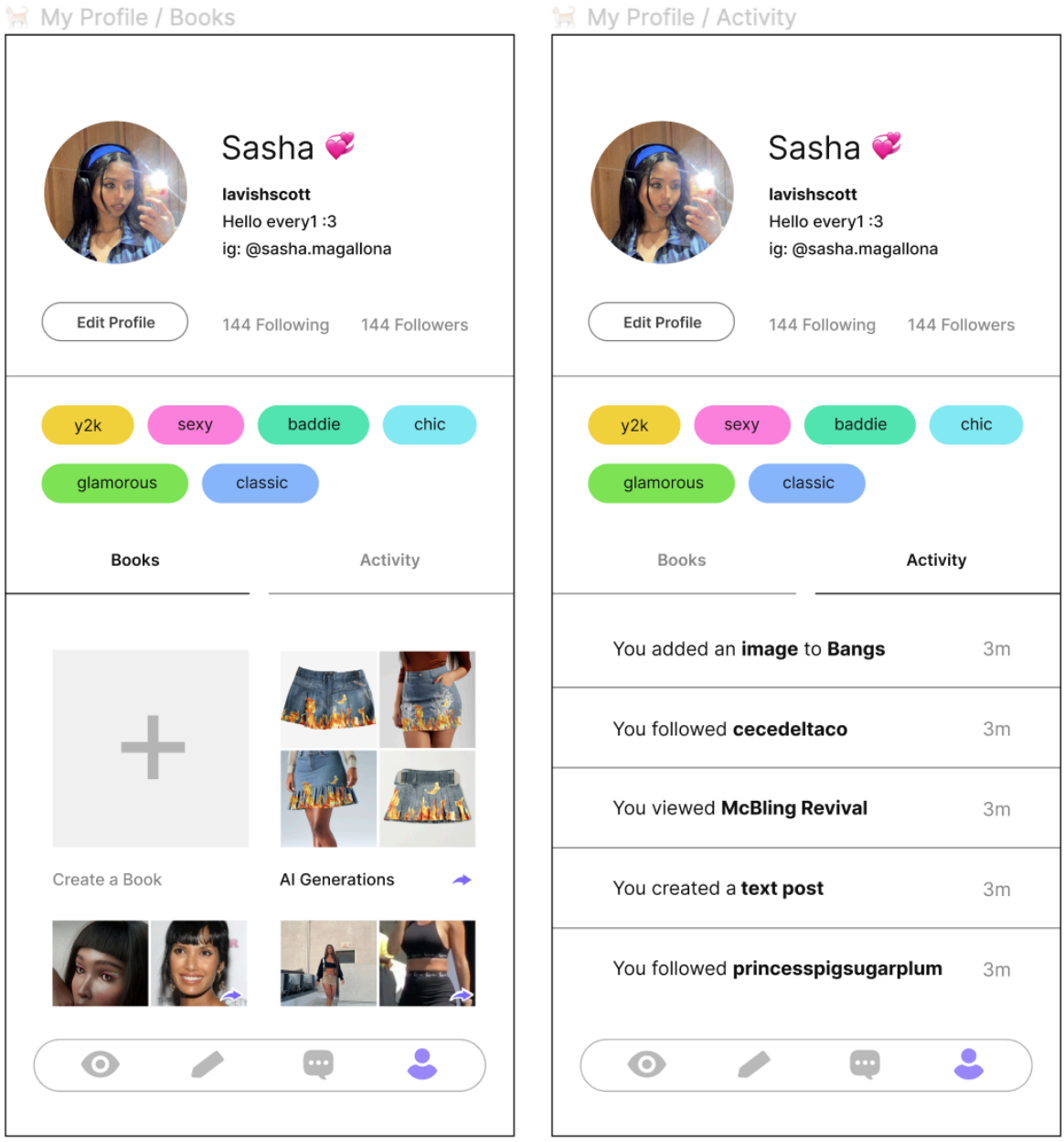


Figure iii.A.4.m

n. Profile / Book

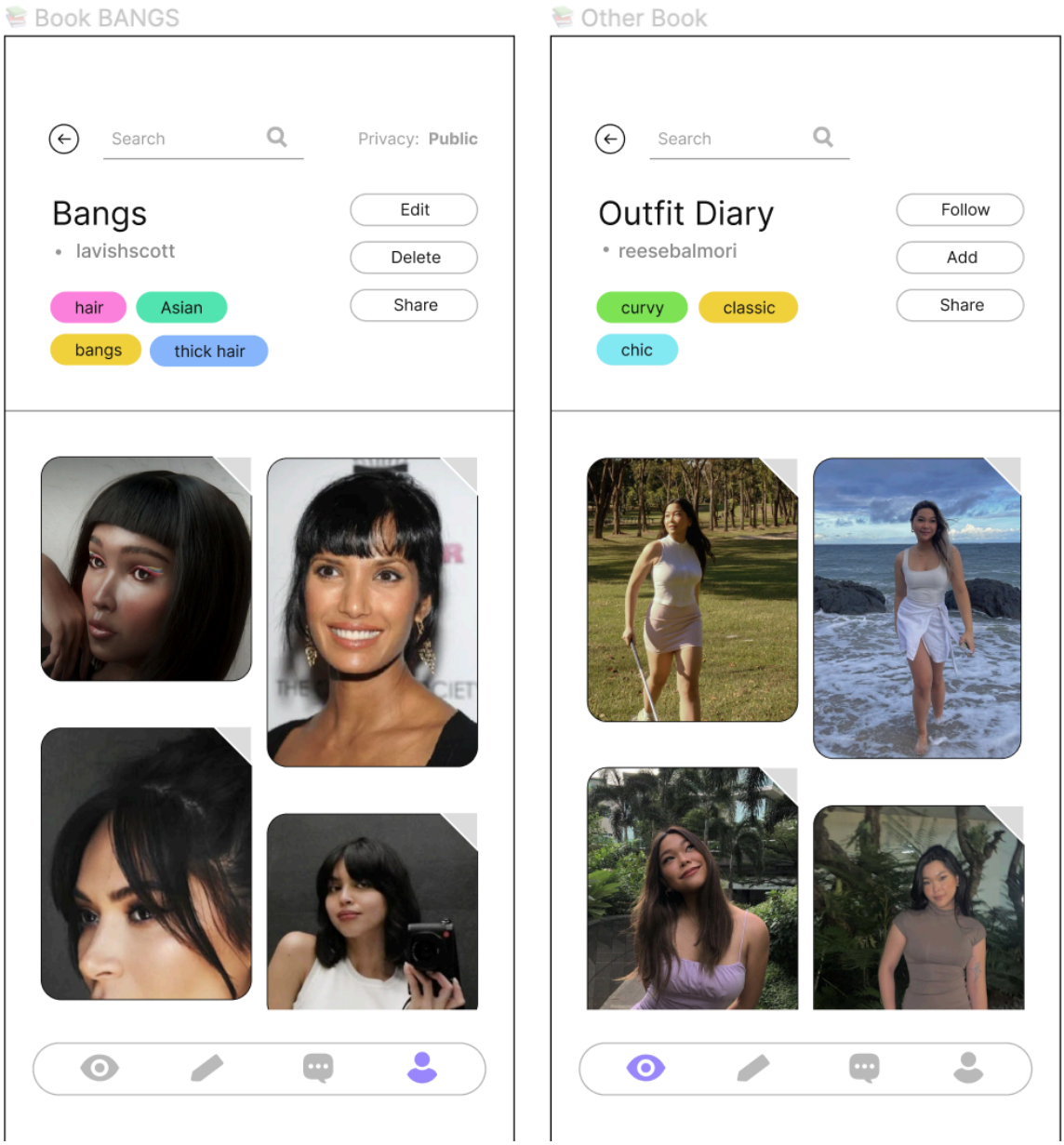


Figure iii.A.4.n

o. Profile / Create a Book

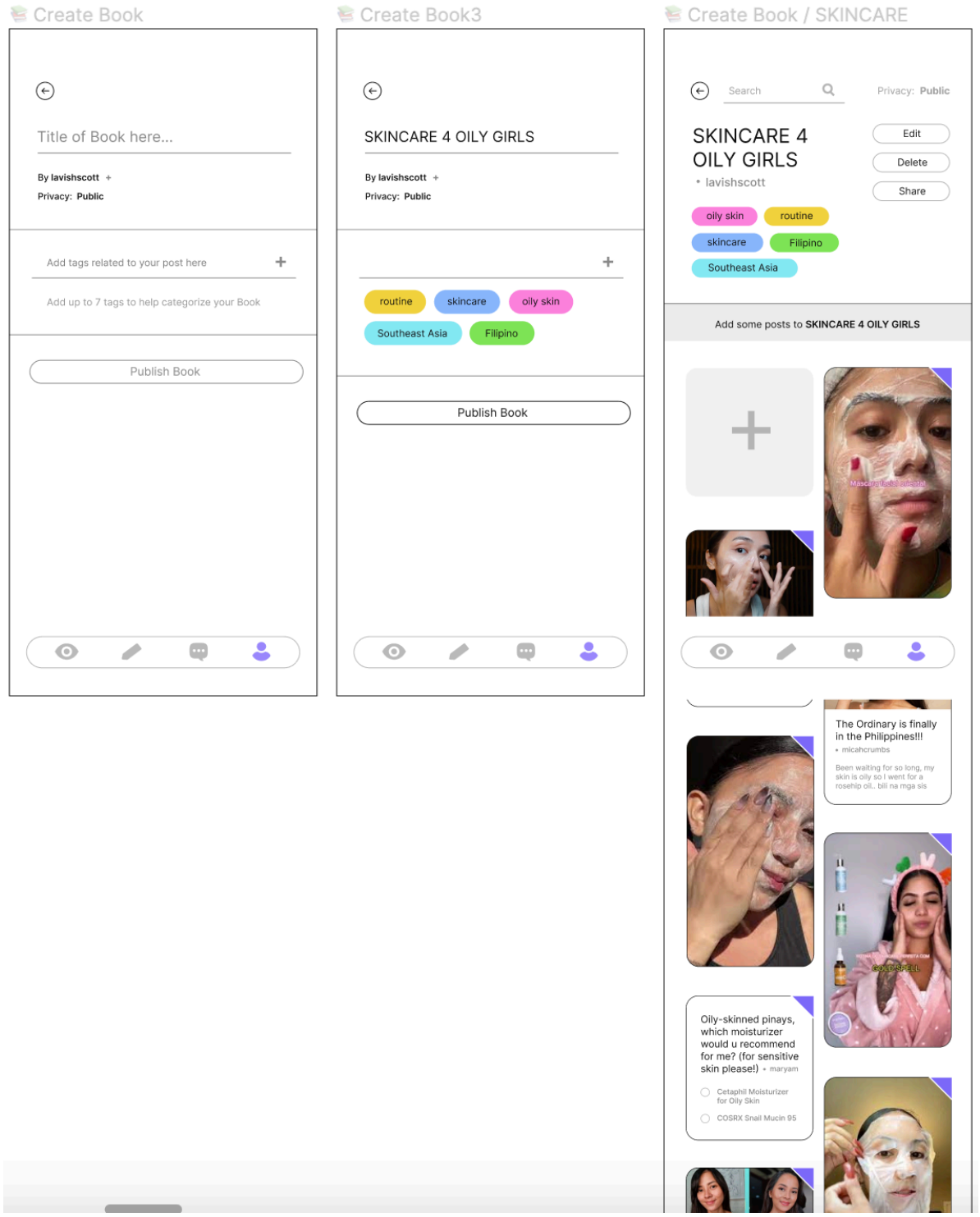


Figure iii.A.4.o

B. Second Prototype

1. *Brainstorming*

Figure iii.B.1

2. *Sitemap*

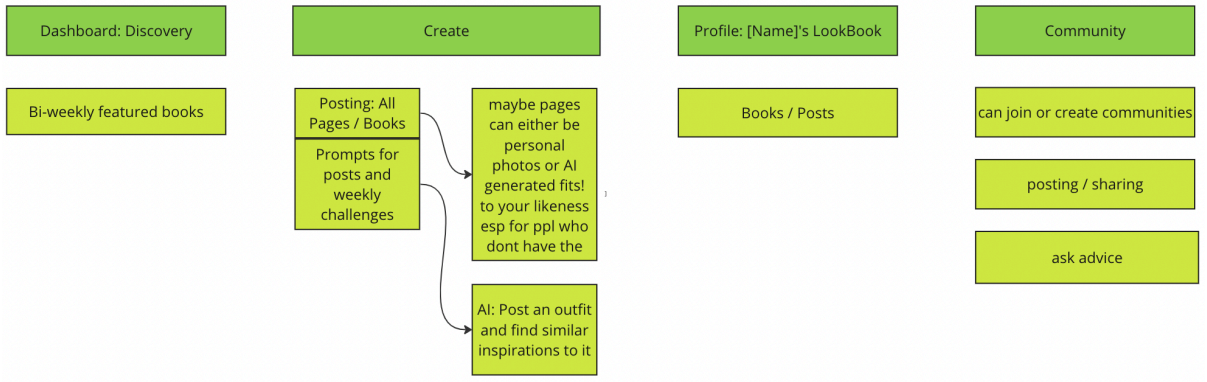


Figure iii.B.2

3. Prototype

a. Opening

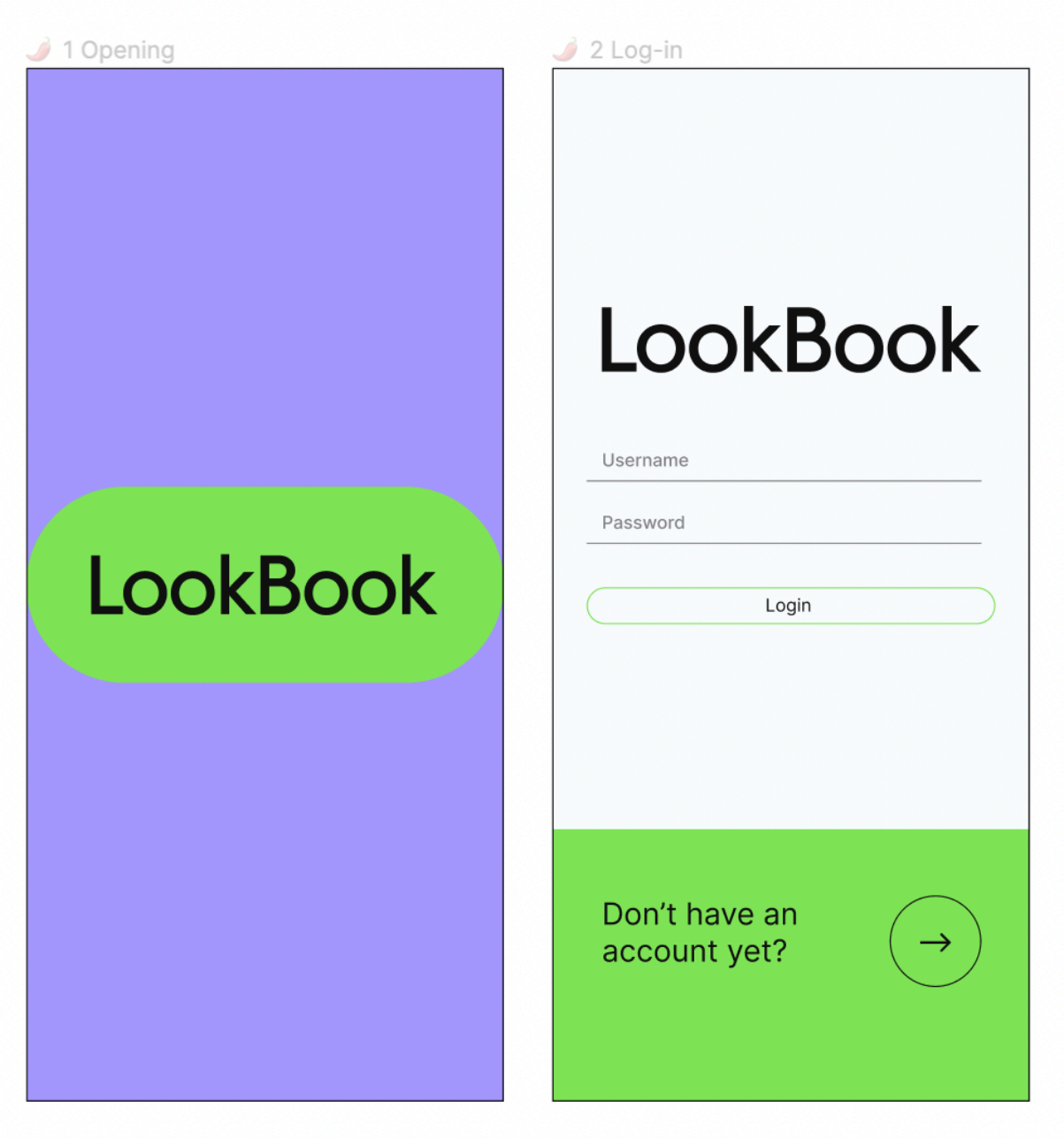


Figure iii.B.3.a

b. Onboarding / Verification

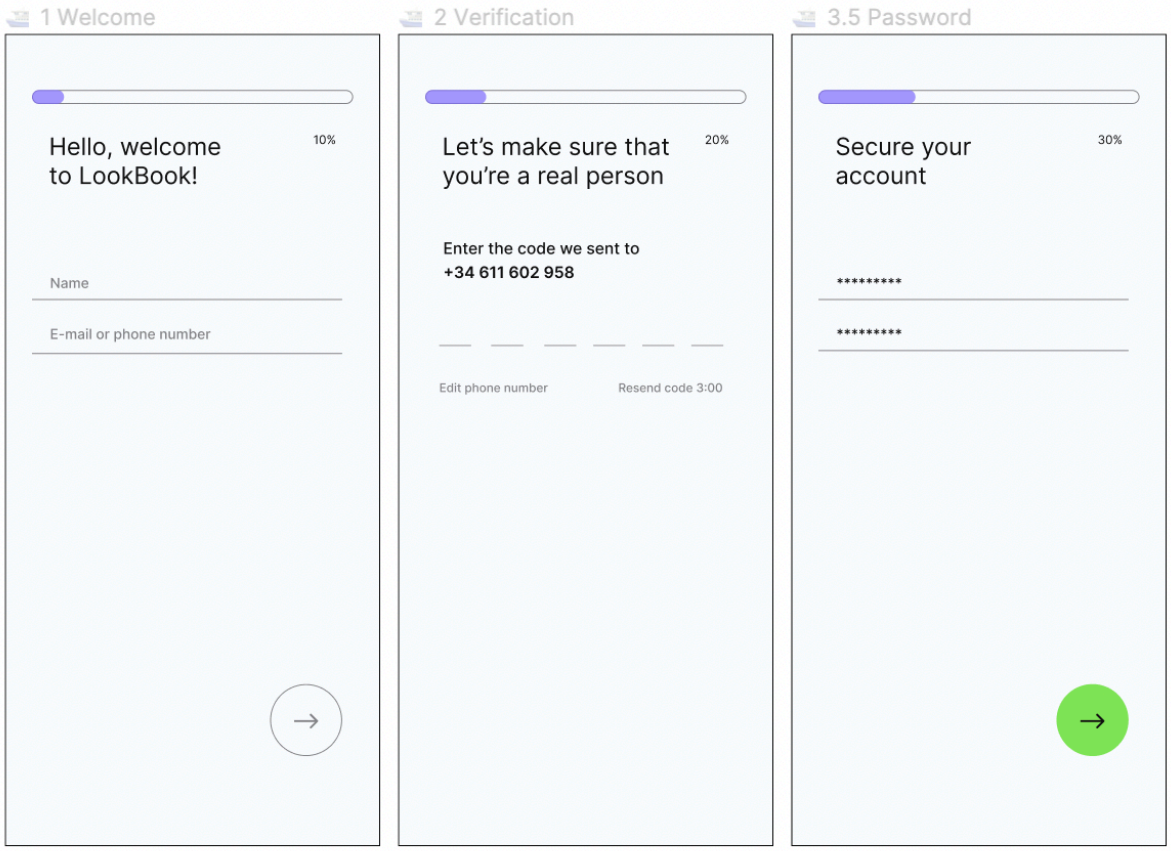


Figure iii.B.3.b

c. Onboarding / Identity

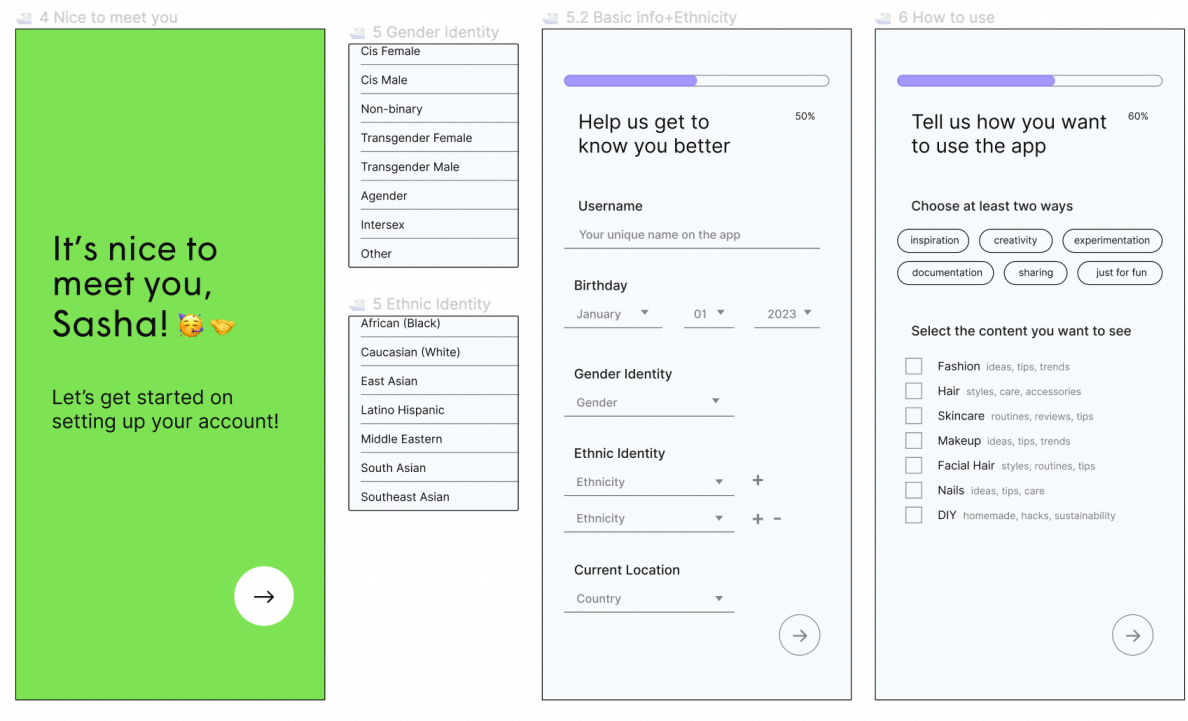


Figure iii.B.3.c

d. Onboarding / Preferences

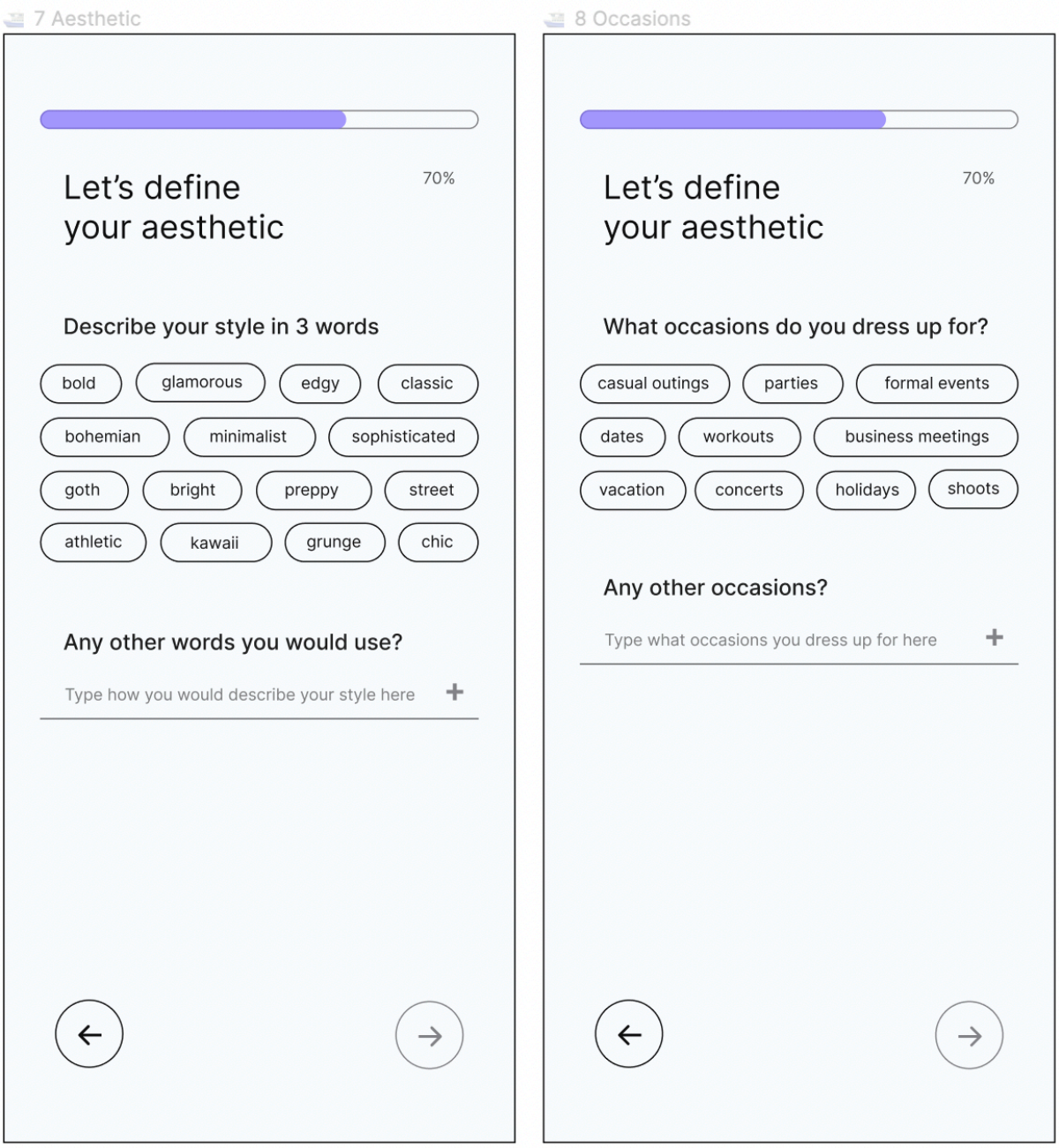


Figure iii.B.3.d

e. Onboarding / Aesthetic Definition 1

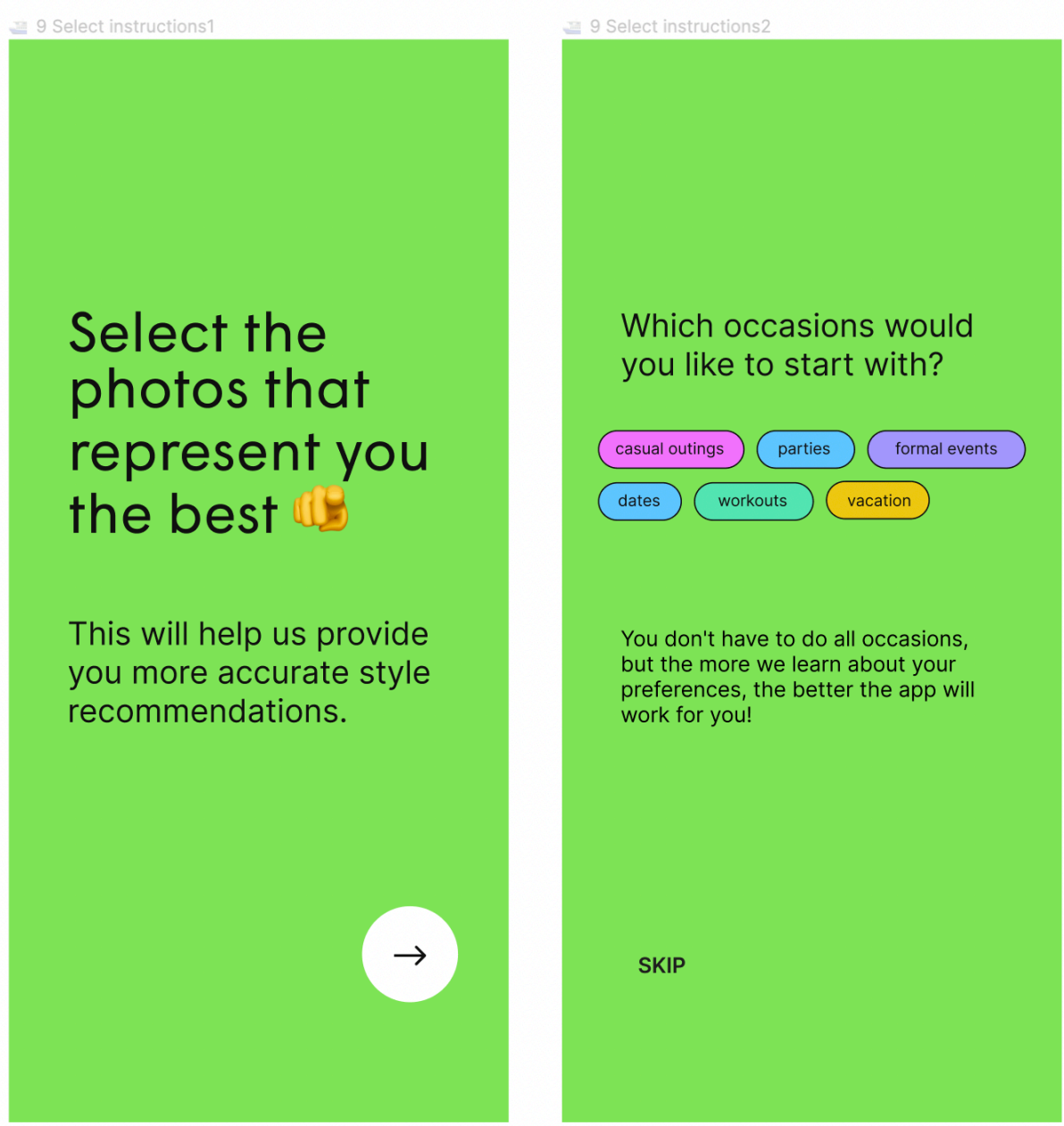


Figure iii.B.3.e

f. Onboarding / Aesthetic Definition 2

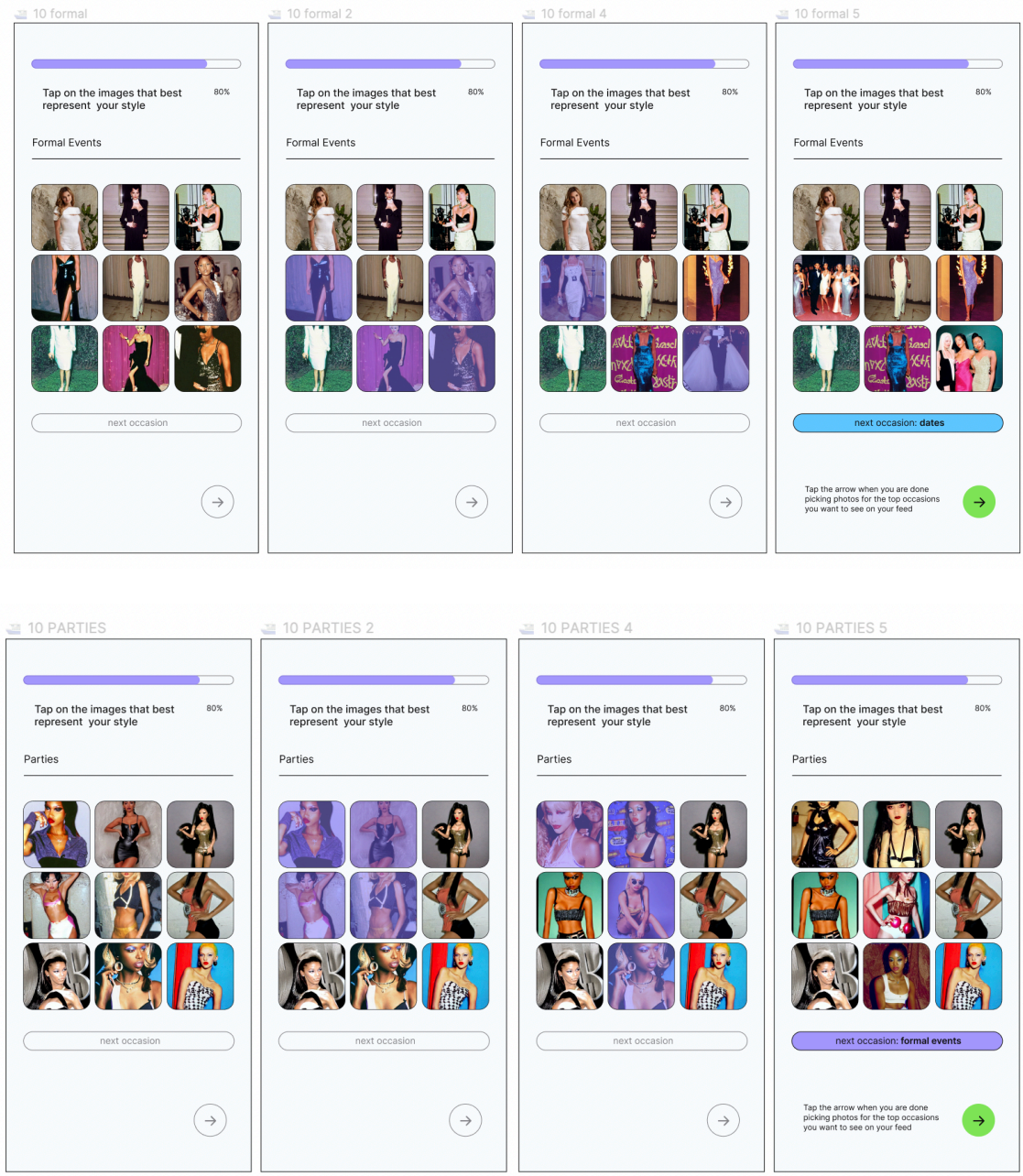


Figure iii.B.3.f

g. Onboarding / Physical Representation and Social Media

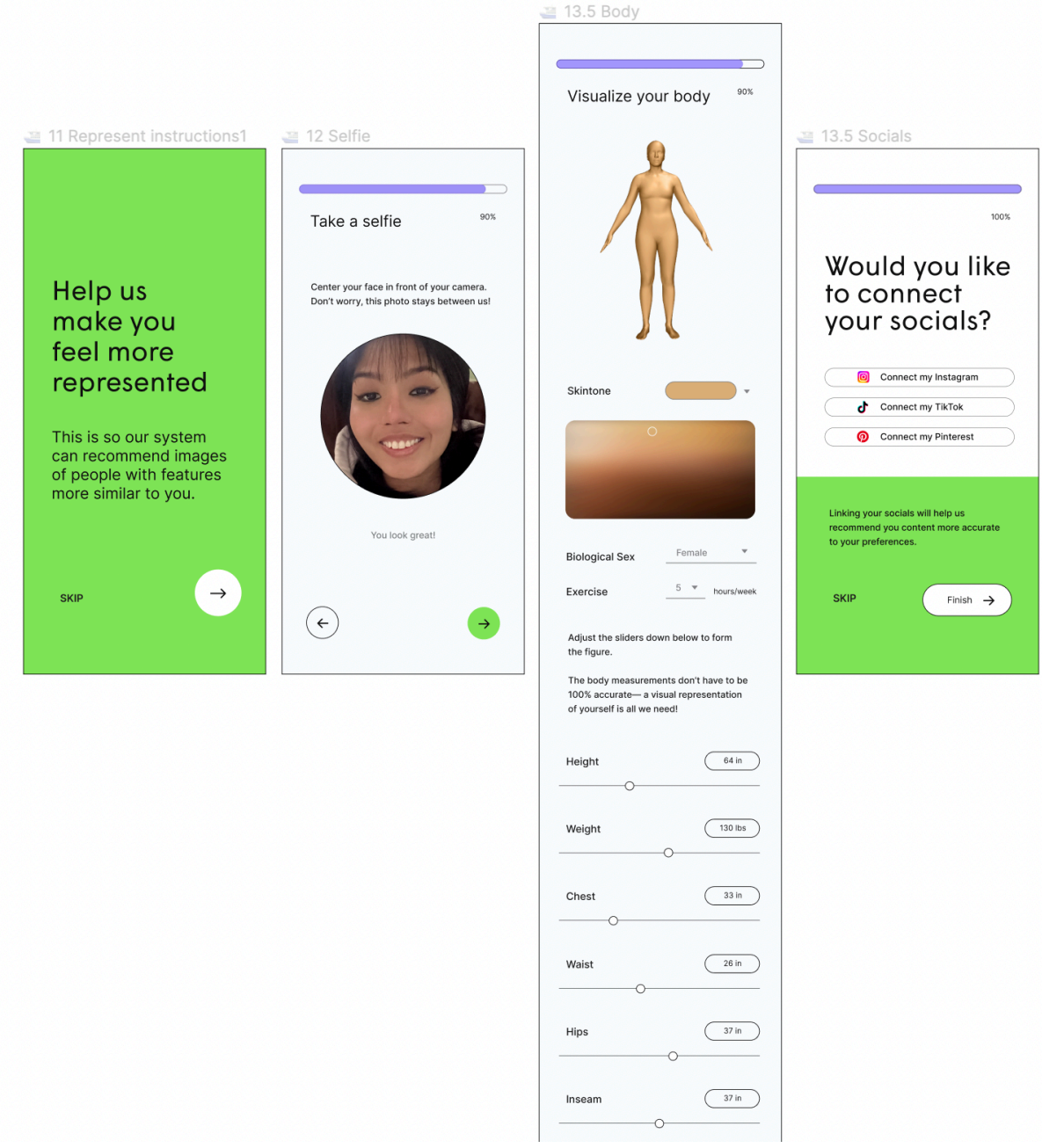


Figure iii.B.3.g

h. Dash / High Personalization vs. Low Personalization

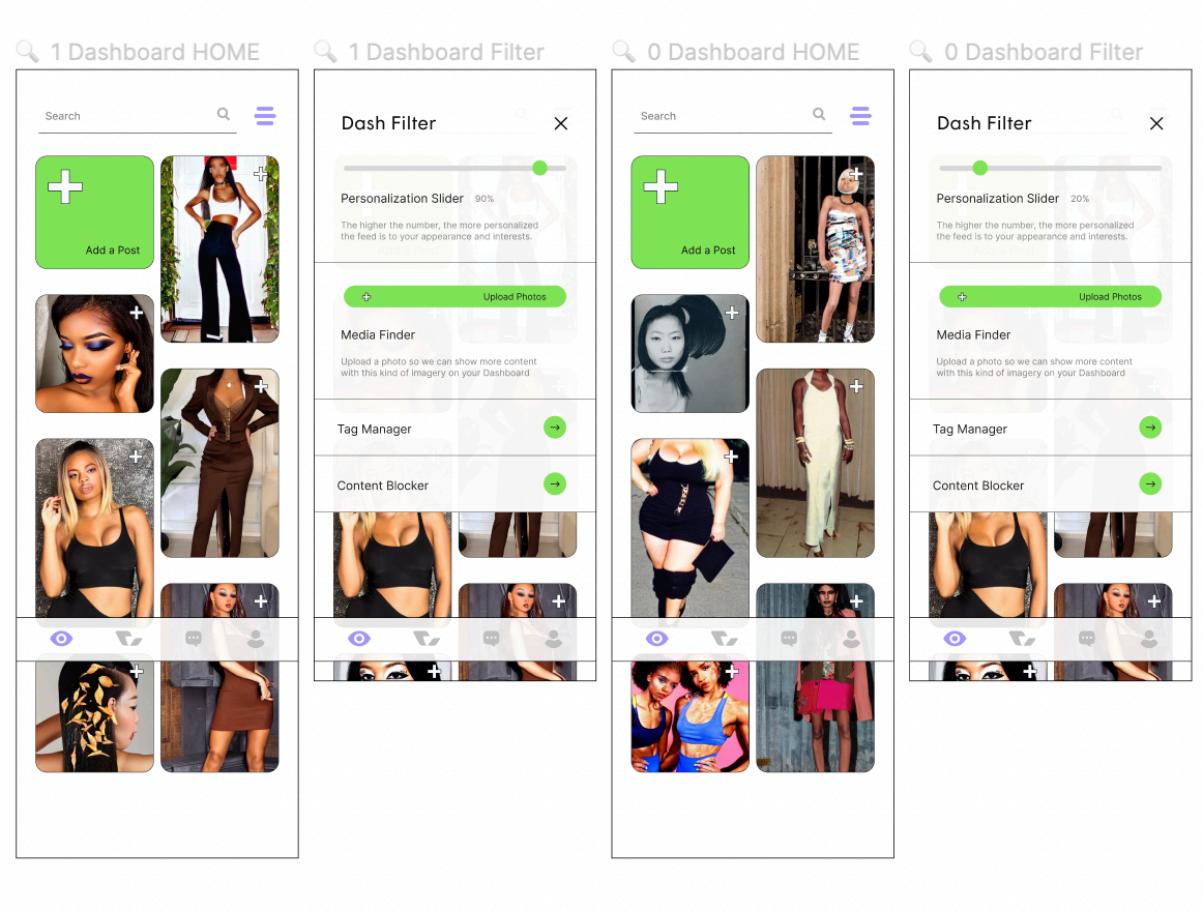


Figure iii.B.3.h

i. Dash / Dash Filter

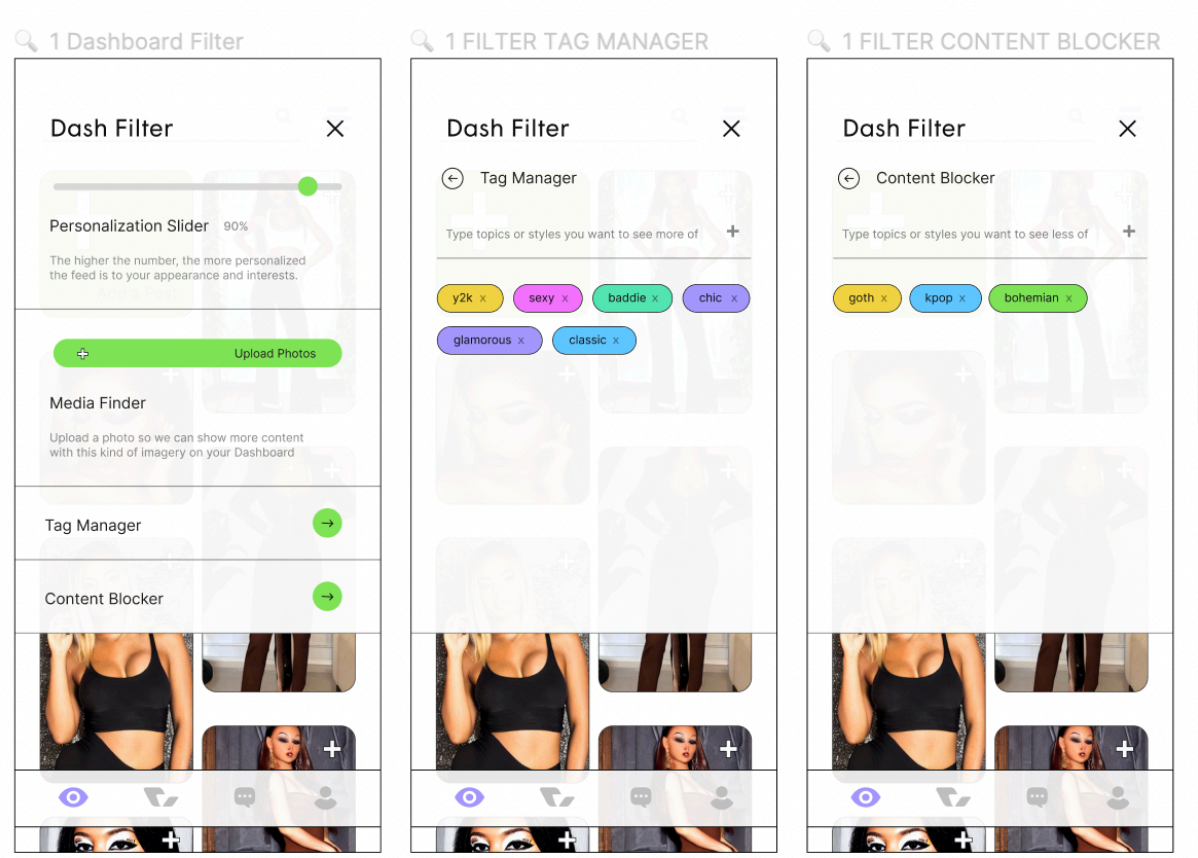


Figure iii.B.3.i

j. Dash / Post

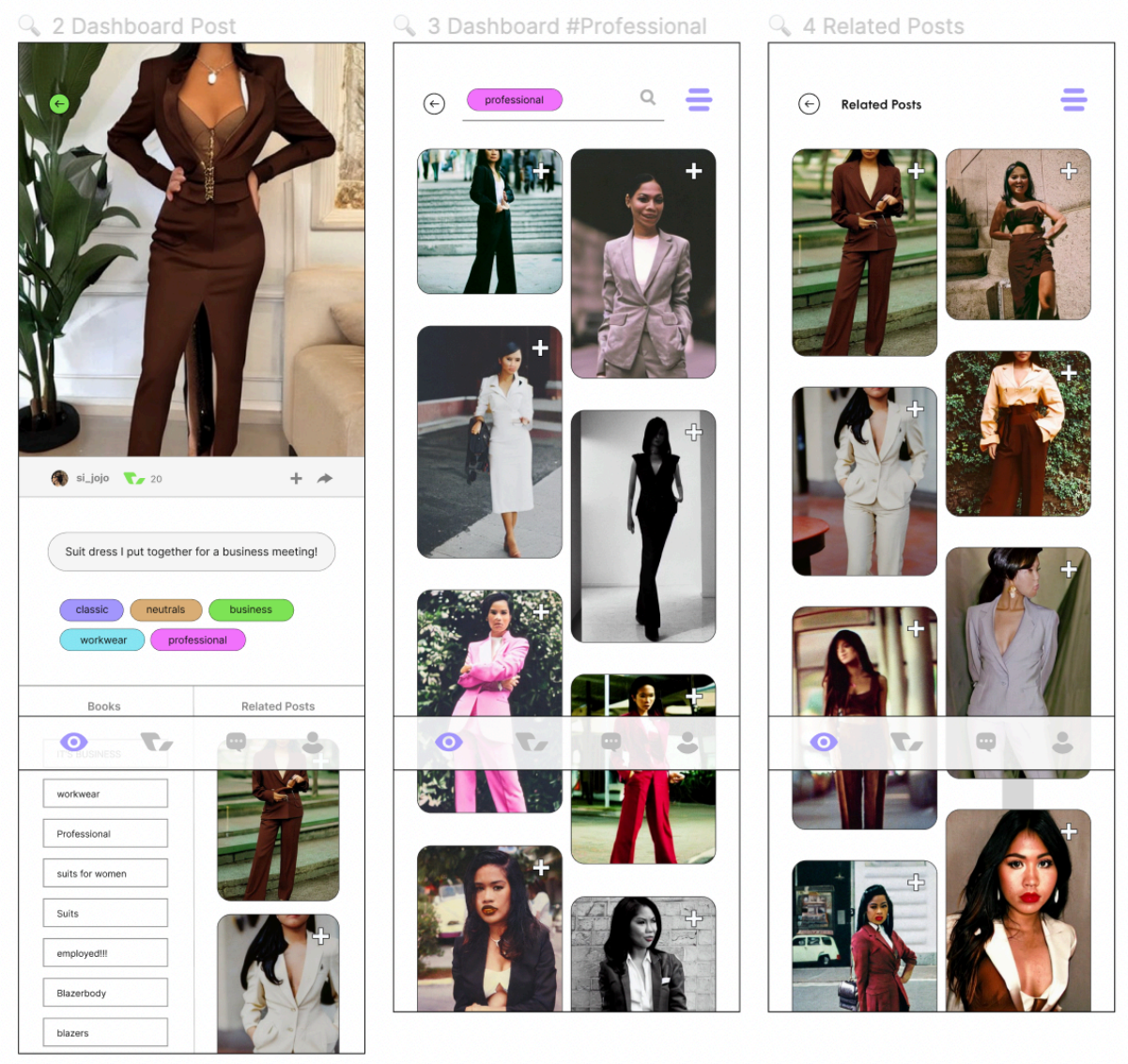


Figure iii.B.3.j

k. Dash / Add Post

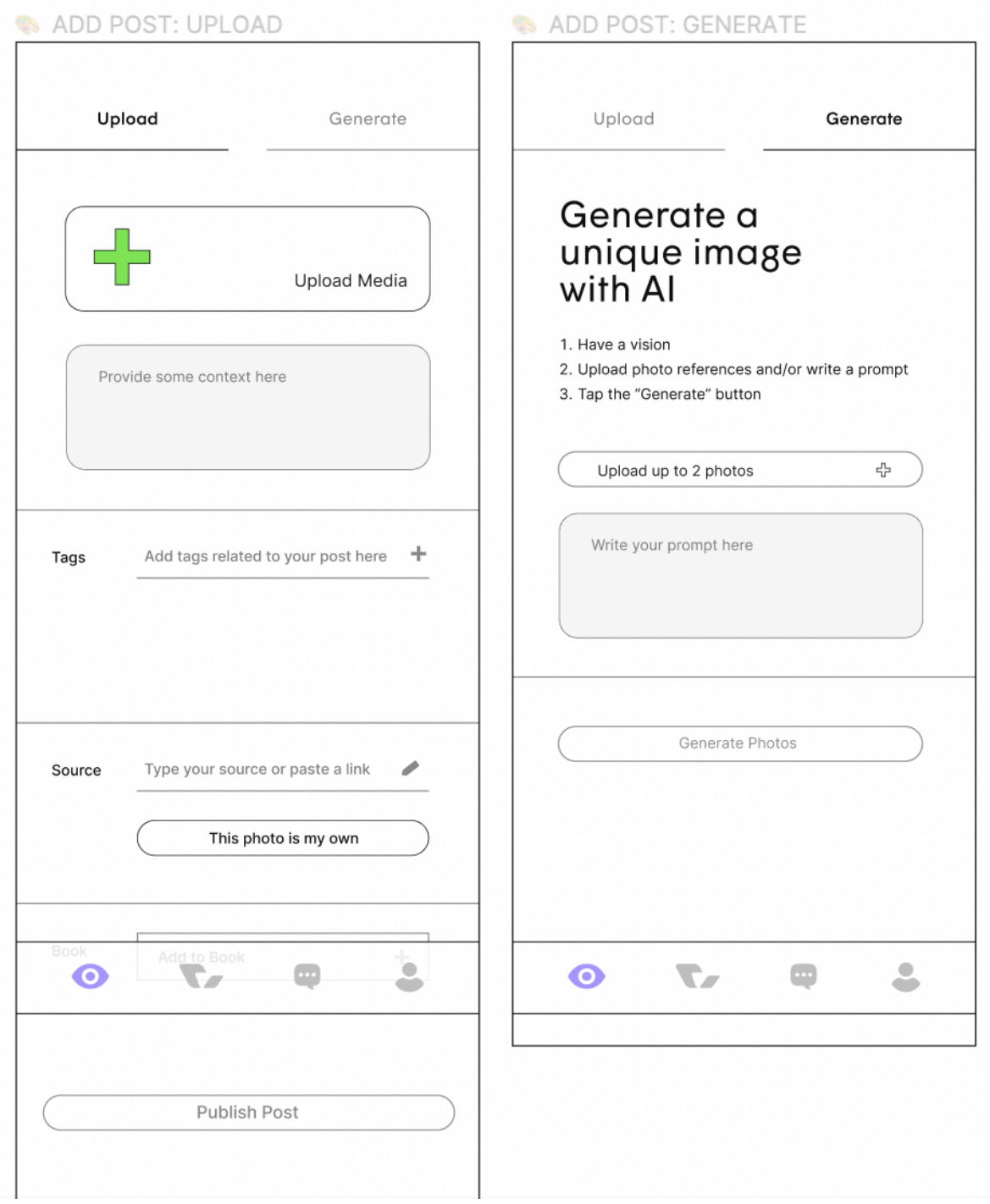


Figure iii.B.3.k

I. Dash / Add Post / Upload

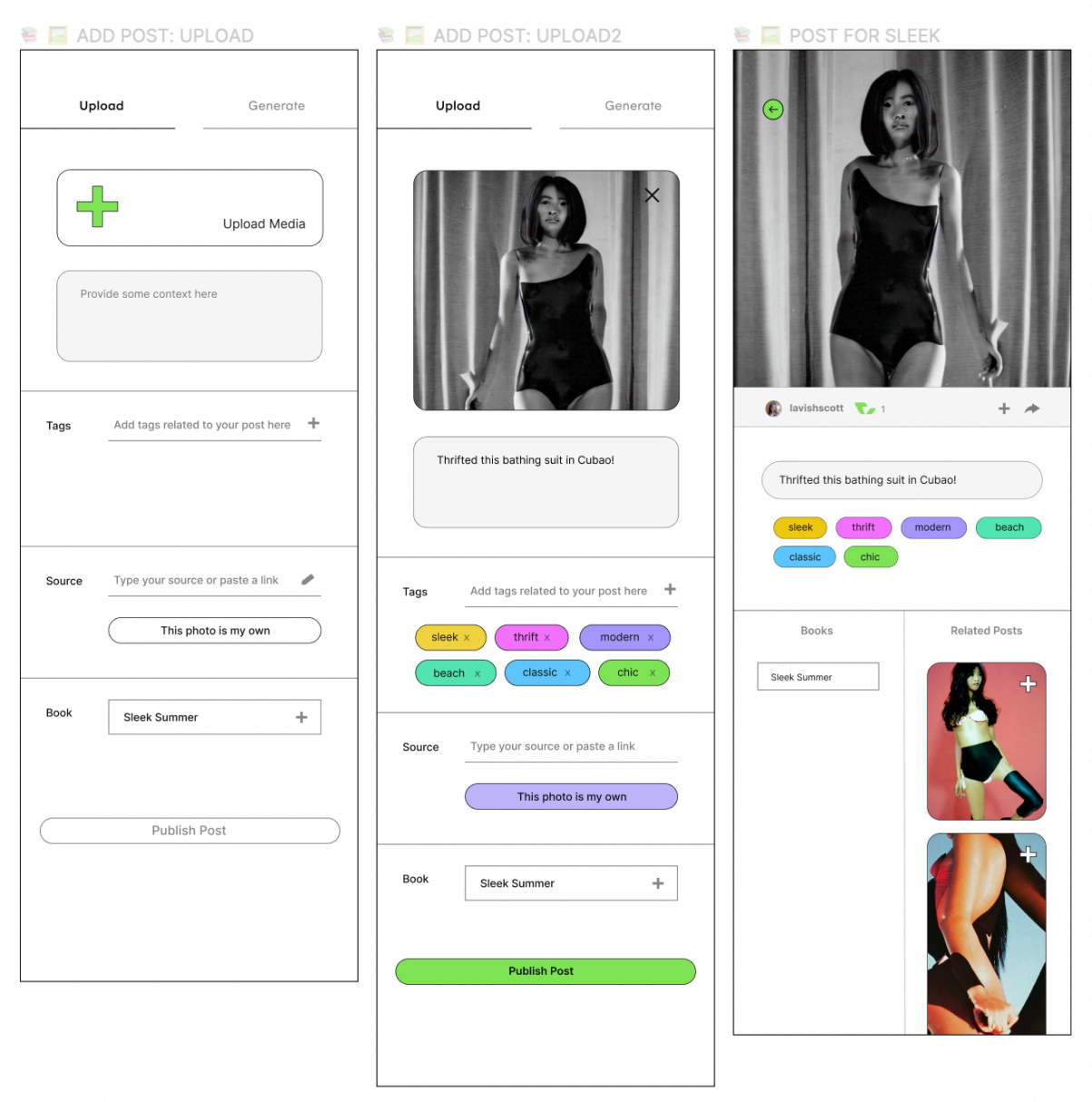


Figure iii.B.3.1

m. Dash / Add Post / Generate

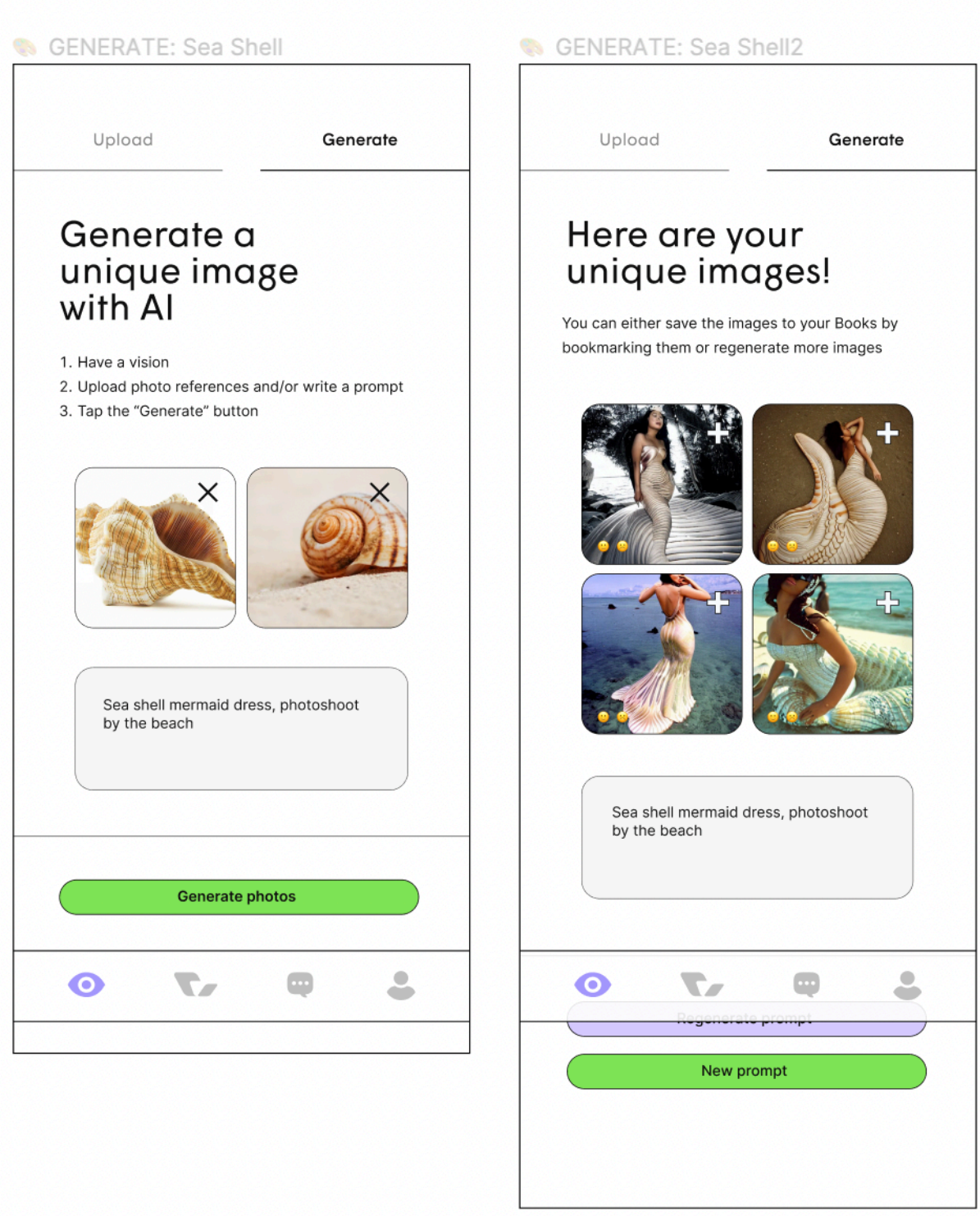


Figure iii.B.3.m

n. Books

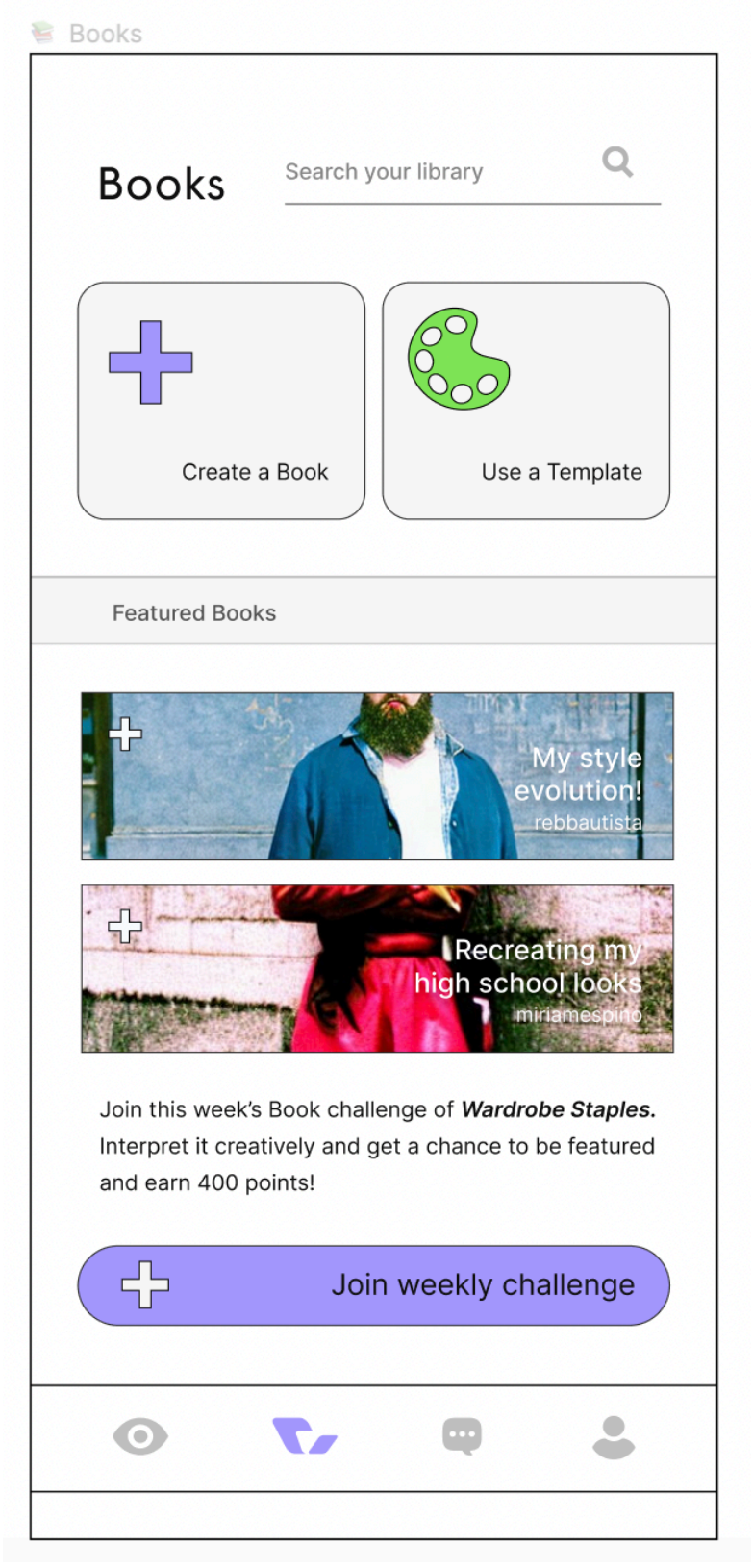


Figure iii.B.3.n

o. Books

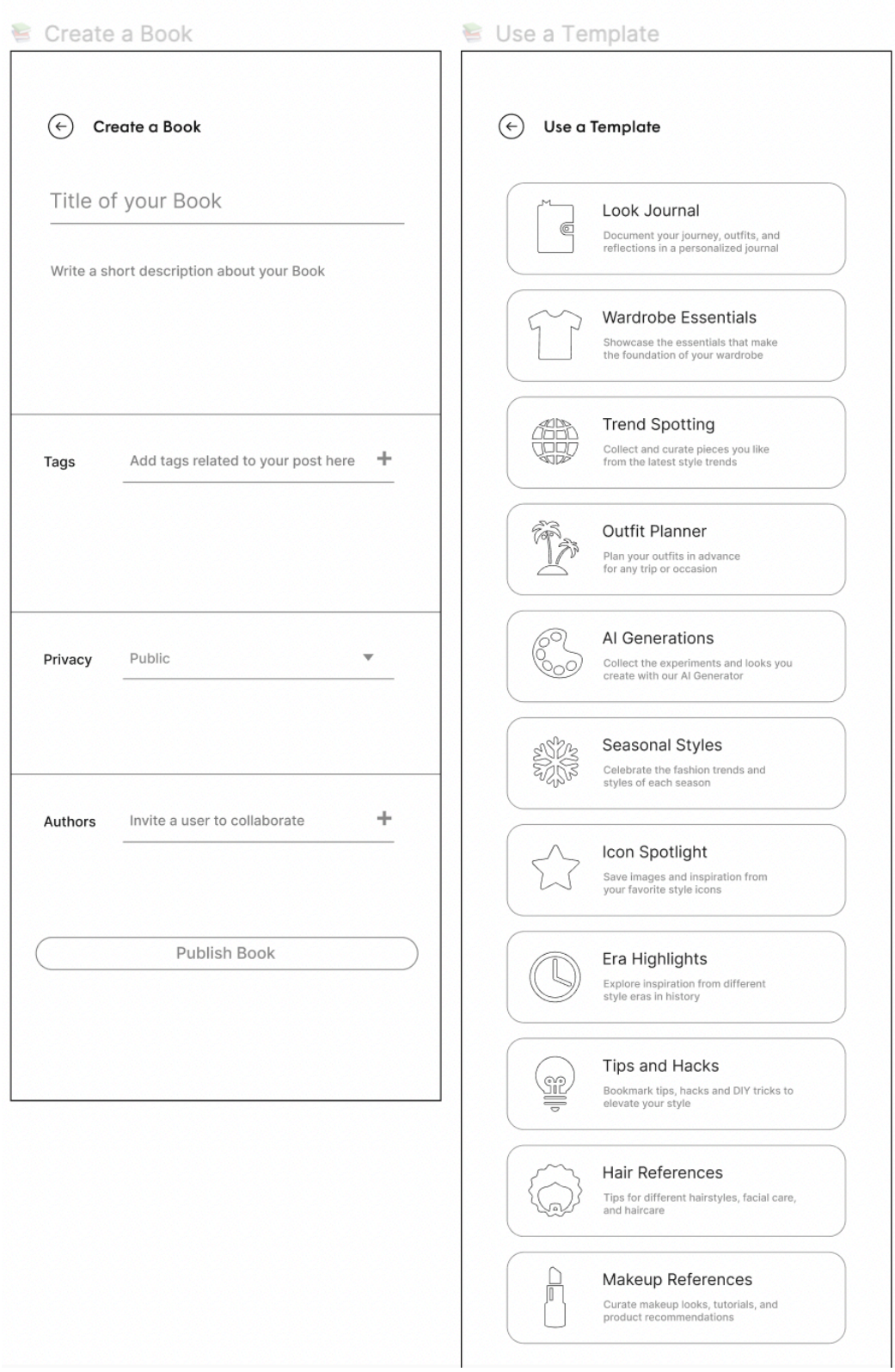


Figure iii.B.3.o

p. Books / Sample Templates

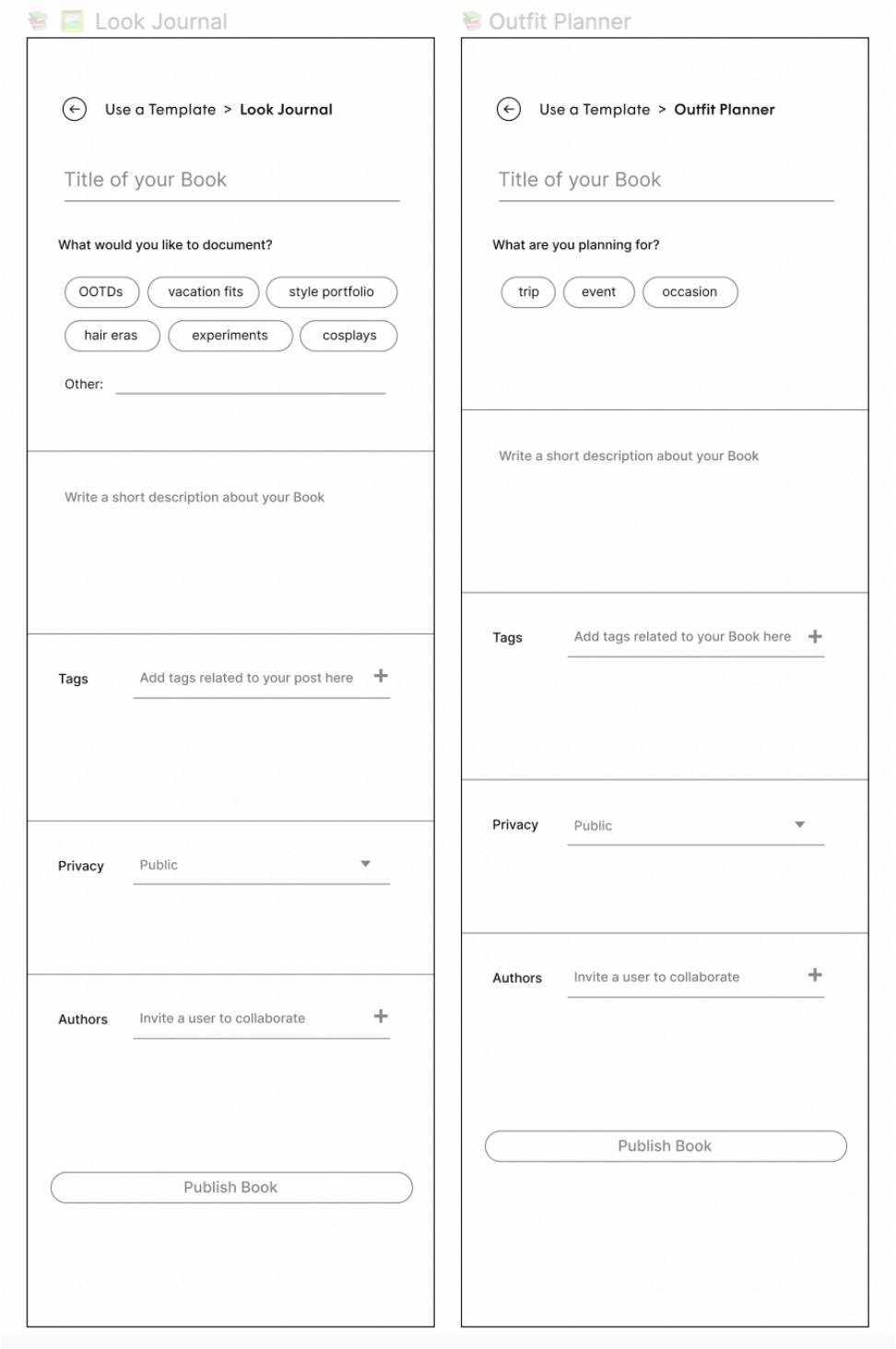


Figure iii.B.3.p

q. Books / Sample Answered Book

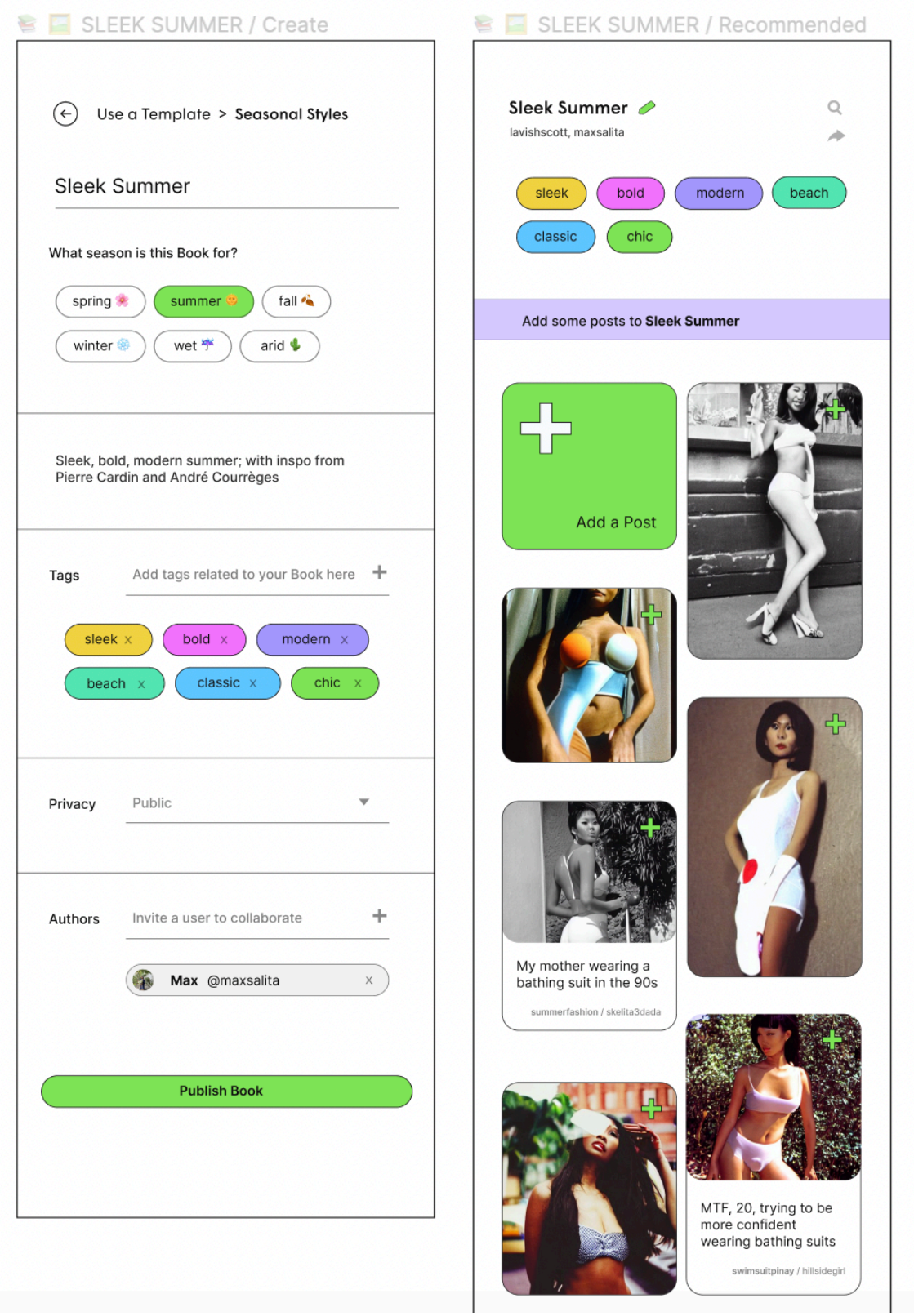


Figure iii.B.3.q

r. Community / Feed and Interactions Tab

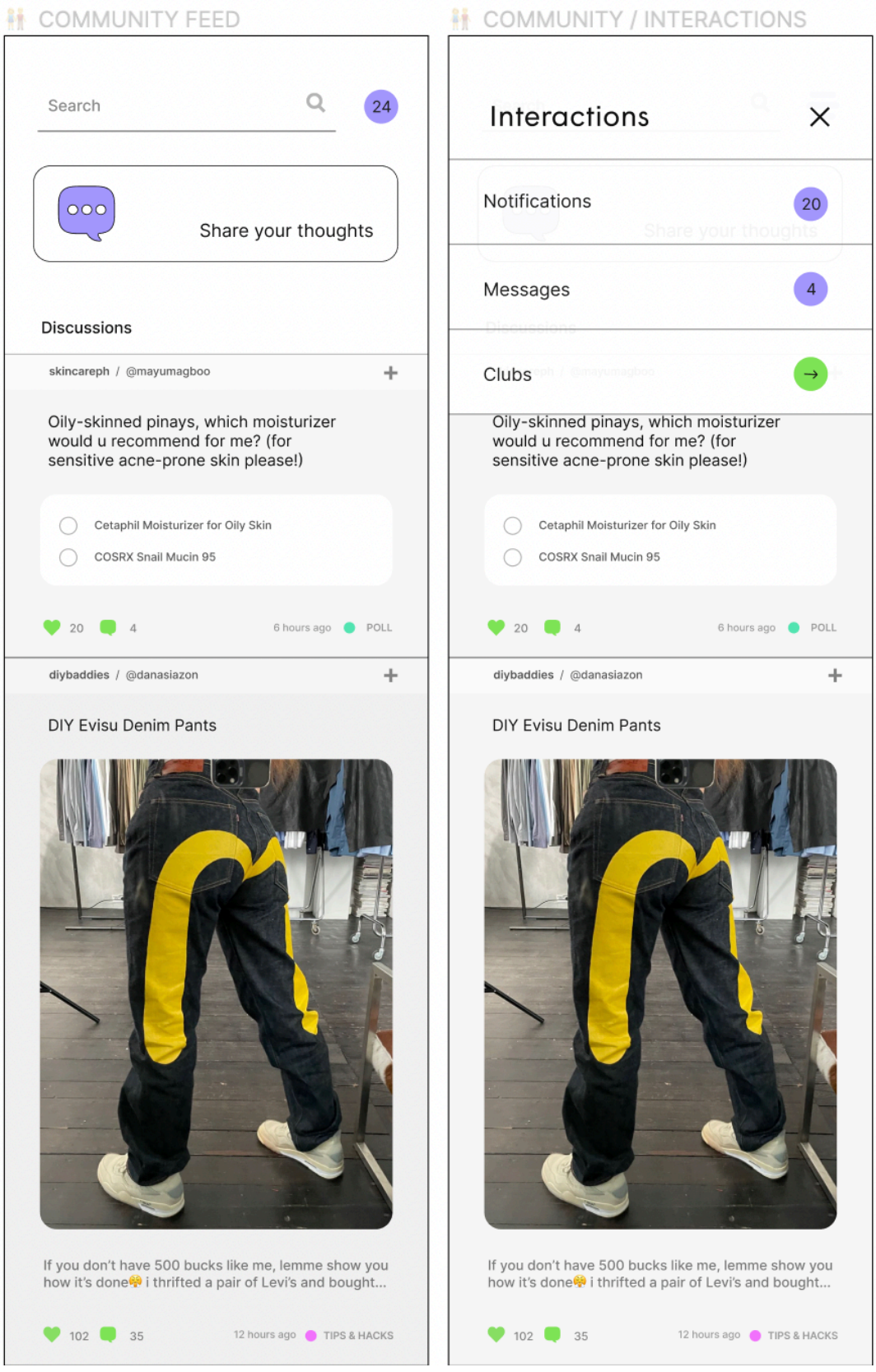


Figure iii.B.3.r

s. Community / Feed / Post

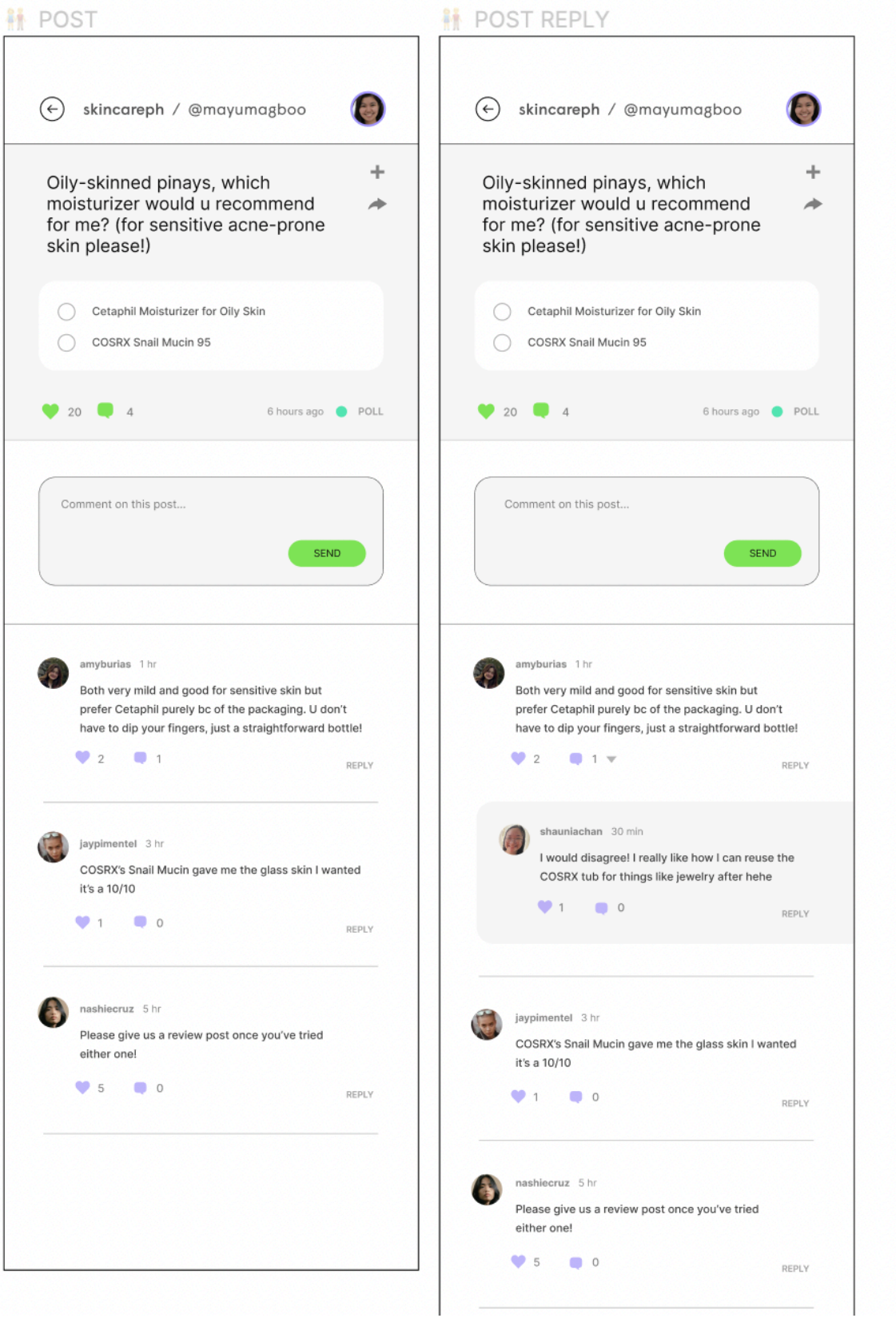


Figure iii.B.3.s

t. Community / Feed / Add Post

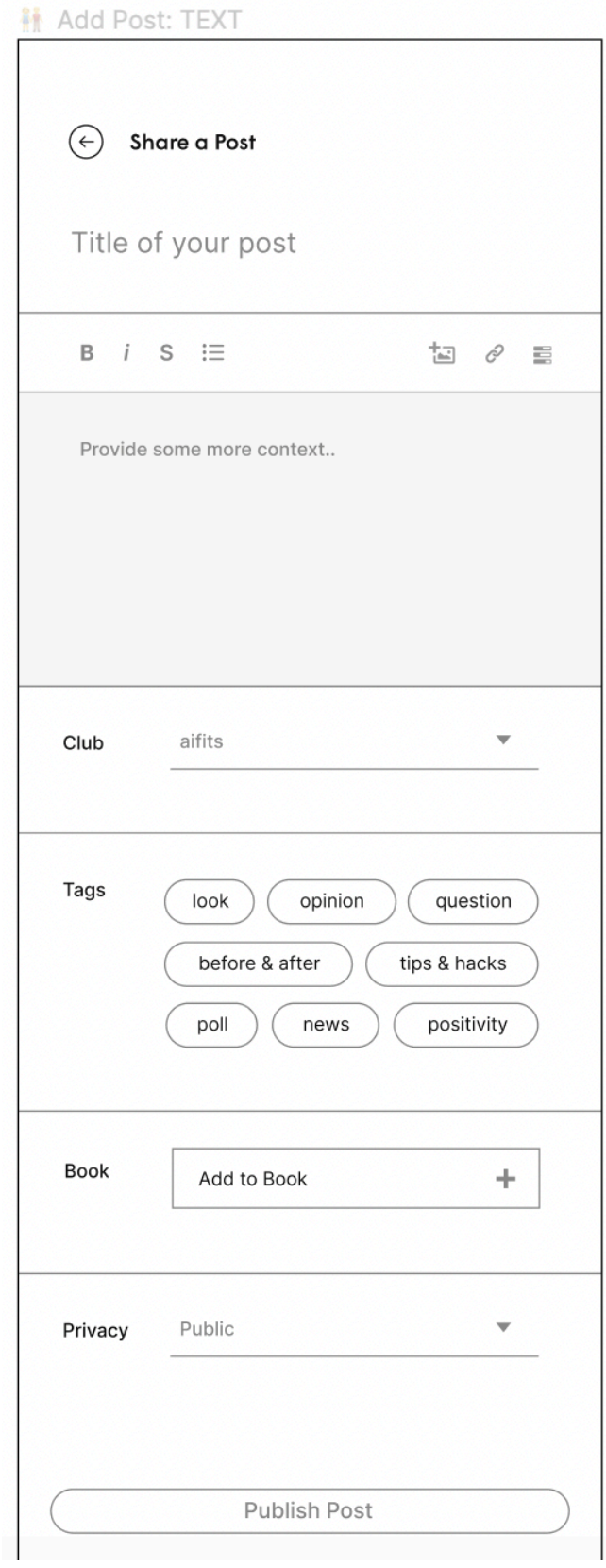


Figure iii.B.3.t

u. Community / Interactions Tab / Clubs

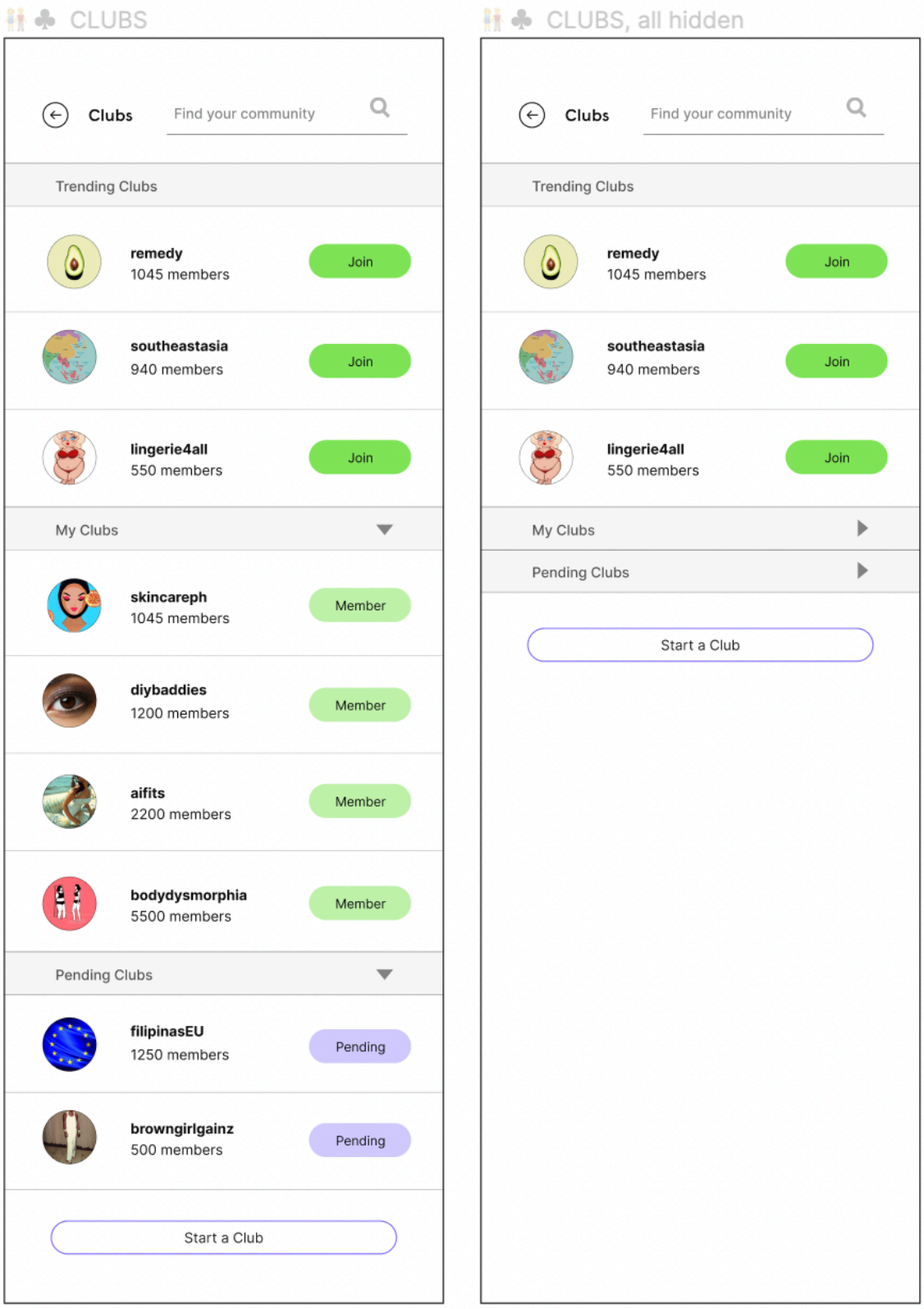


Figure iii.B.3.u

v. Community / Interactions Tab / Clubs / Sample Club

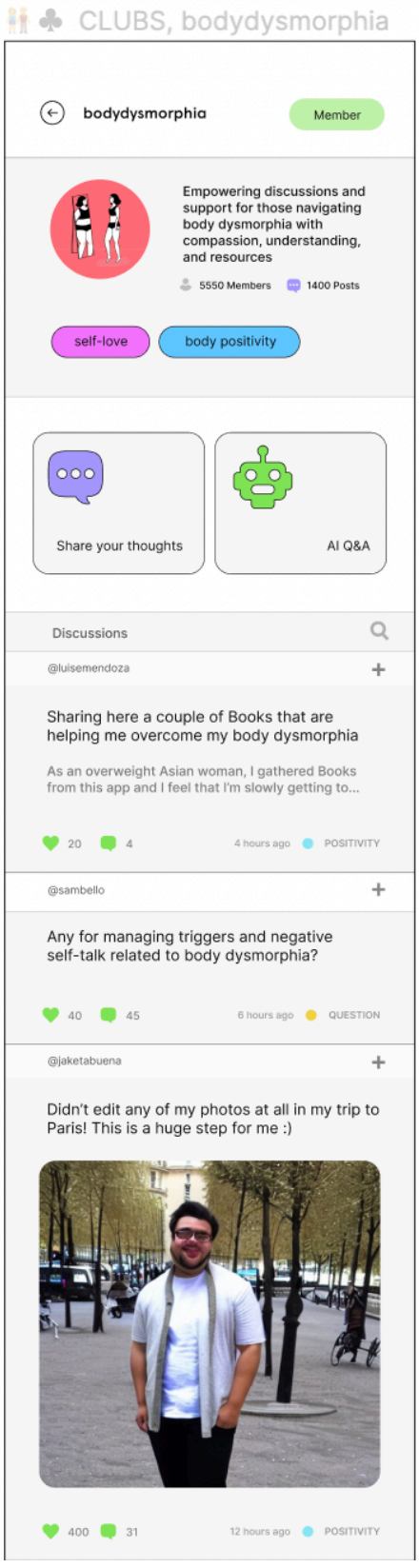


Figure iii.B.3.v

v. Community / Interactions Tab / Clubs / Sample Club / AI Q&A

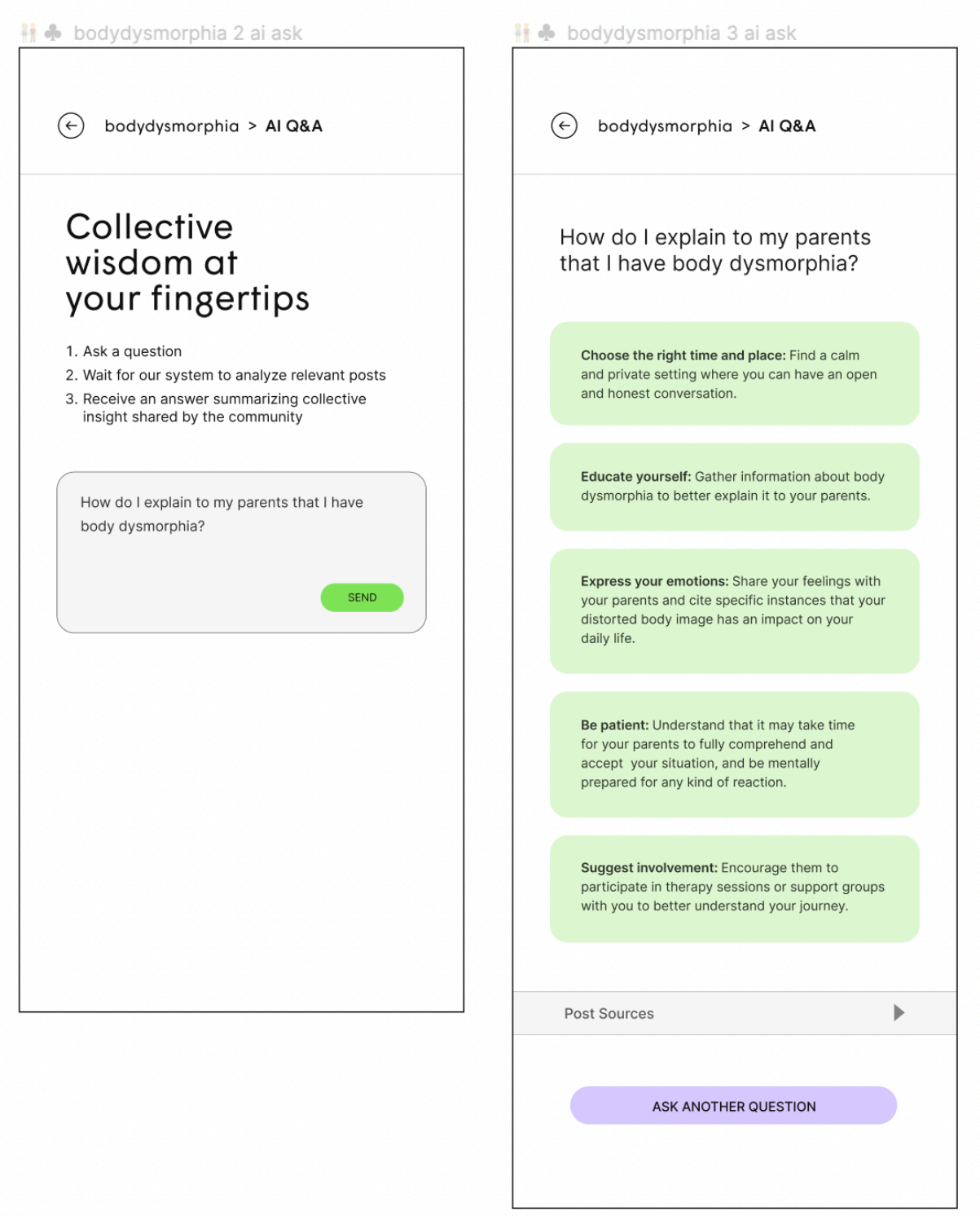


Figure iii.B.3.v

w. Community / Interactions Tab / Inbox

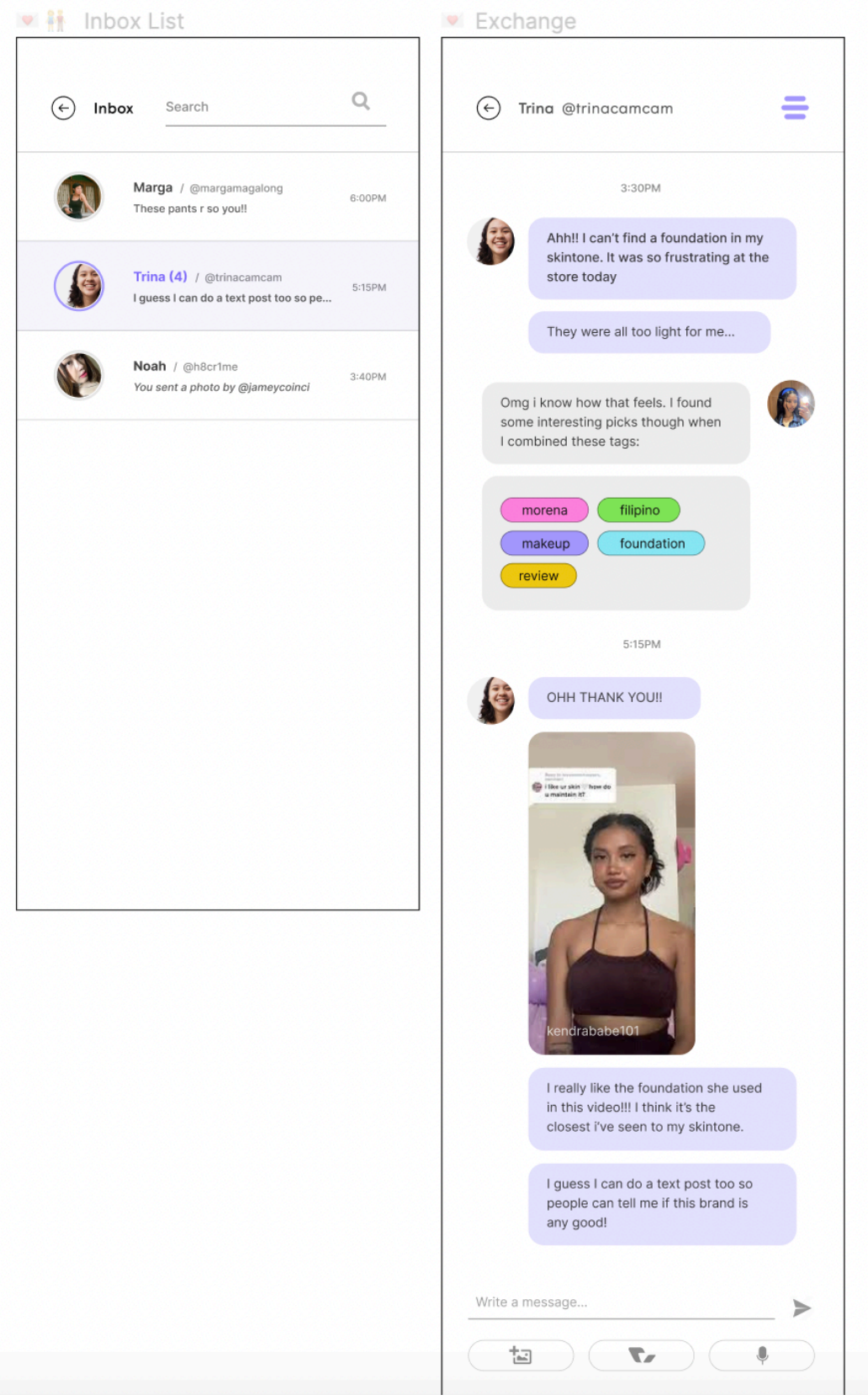


Figure iii.B.3.w

x. My Profile

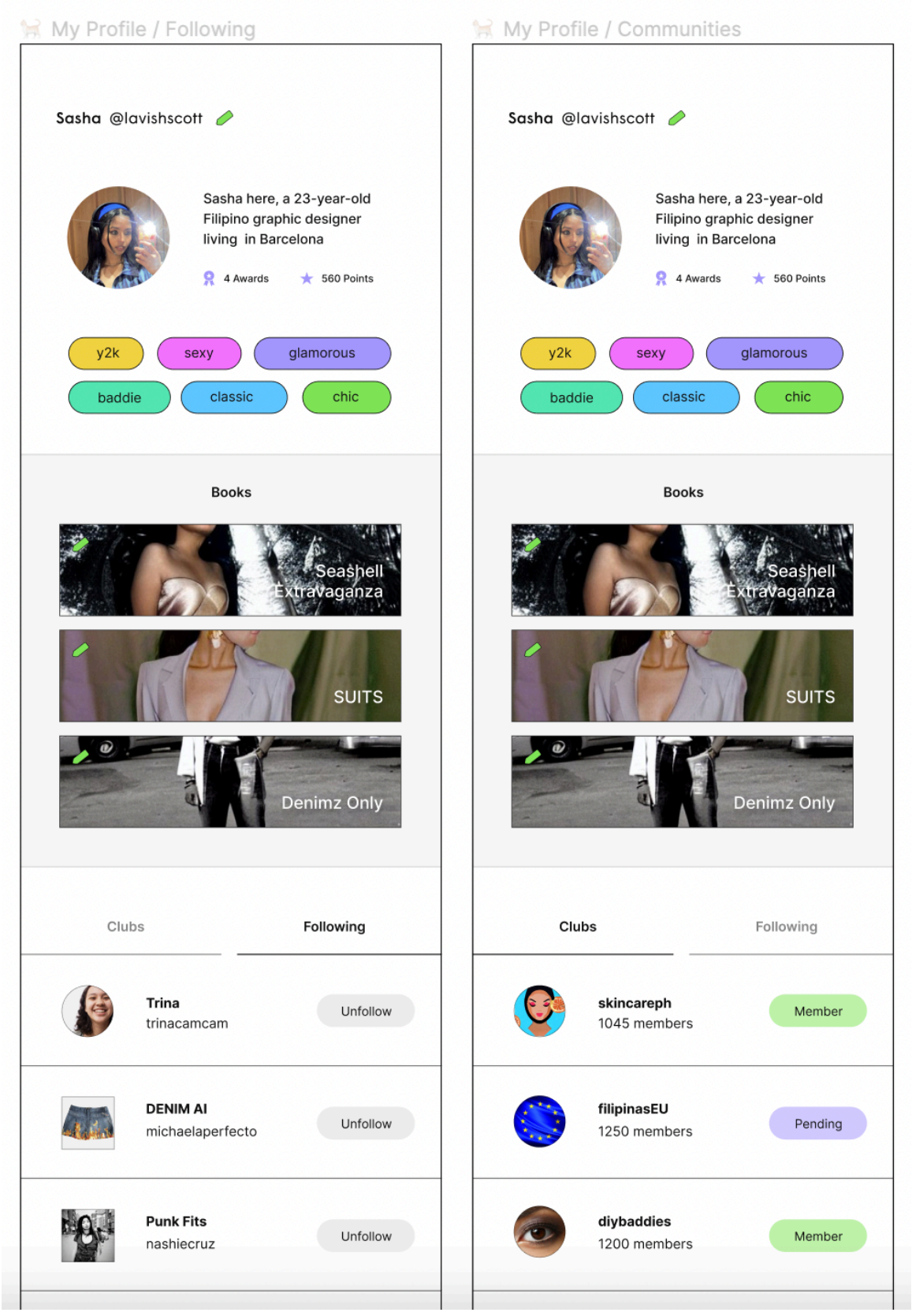


Figure iii.B.3.x

y. Friend's Profile and Friend's Book

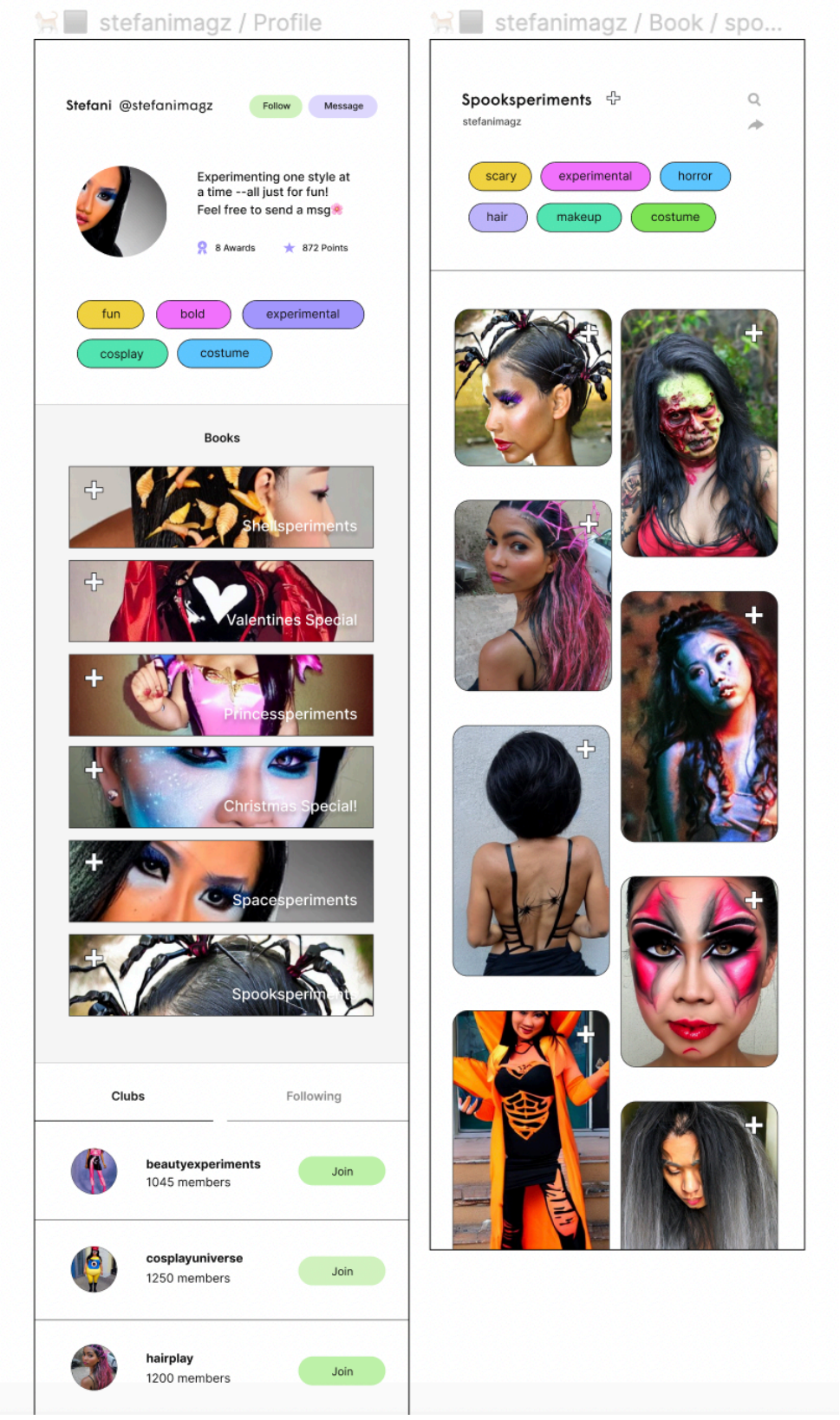
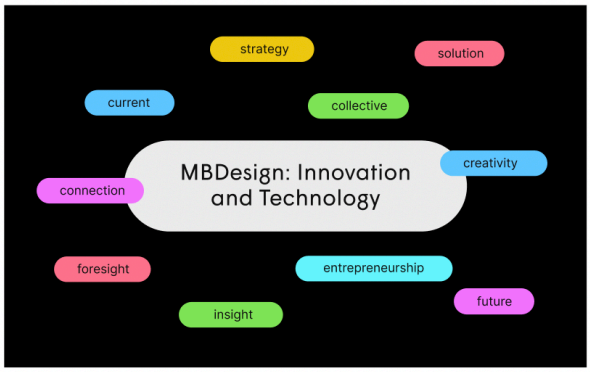


Figure iii.B.3.y

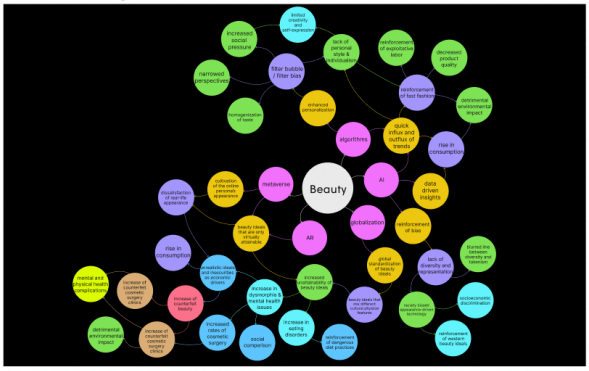
4. *Demo Slides*

Intro

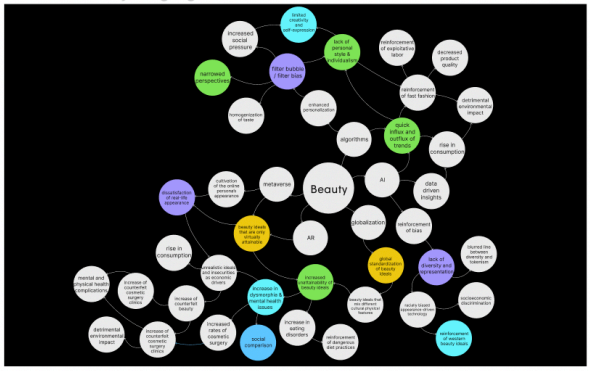
Course



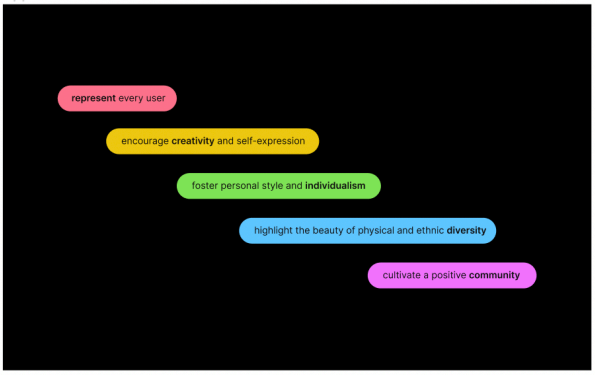
Future of Beauty



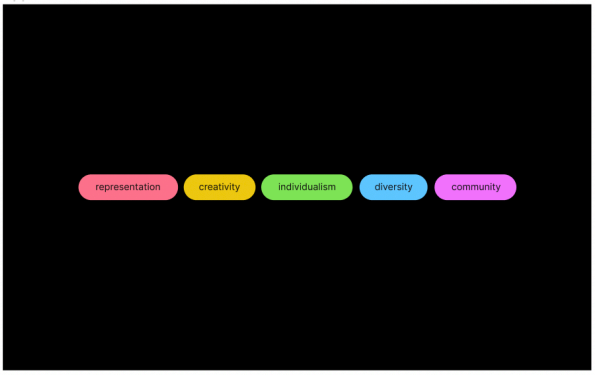
Future of Beauty - highlights



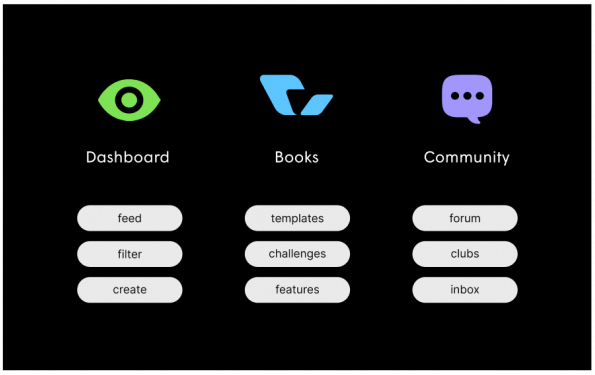
Application Goals



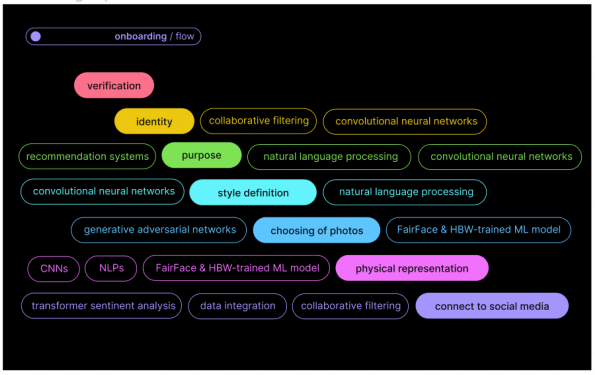
Application Goals 2



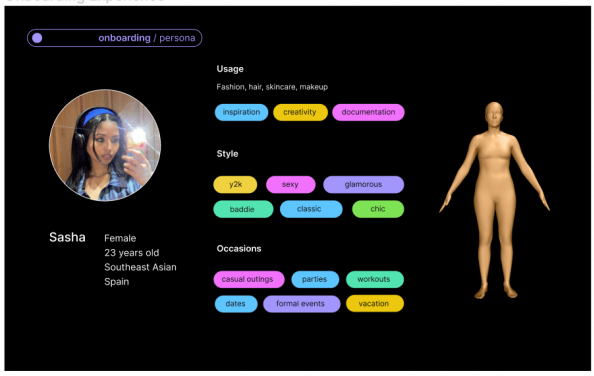
Main Pillars 2



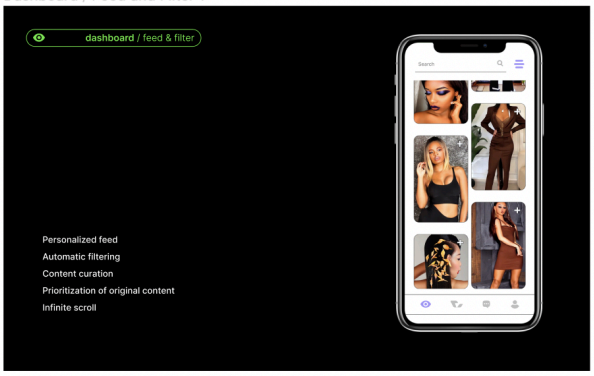
Onboarding Experience



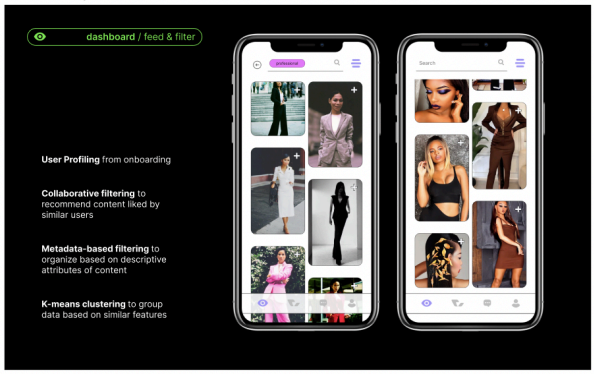
Onboarding Experience



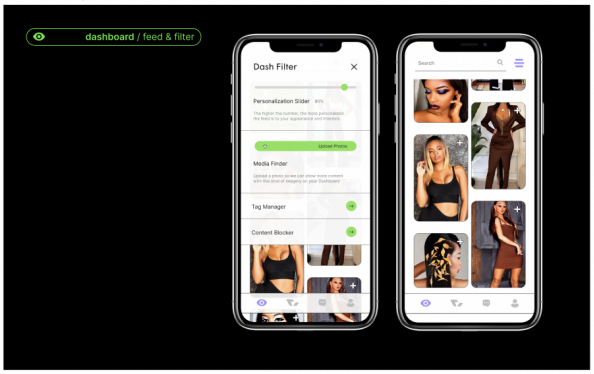
Dashboard / Feed and Filter 1



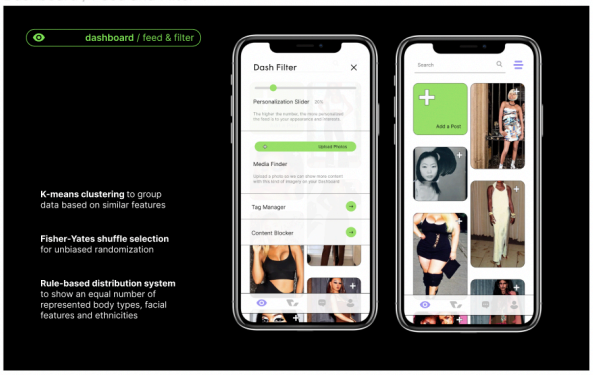
Dashboard / Feed and Filter 2



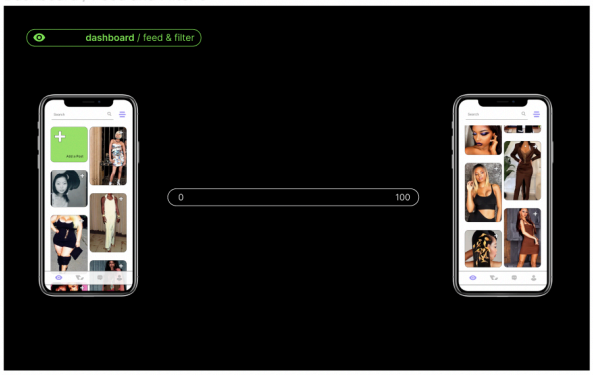
Dashboard / Feed and Filter 3



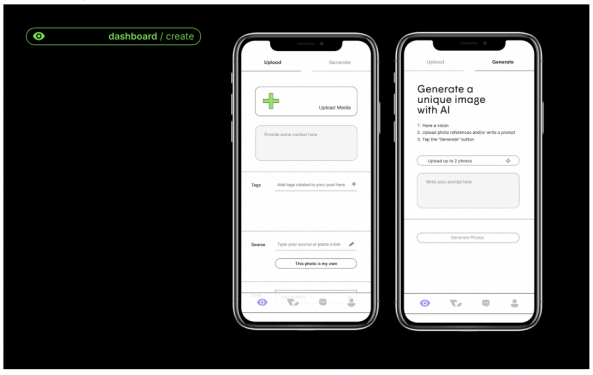
Dashboard / Feed and Filter 4



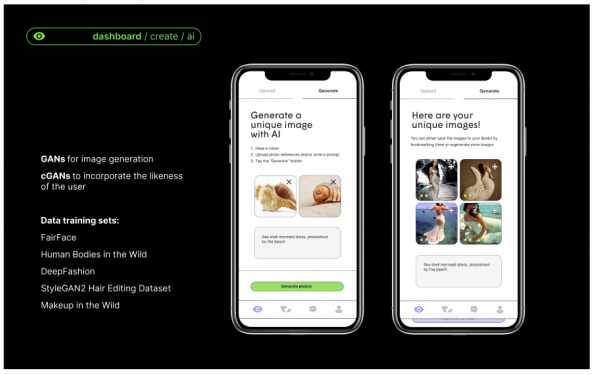
Dashboard / Feed and Filter 5



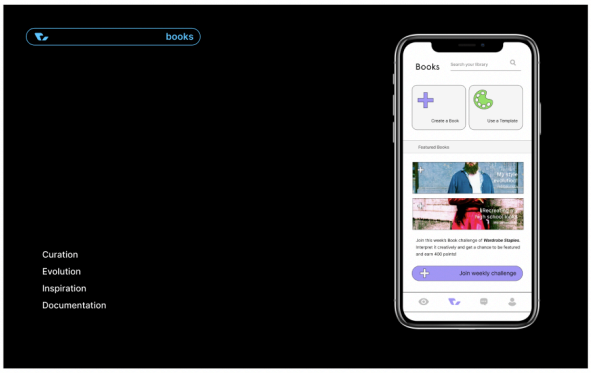
Dashboard / Create



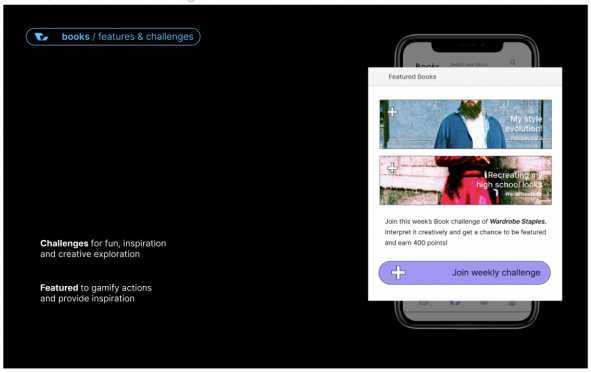
Dashboard / Create / AI



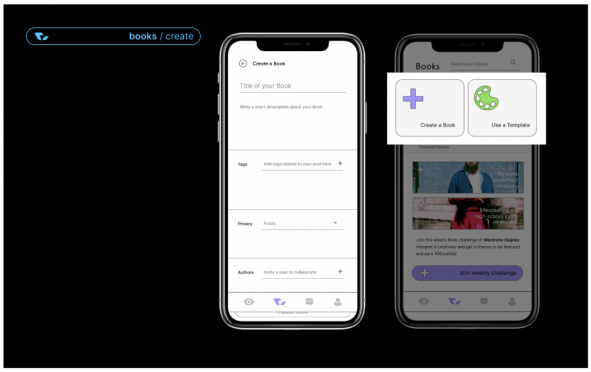
Books 1



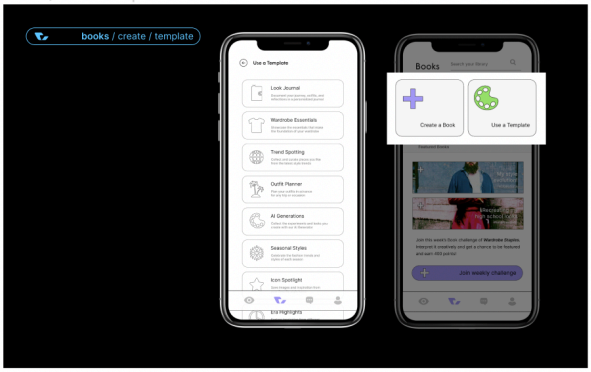
Books / Features & Challenges



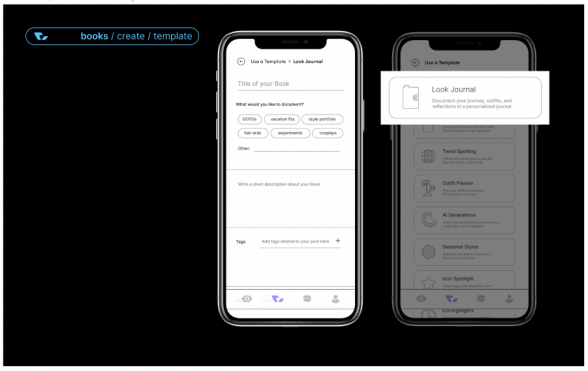
Books / Create a Book



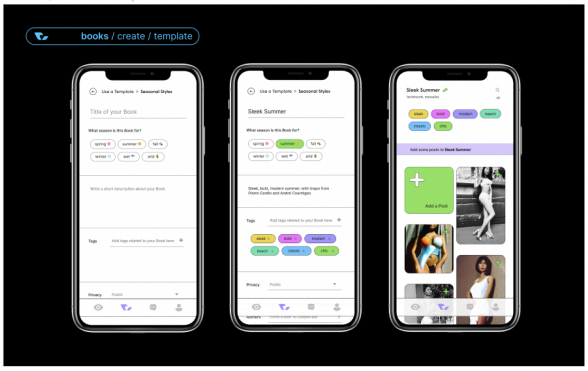
Books / Use a Template



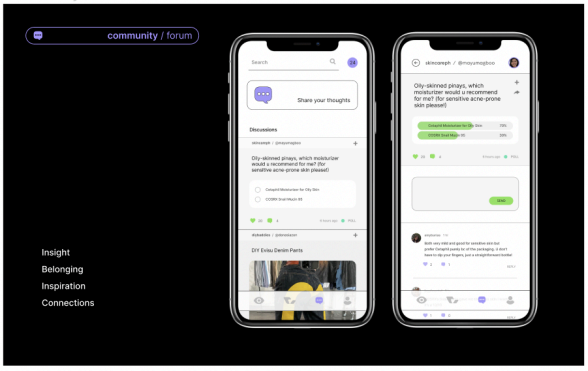
Books / Use a Template 2



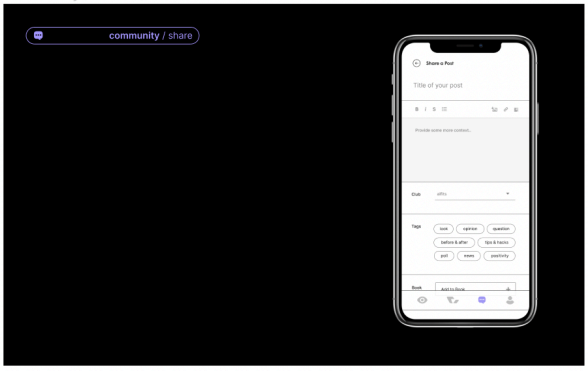
Books / Use a Template 4



Community / Forum



Community / Forum / Share



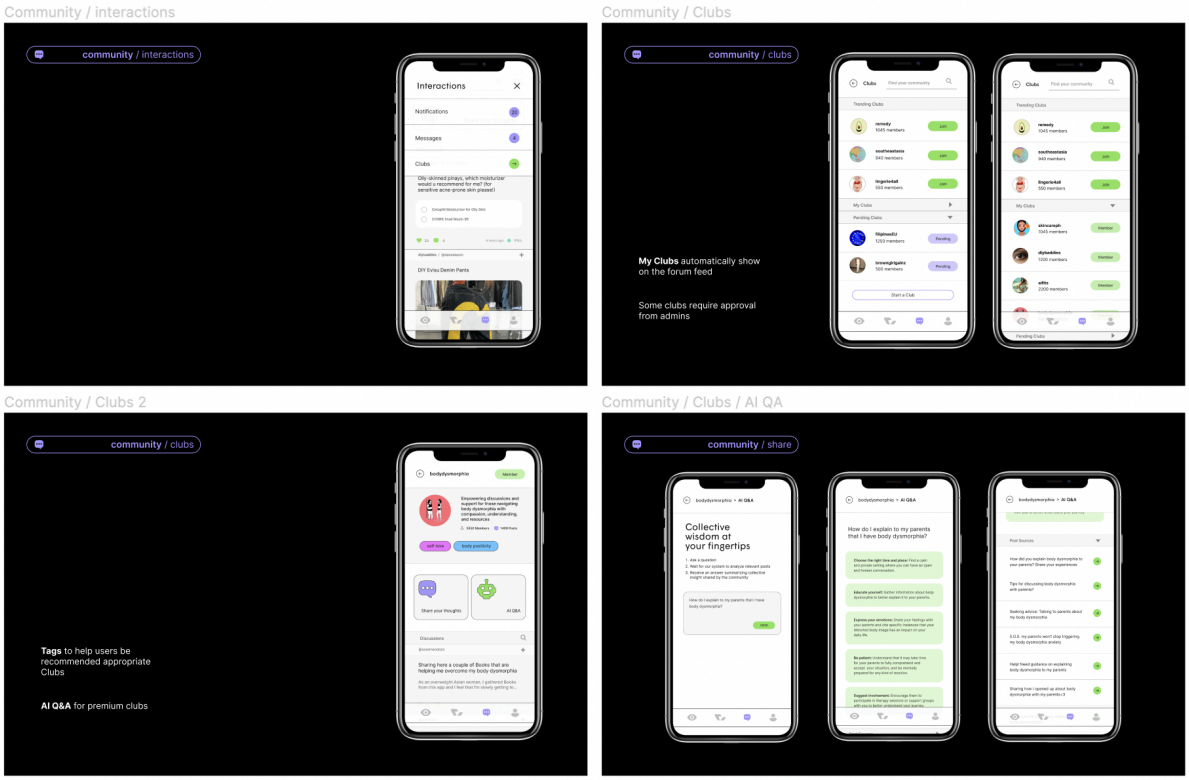


Figure iii.B.4

5. *Adviser Comments*

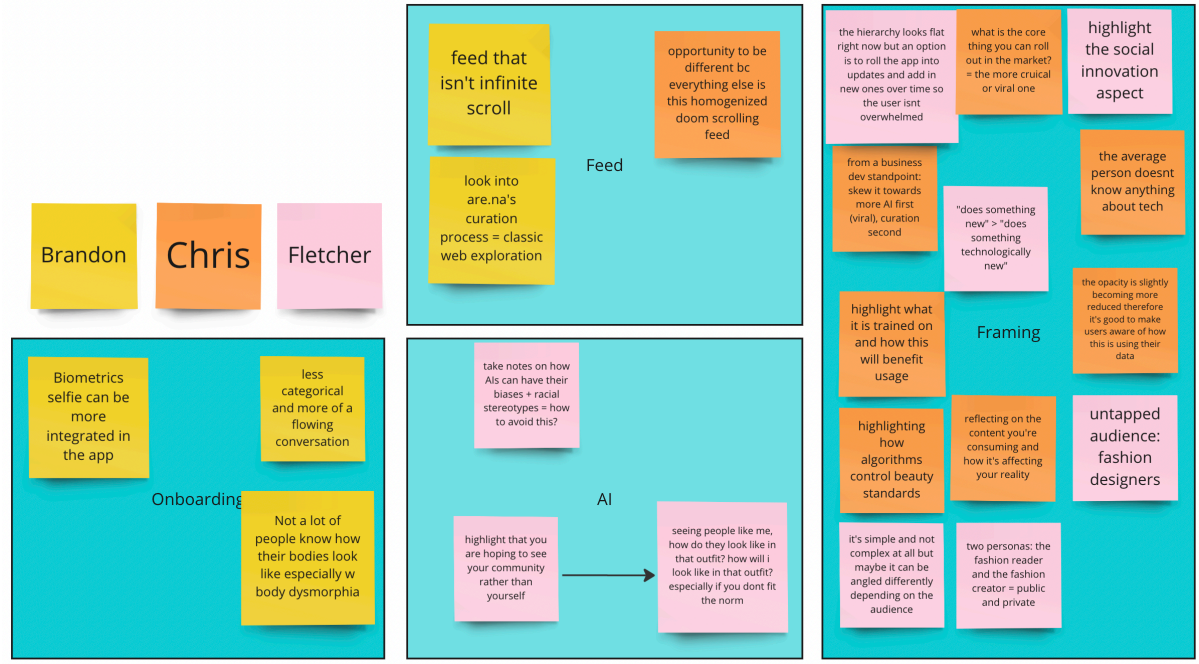


Figure iii.B.5

6. *Revision Plan*

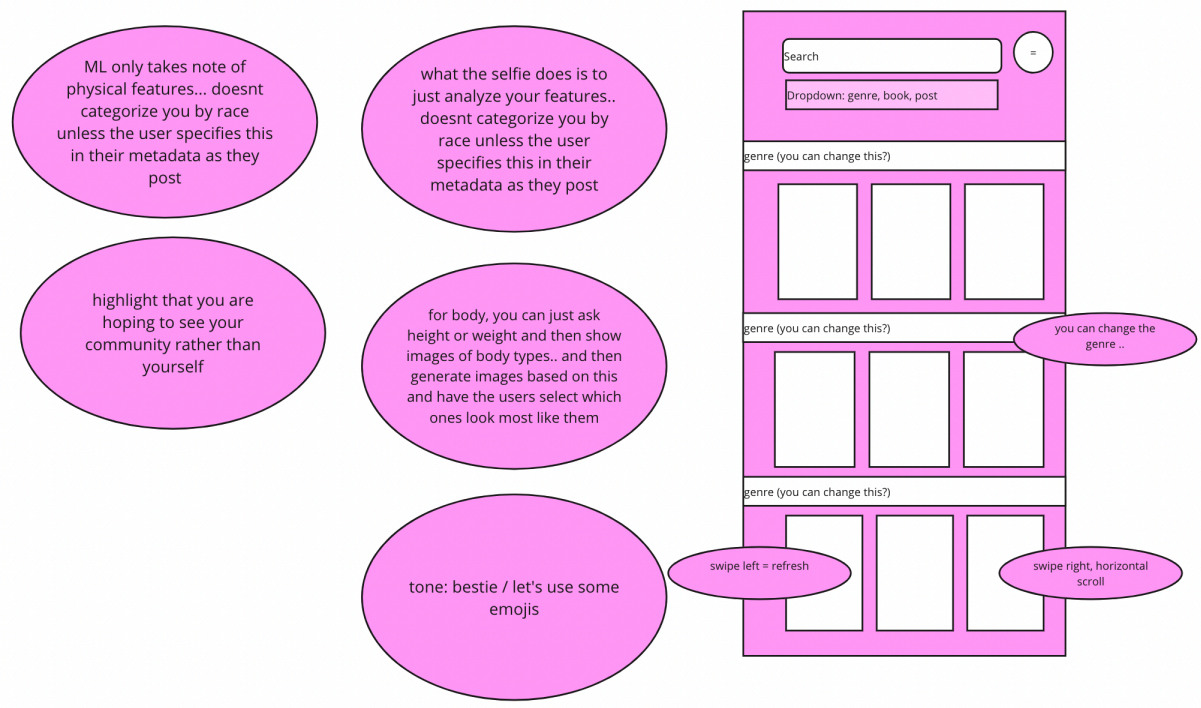


Figure iii.B.6

iv. Application Prototype

A. Opening

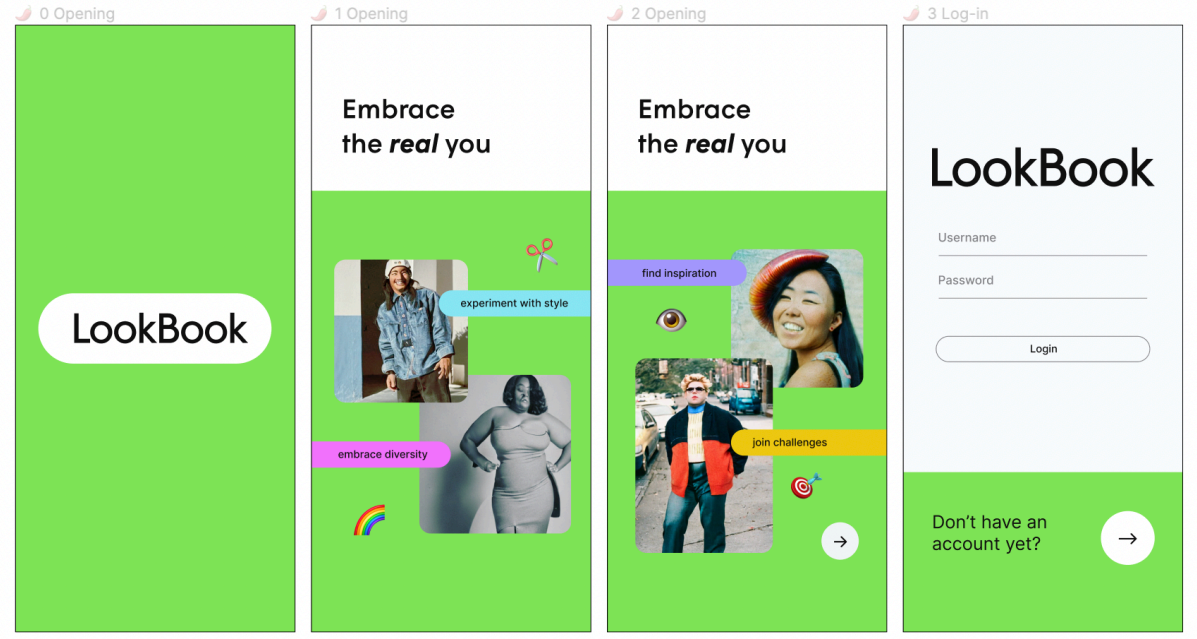


Figure iv.A

B. Onboarding

1. Identity

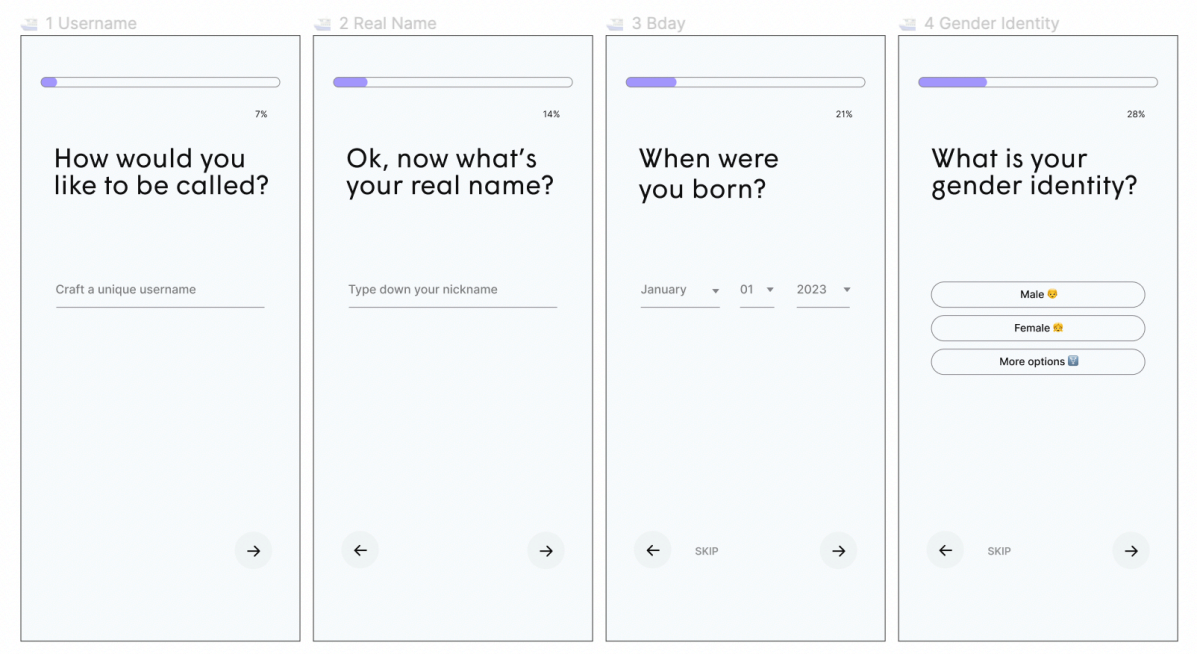


Figure iv.B.1

1.5. Identity — Answered

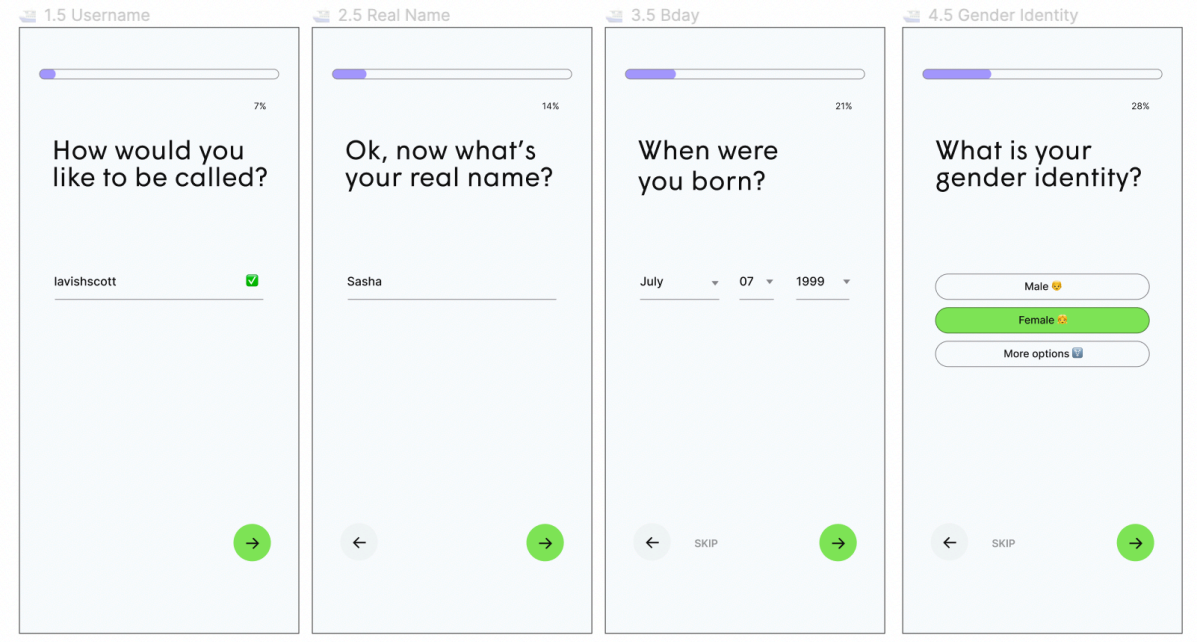


Figure iv.B.1.5

2. Preferences

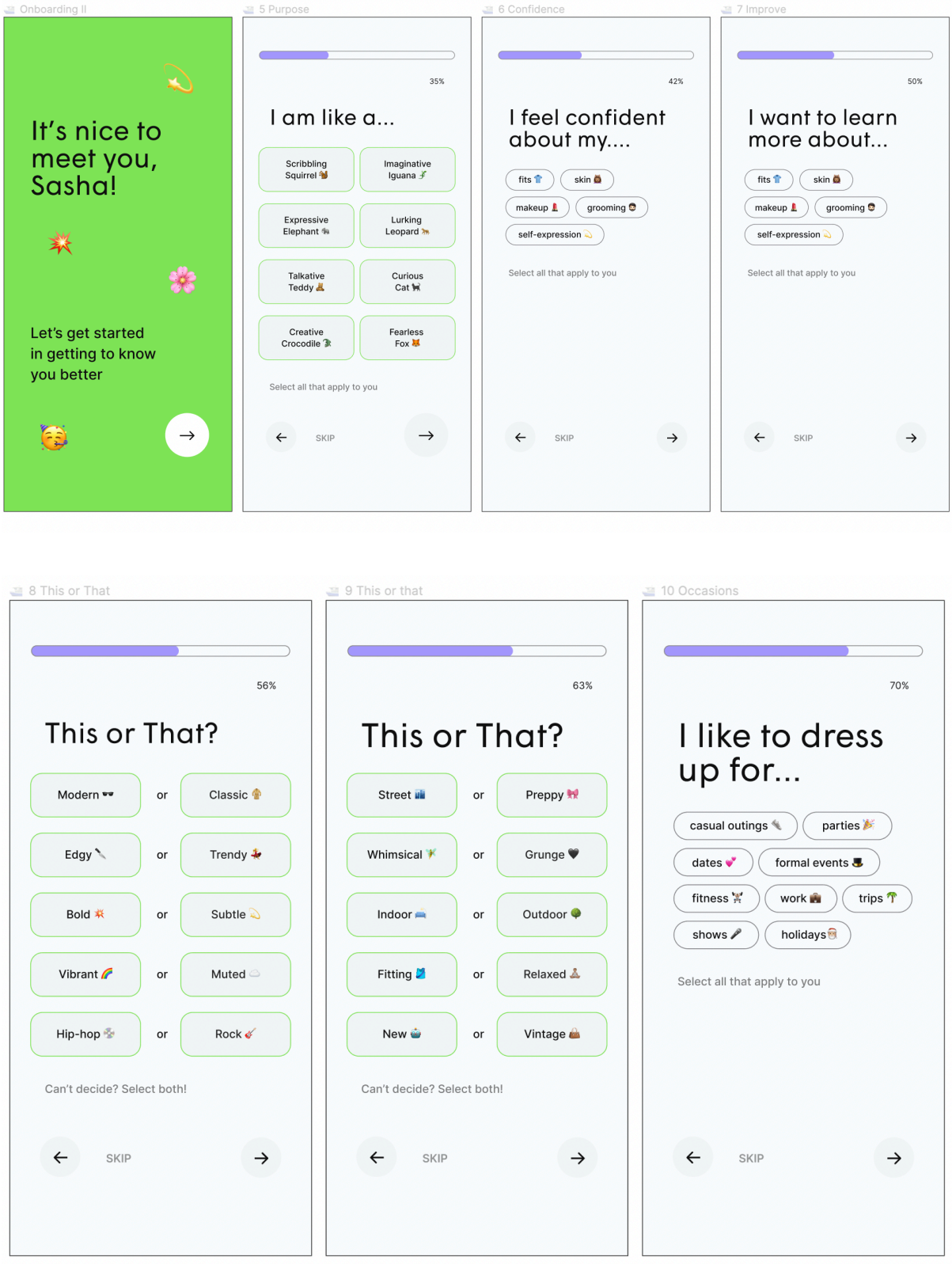


Figure iv.B.2

2.5. Preferences — Answered

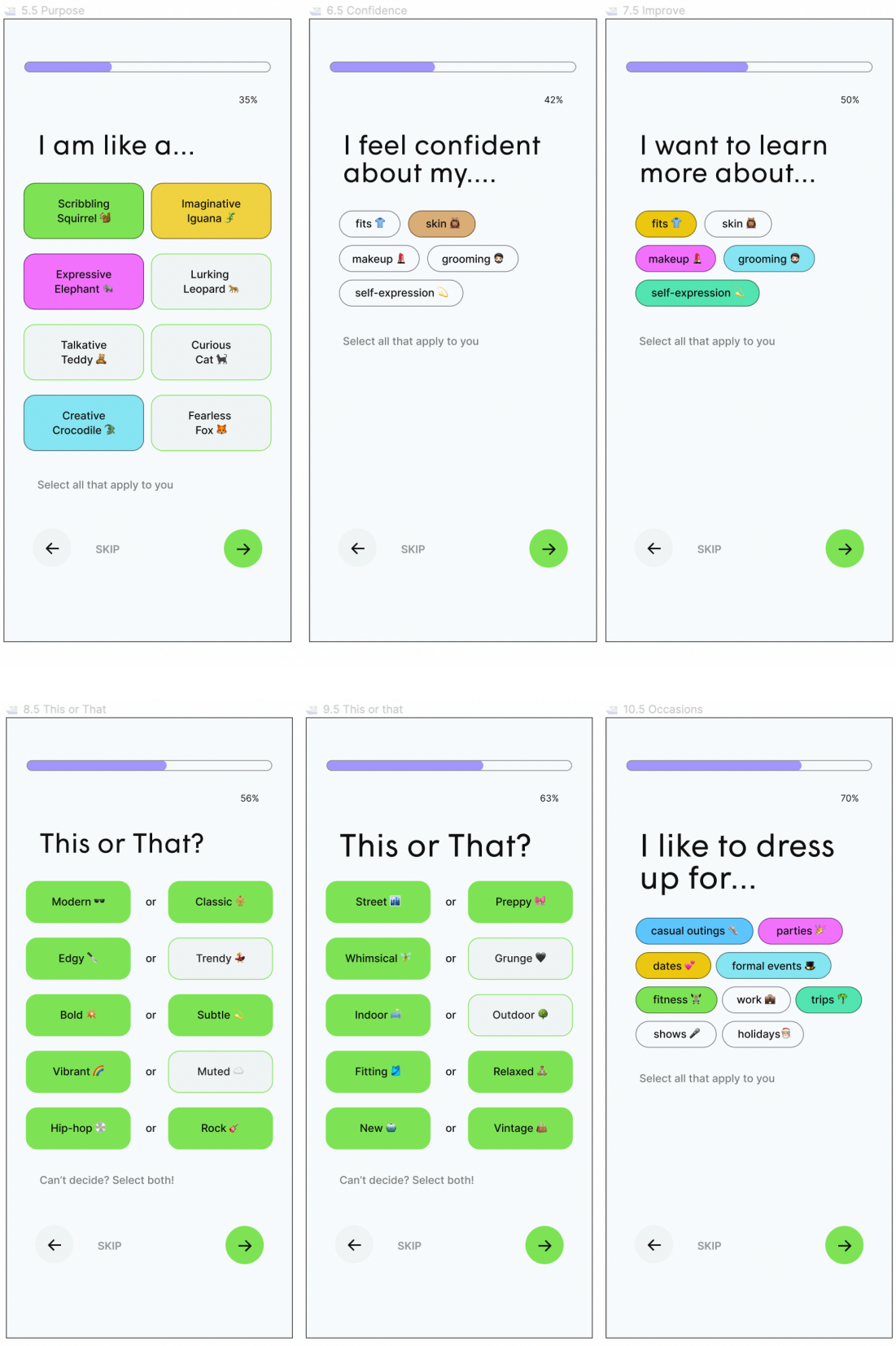


Figure iv.B.2.5

3. Representation

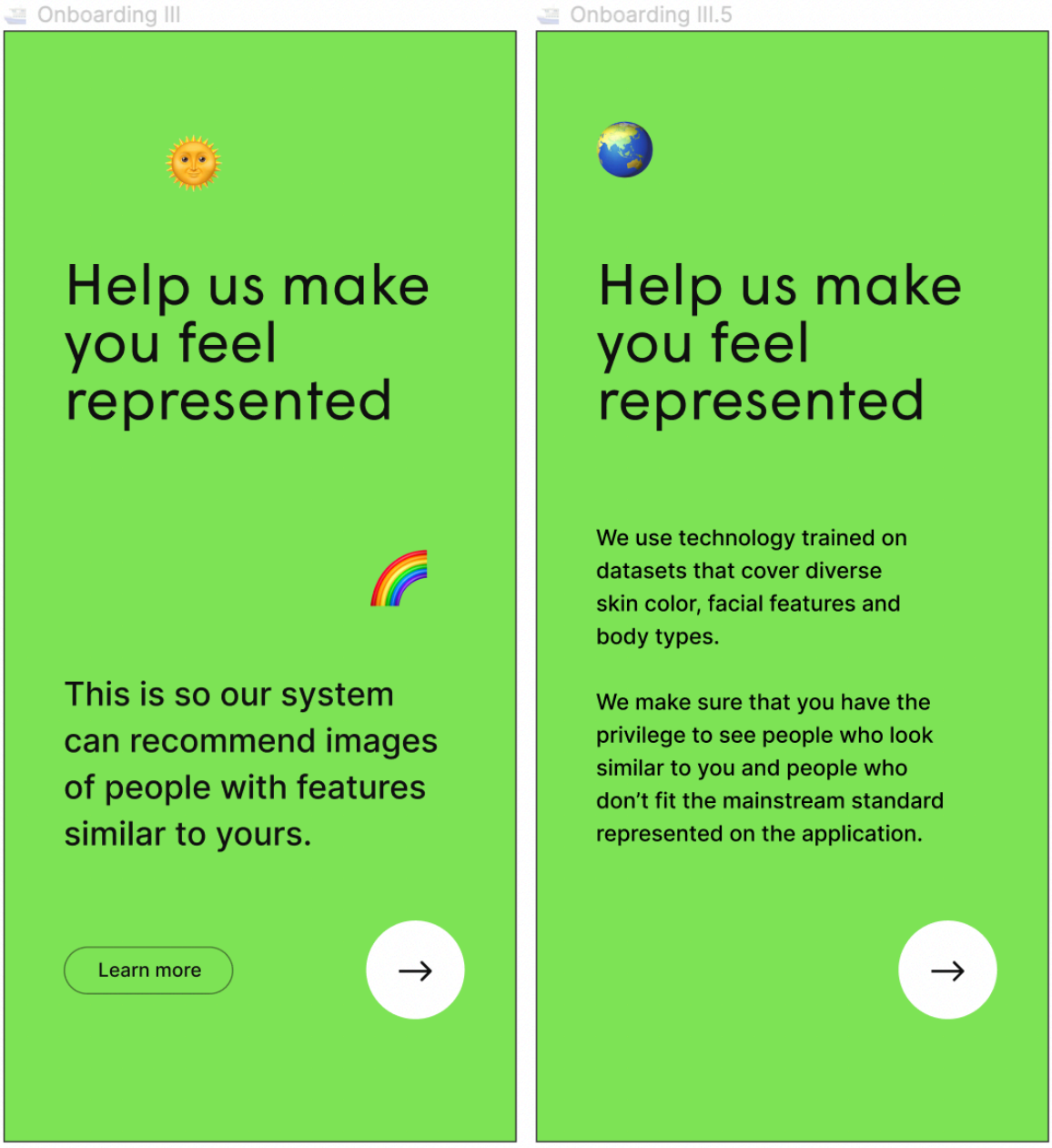


Figure iv.B.3.1

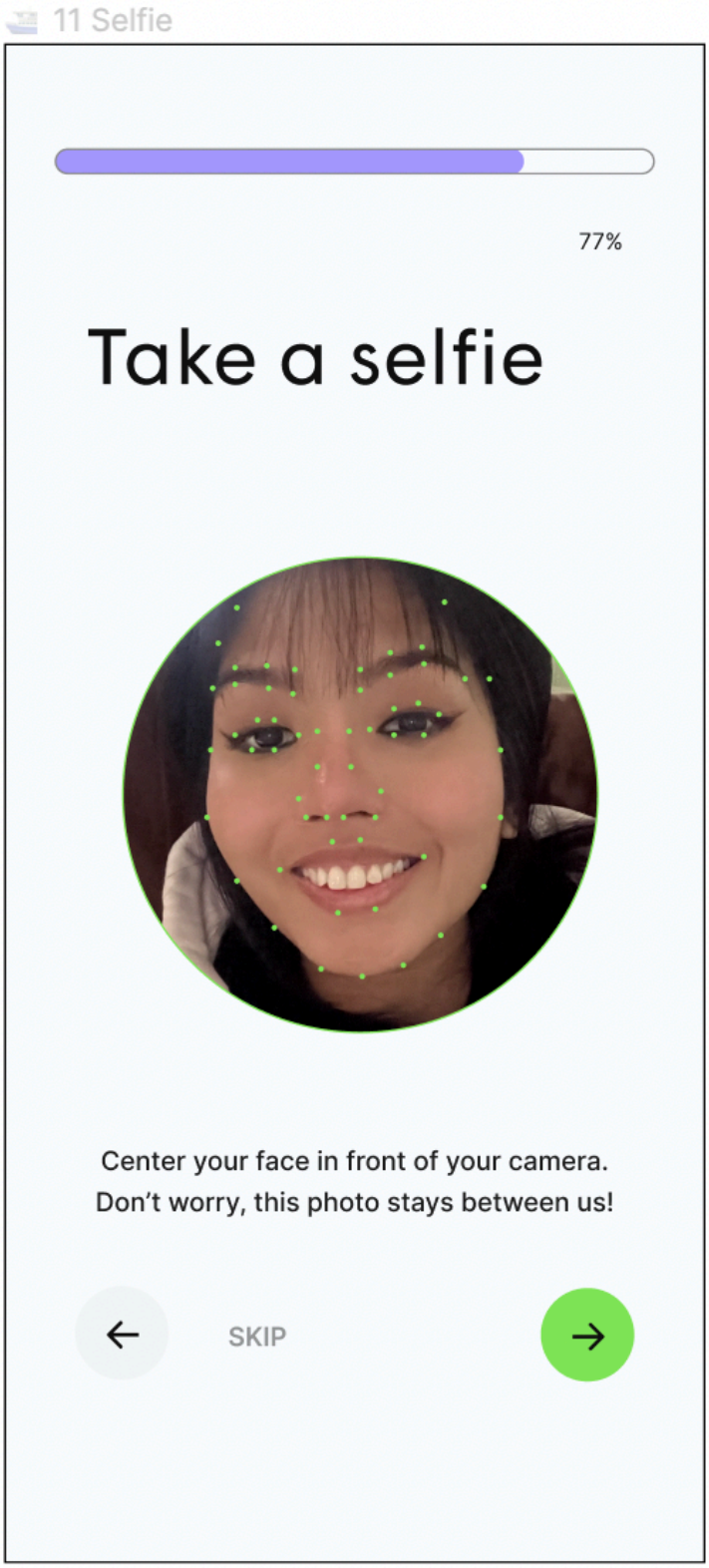


Figure iv.B.3.2

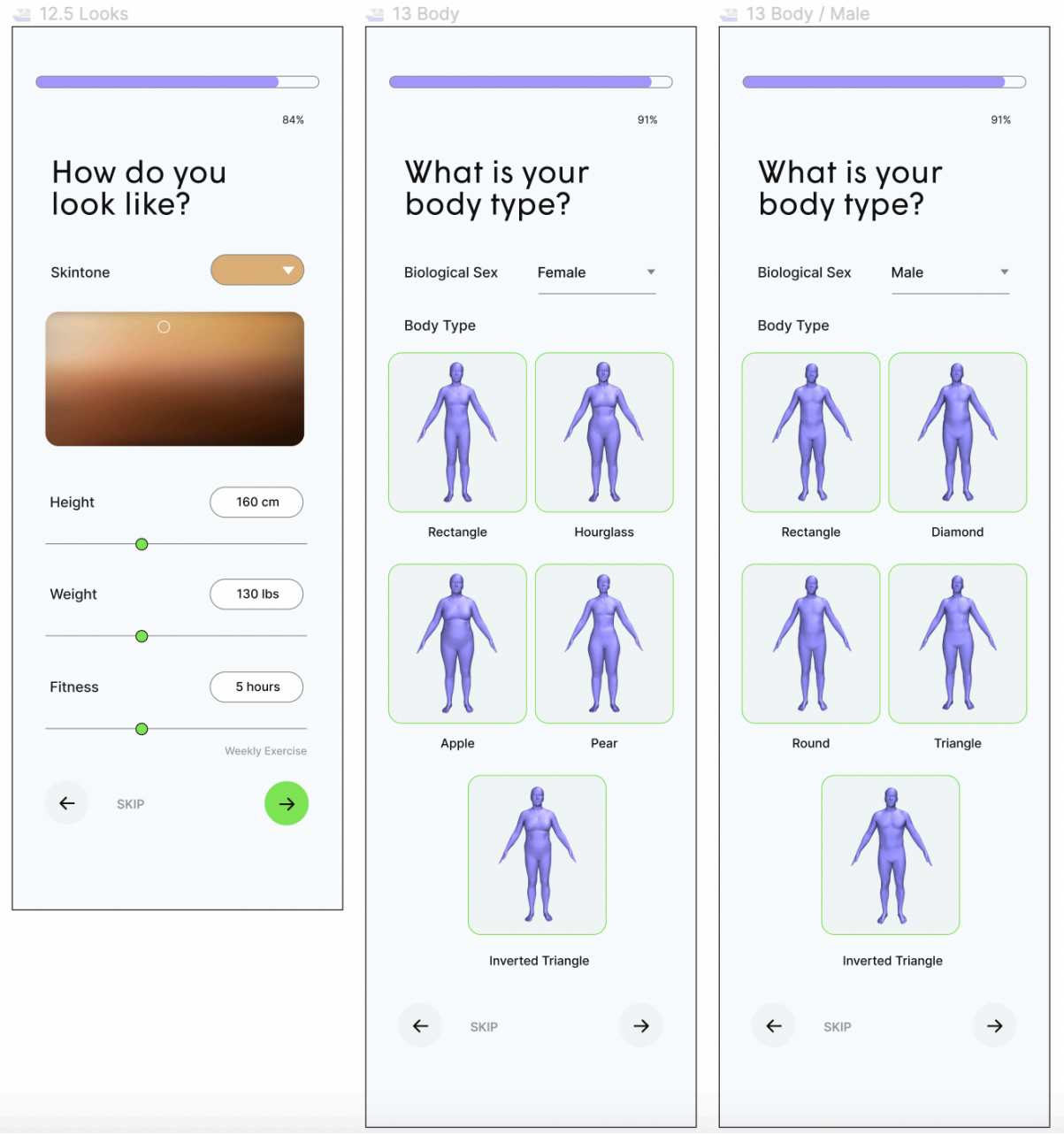


Figure iv.B.3.3

4. Social Media

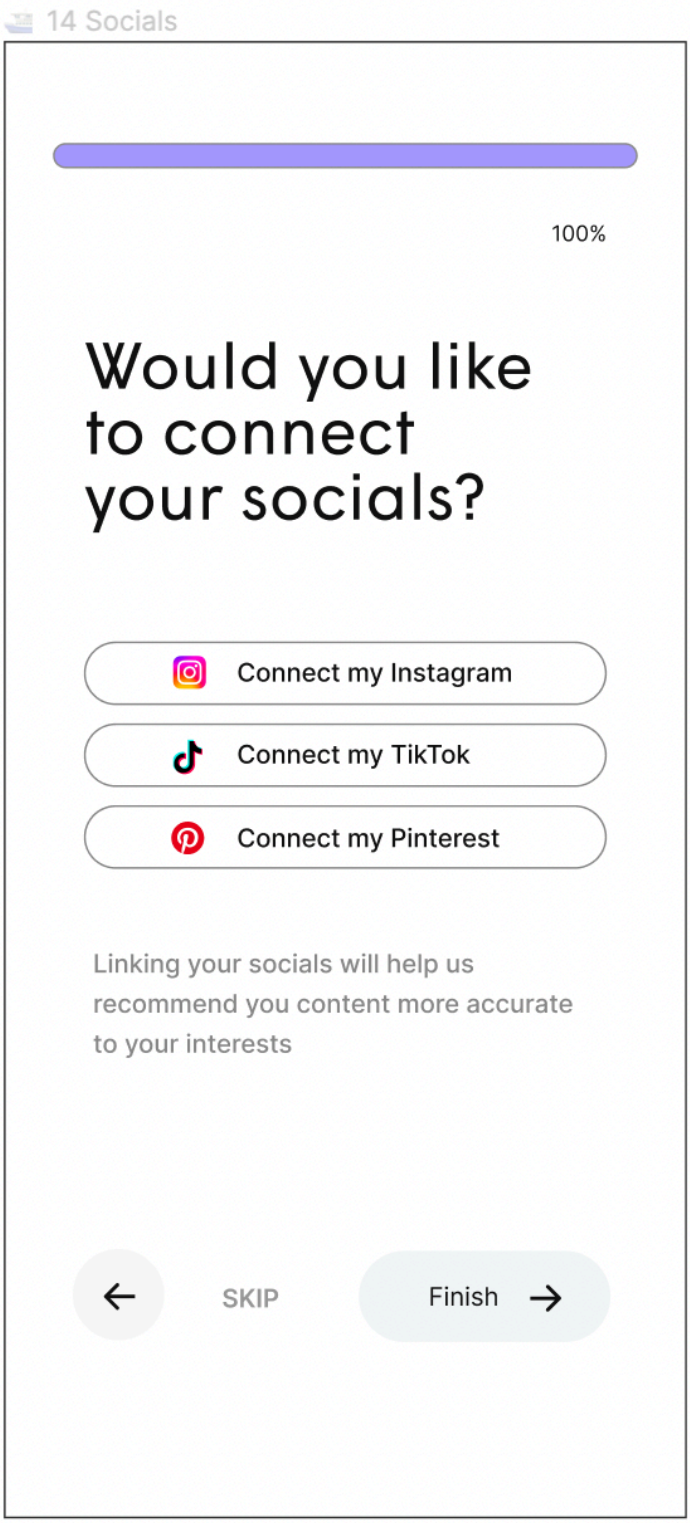


Figure iv.B.4

C. Dash

1. Dash / Home

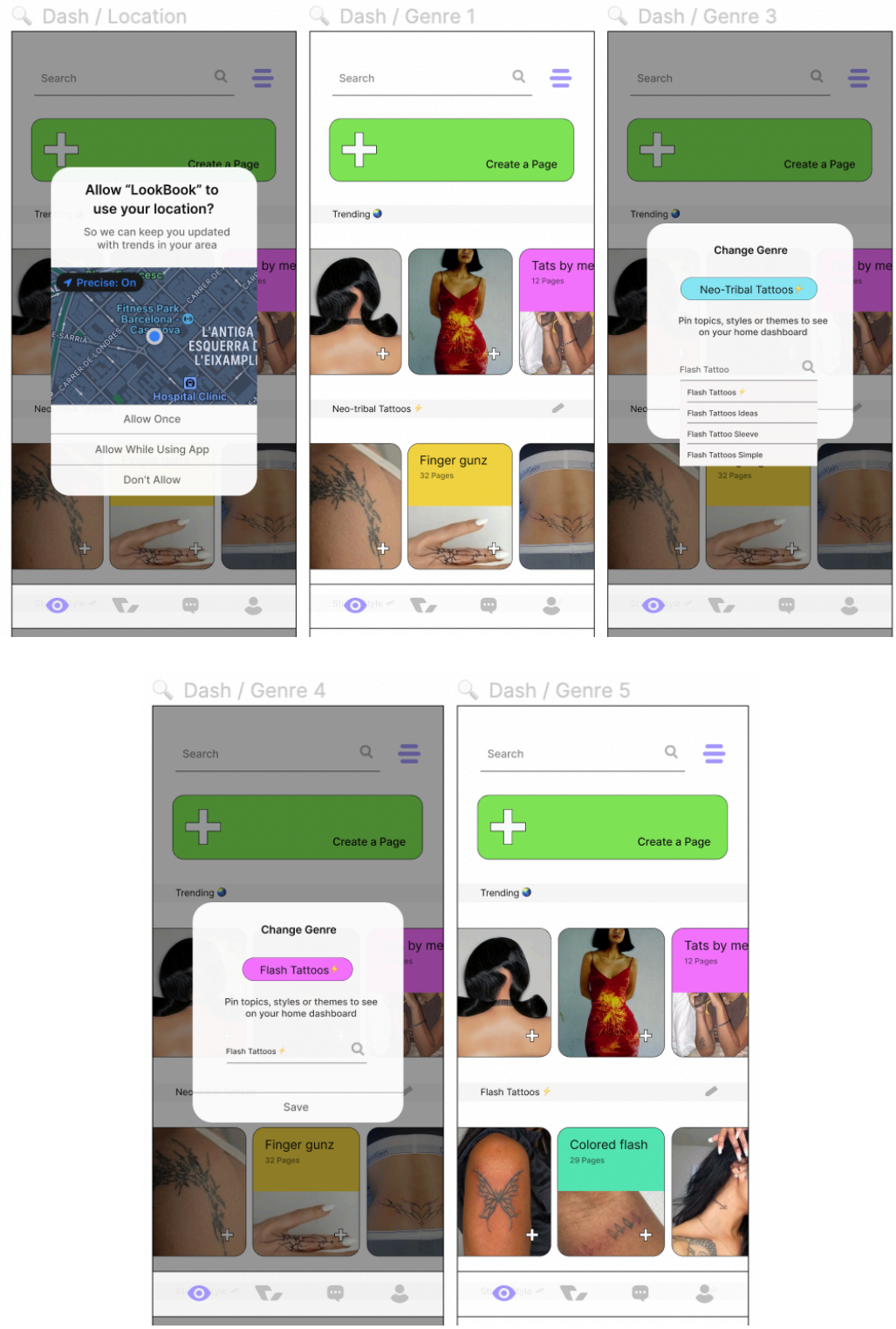


Figure iv.C.1

2. Dash / Search

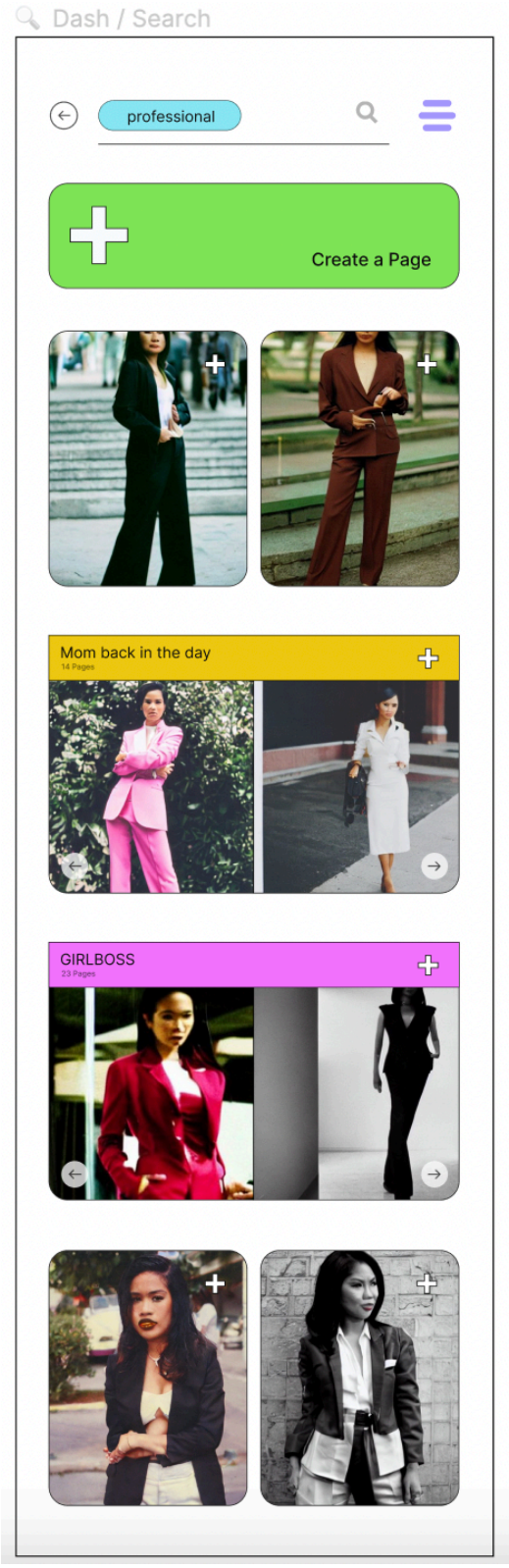


Figure iv.C.2

3. Dash / View A Page

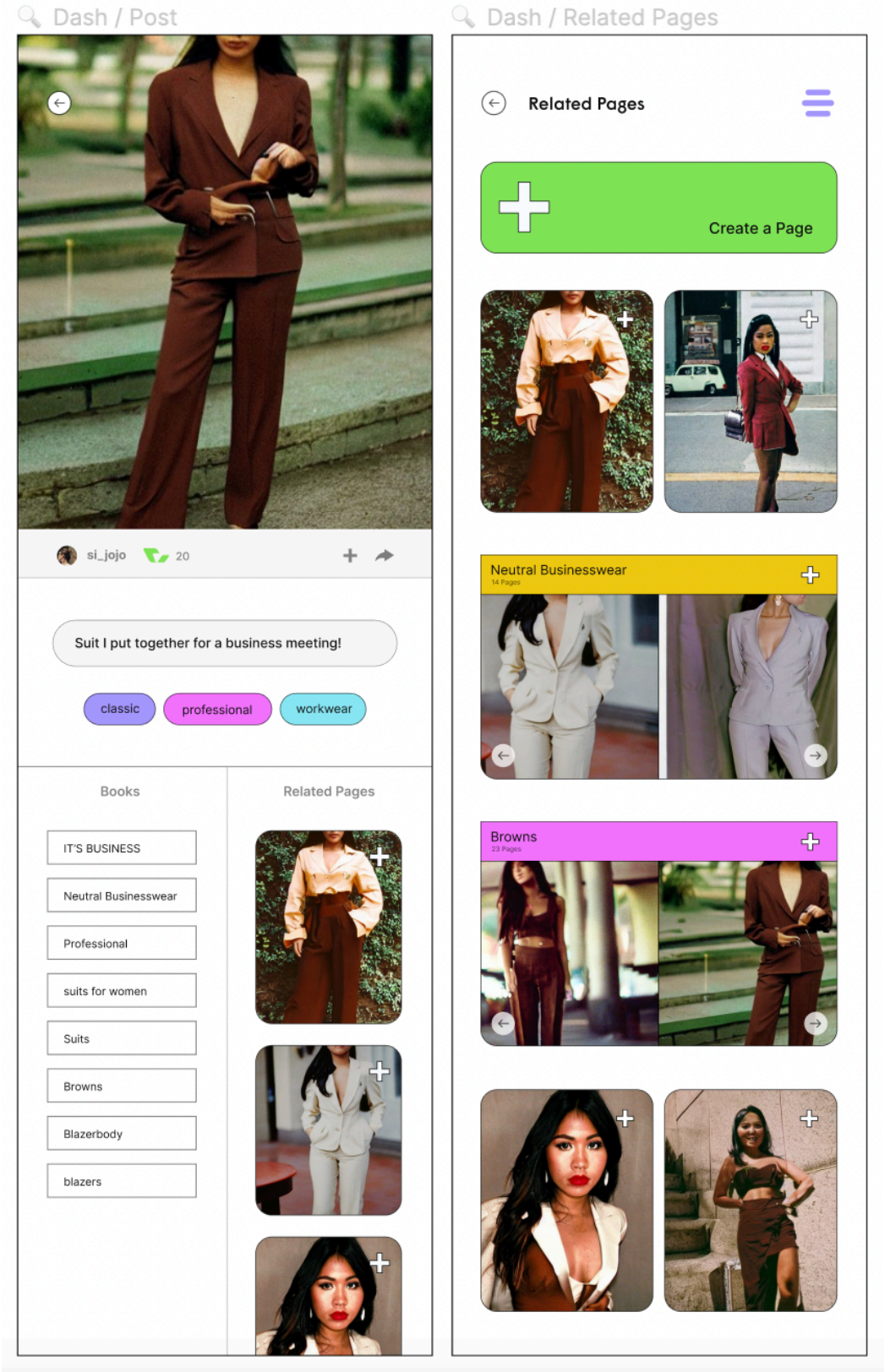


Figure iv.C.3

4. Dash / Filter

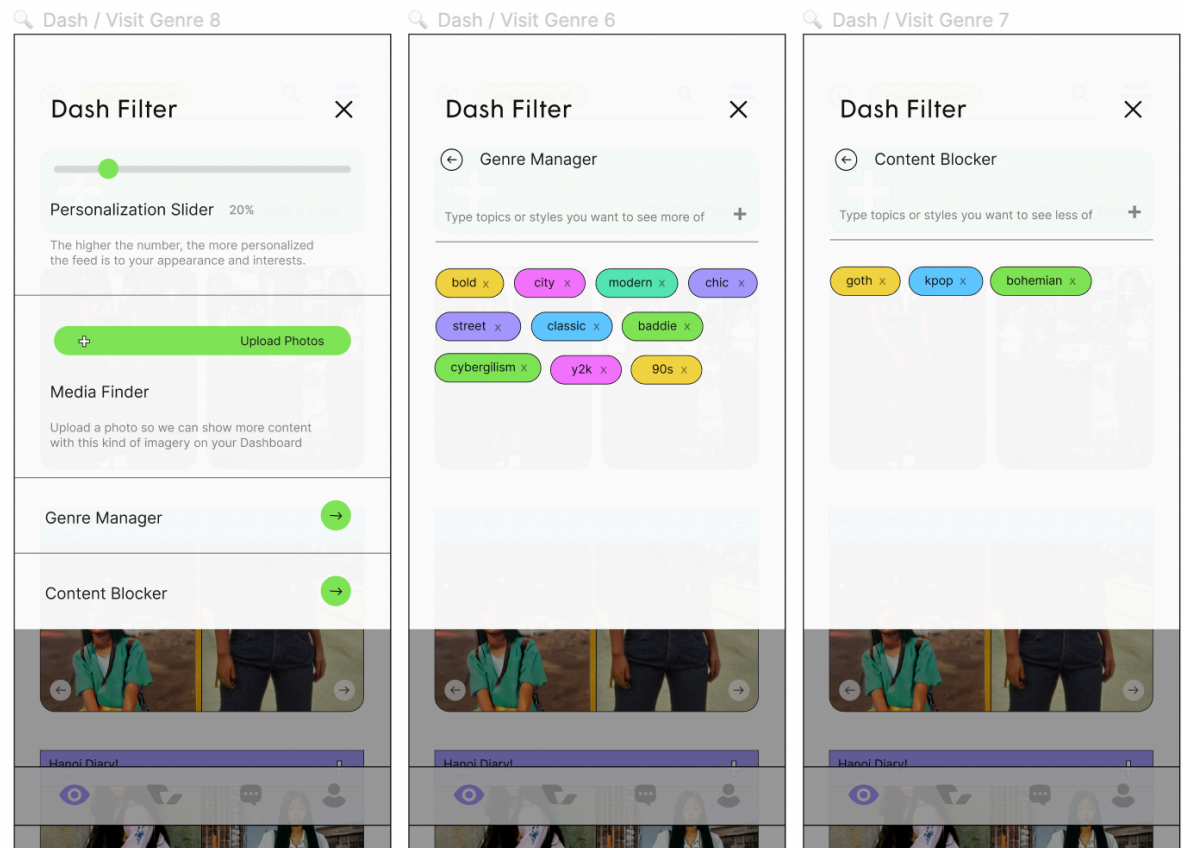


Figure iv.C.4

4.5 Dash / Filter — Personalization Slider

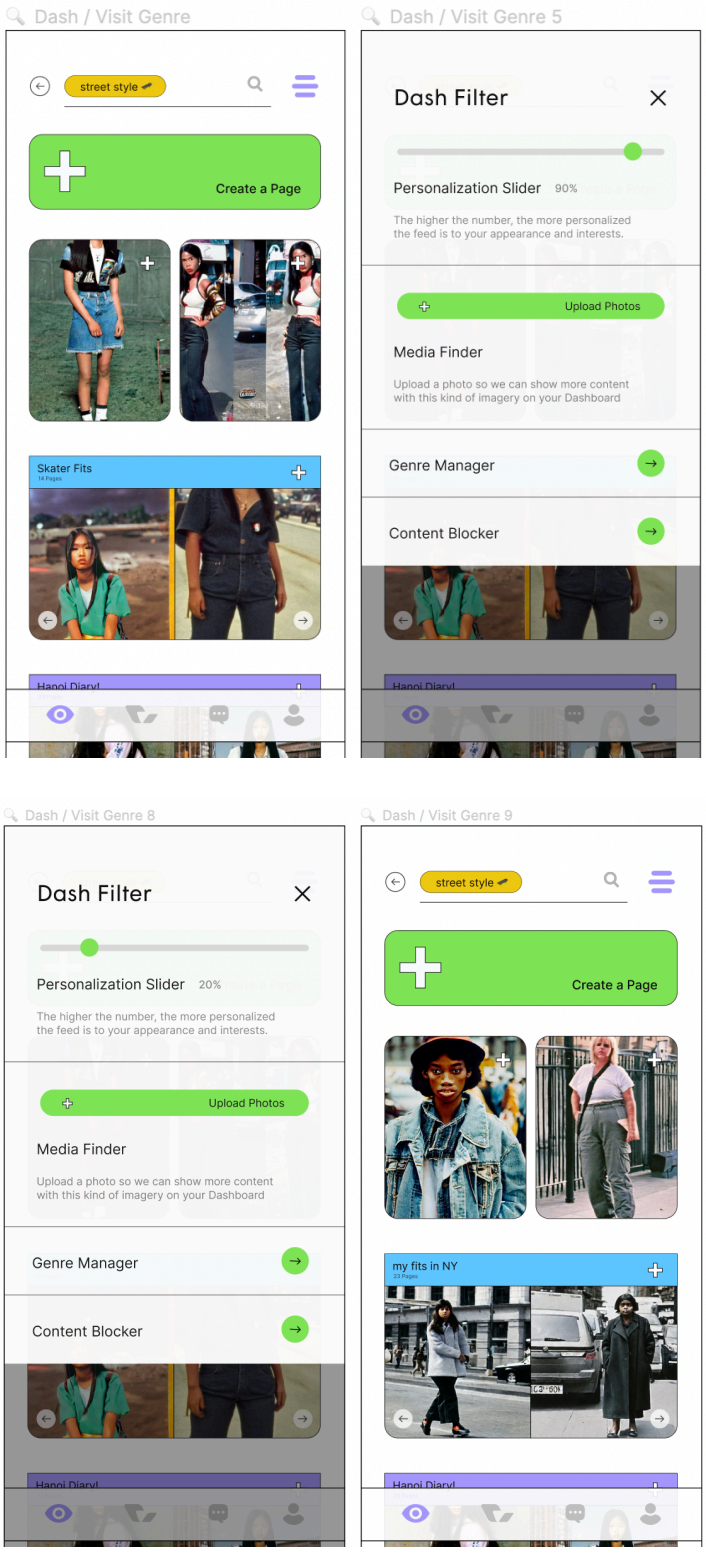


Figure iv.C.4.5

5. Dash / Create a Page

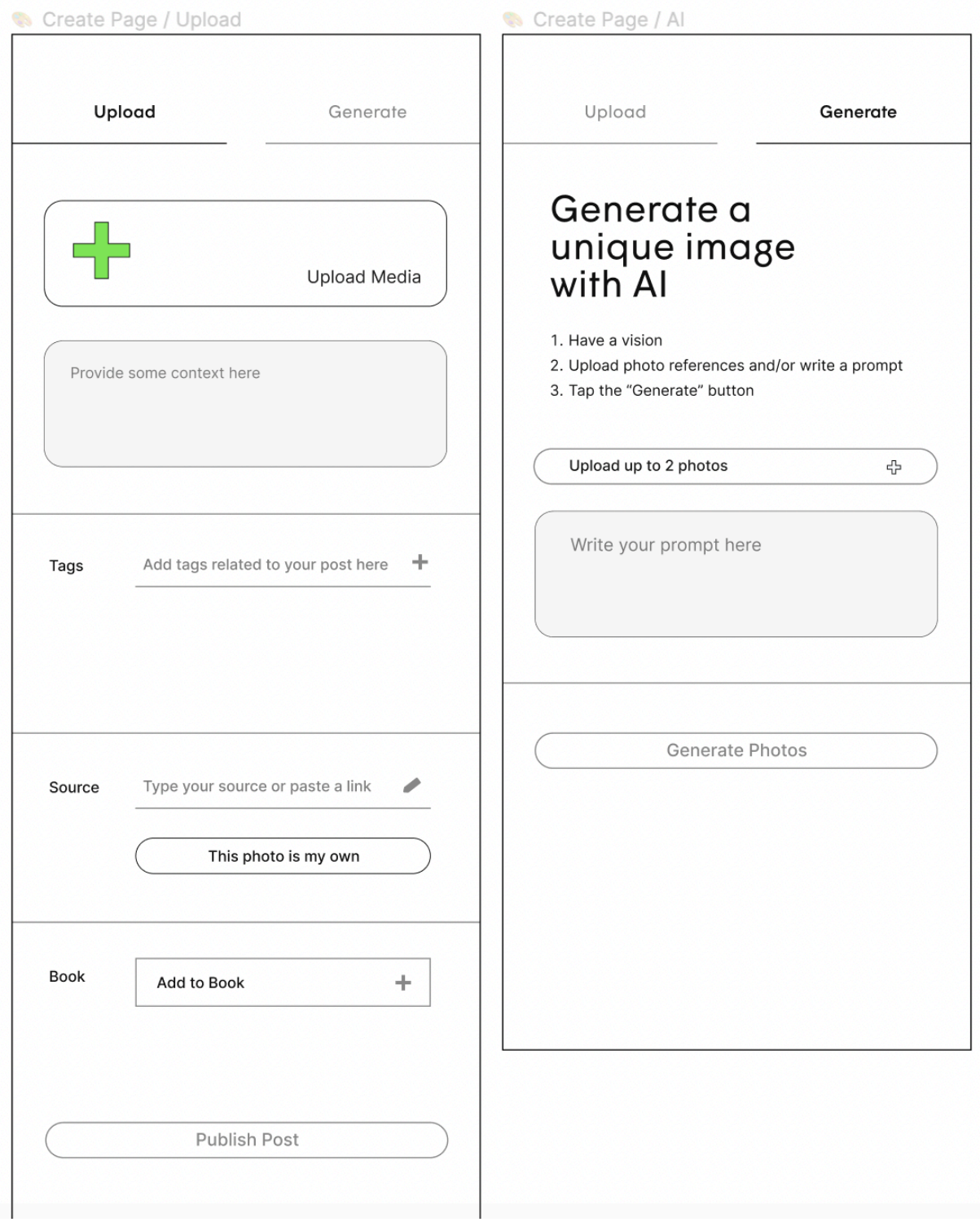


Figure iv.C.5

5.5 Dash / Create a Page / Generate

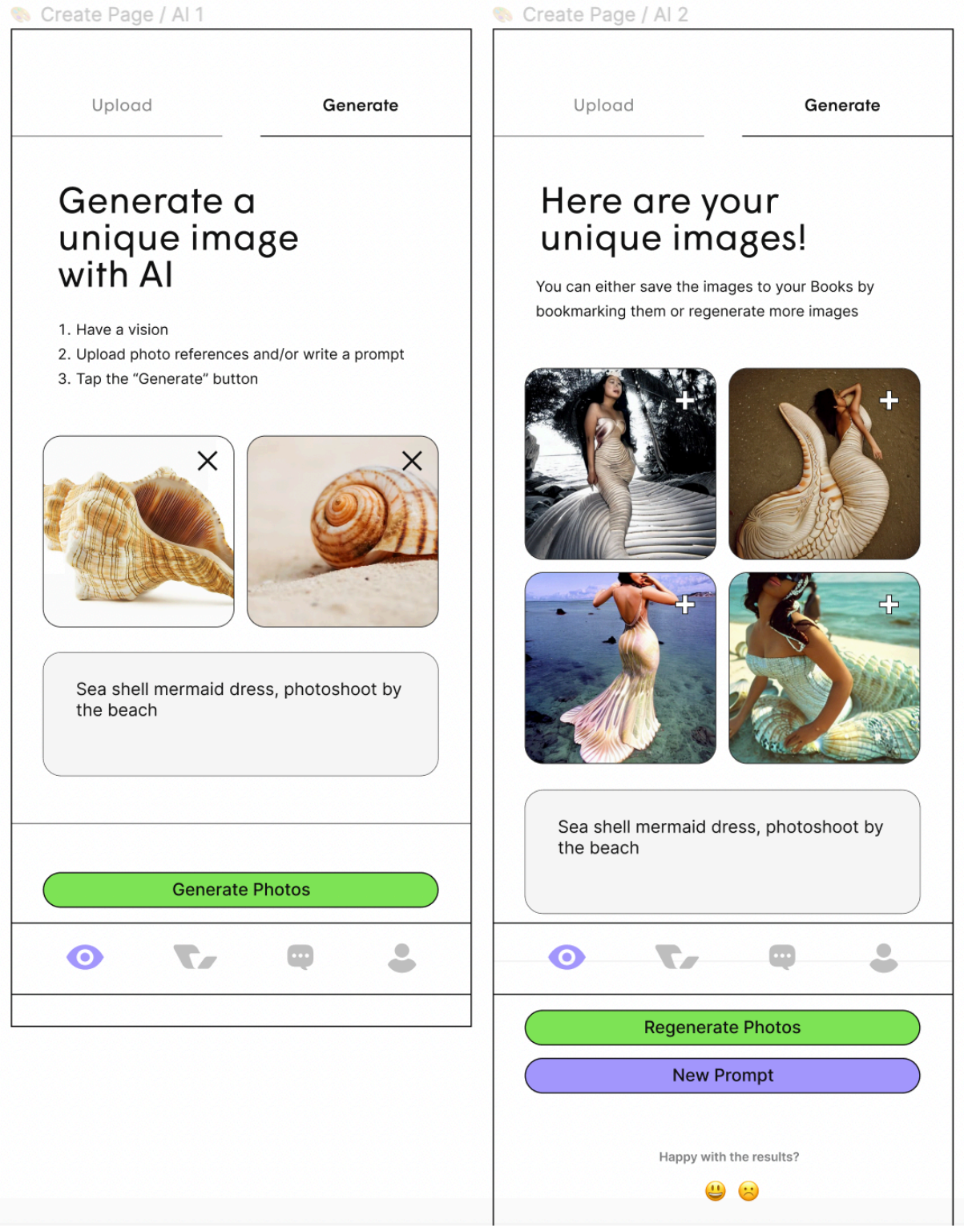


Figure iv.C.5.5

D. Books

1. Books

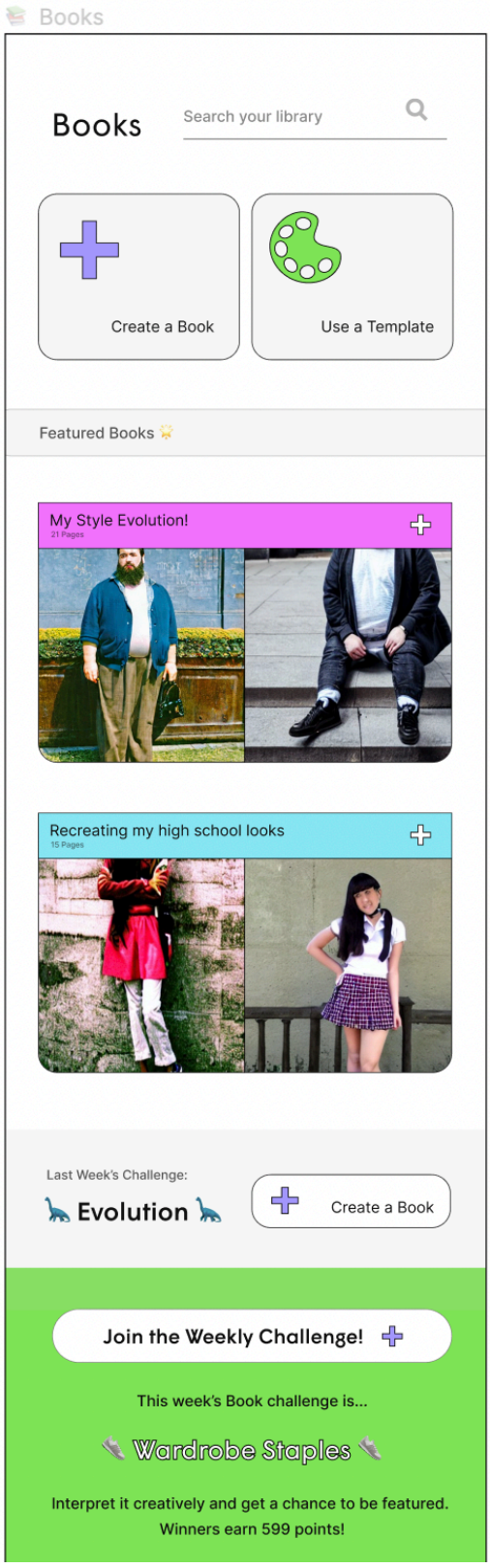


Figure iv.D.1

2. Books / Create a Book

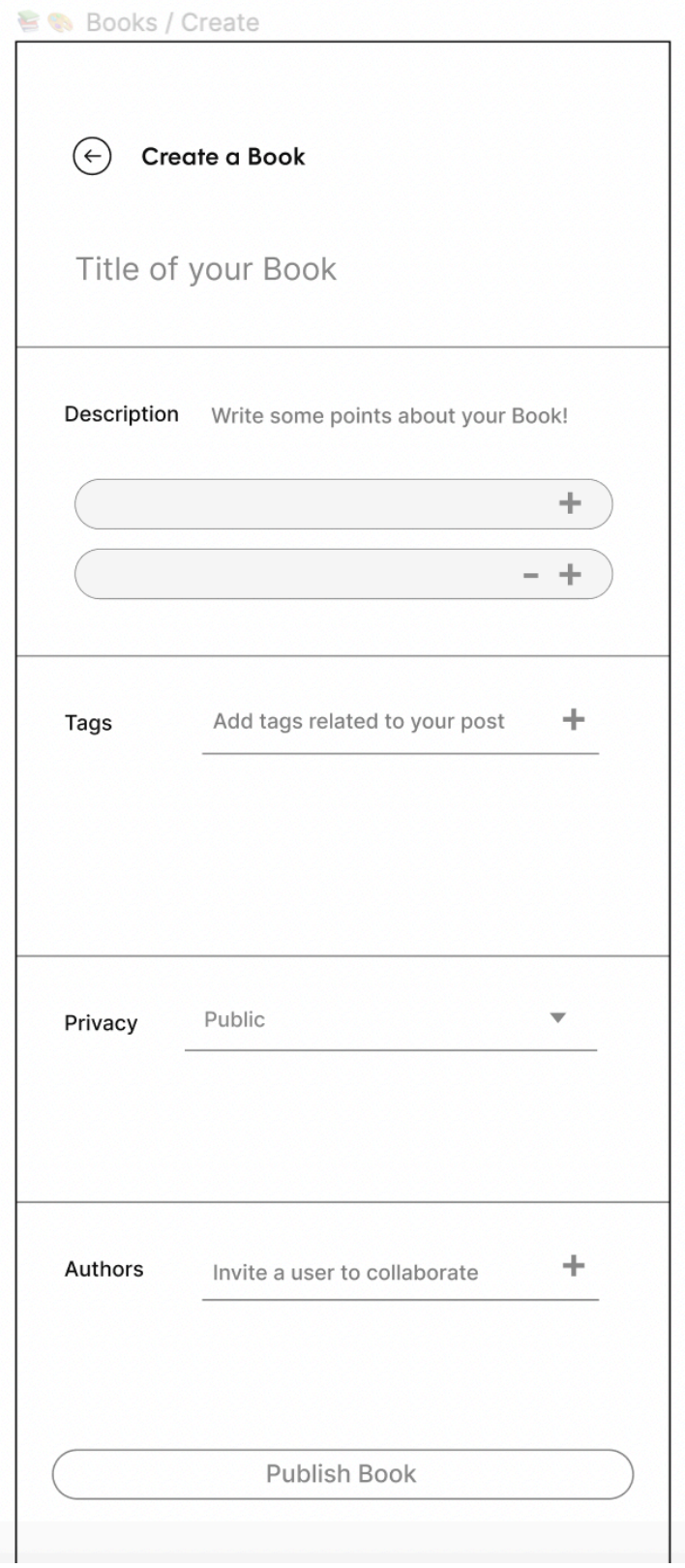


Figure iv.D.2

3. Books / Use a Template

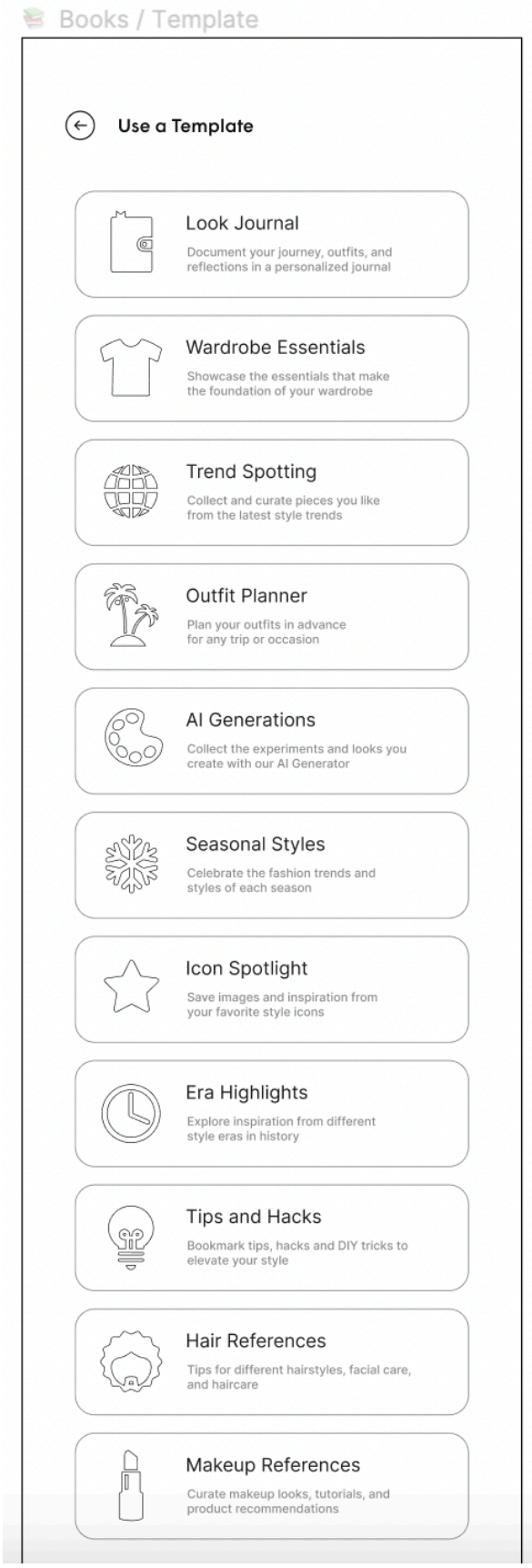


Figure iv.D.3

3.5 Books / Sample Templates

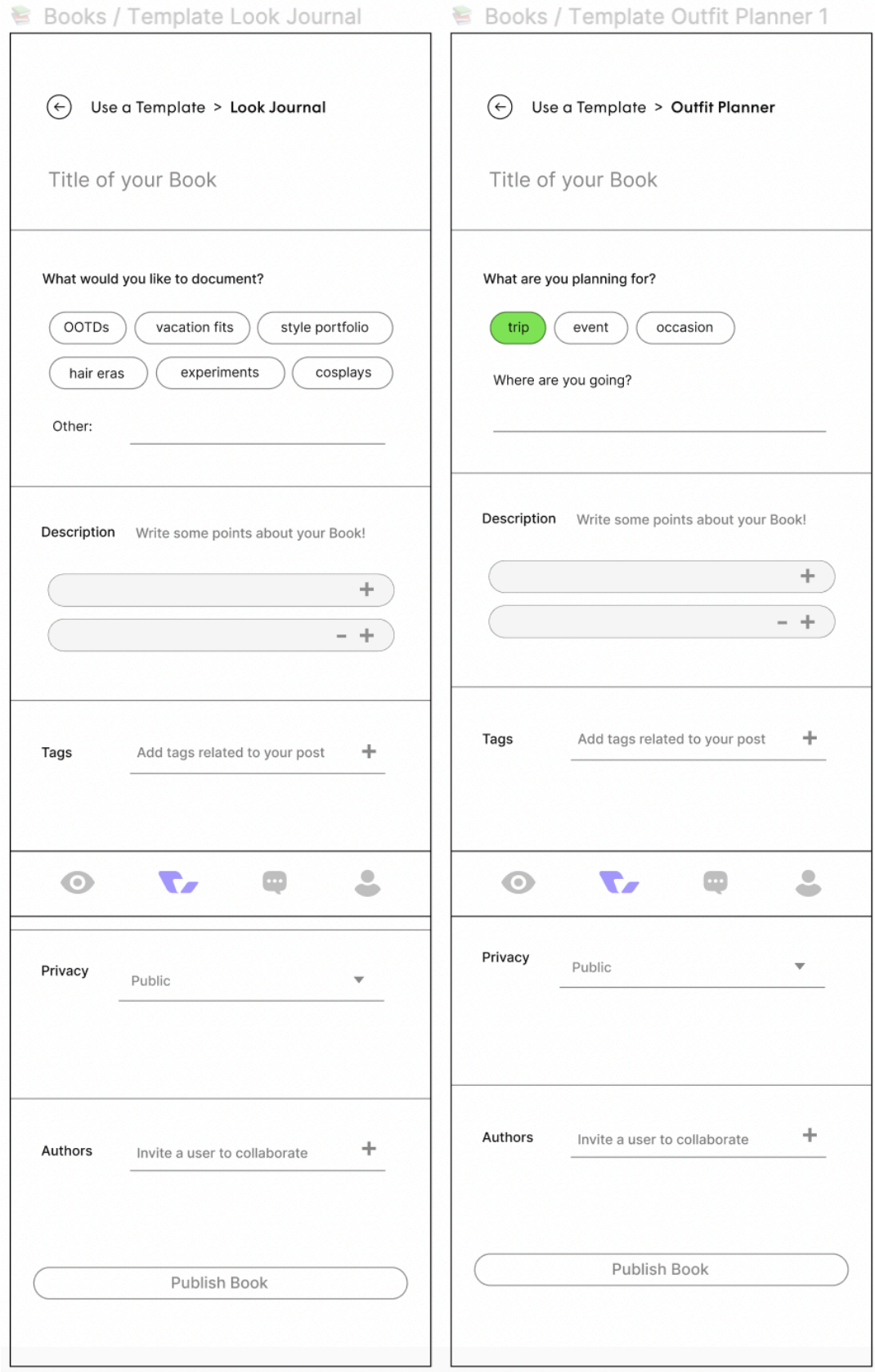


Figure iv.D.3.5

4. Books / Sample Template — Answered

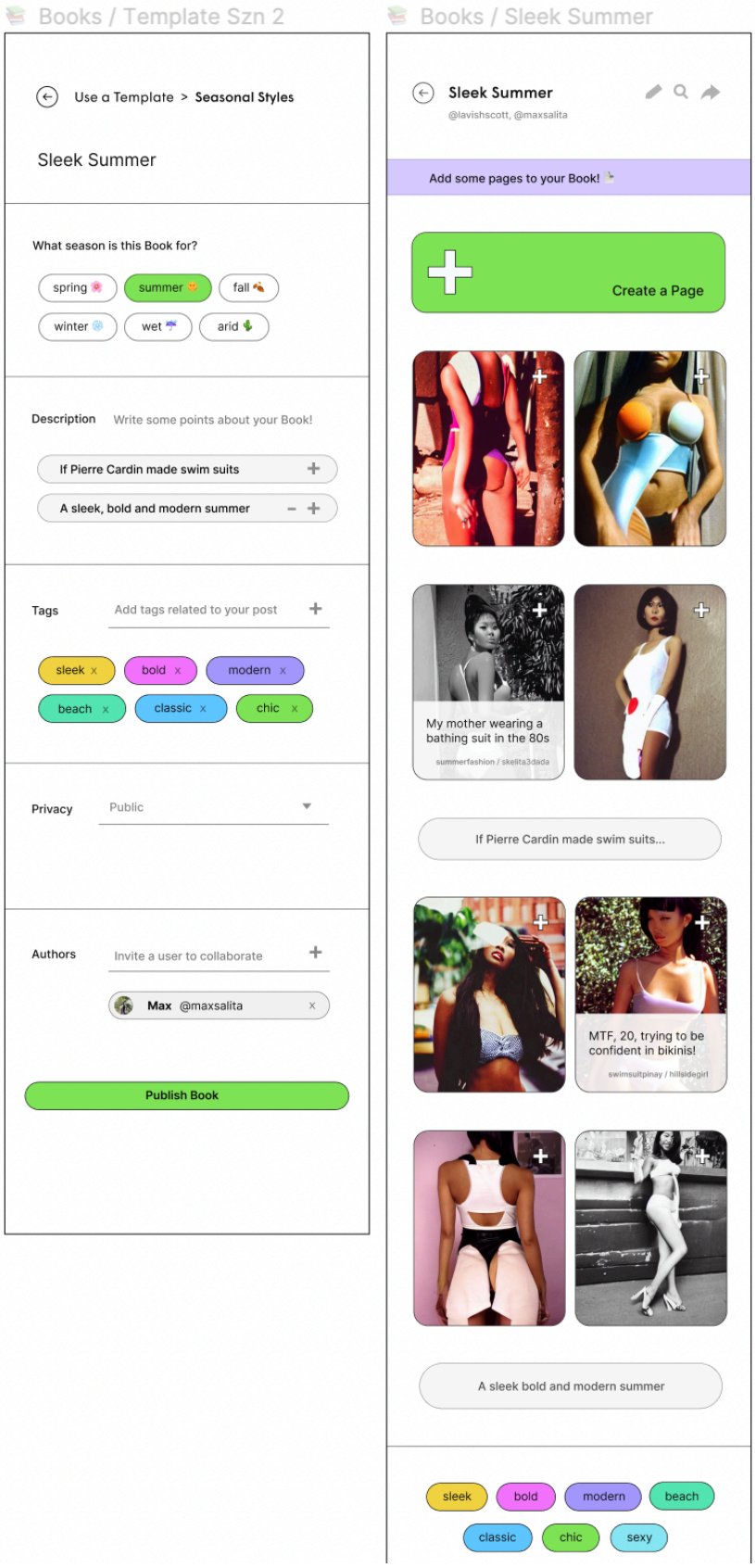


Figure iv.D.4

5. Books / Add Page to Book

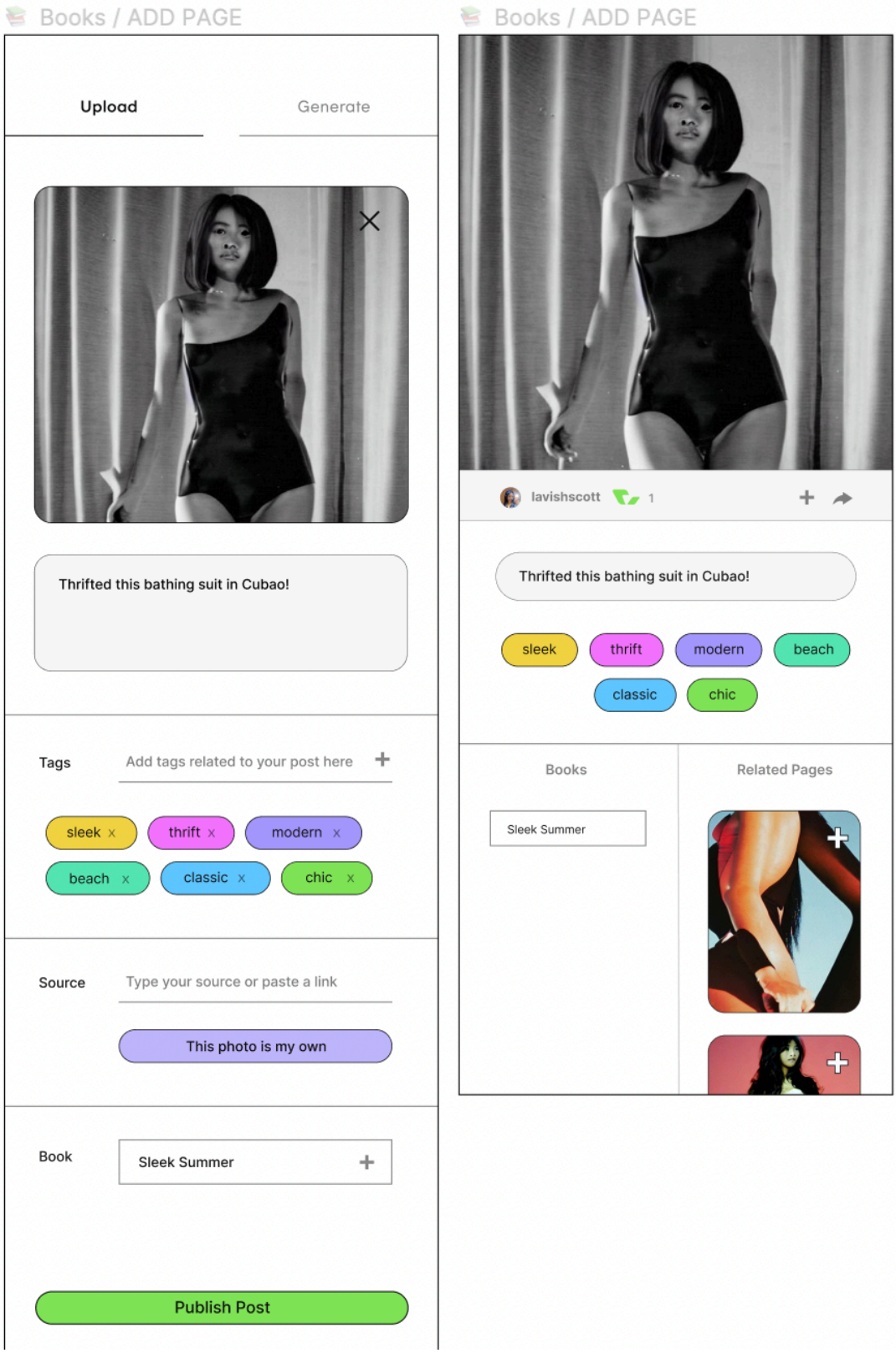


Figure iv.D.5

E. Community

1. Community / Feed

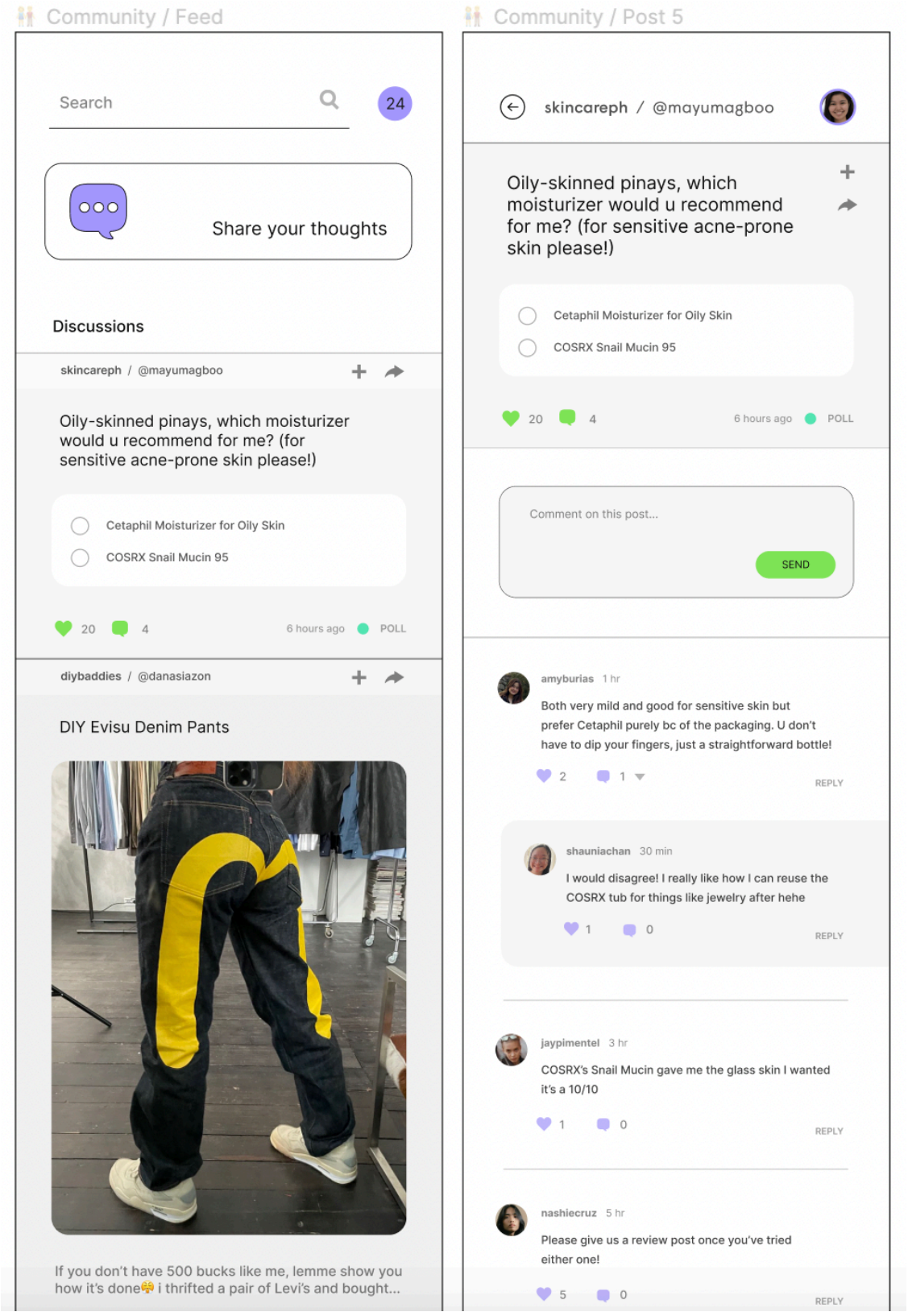


Figure iv.E.1

1.5. Community / Interactions

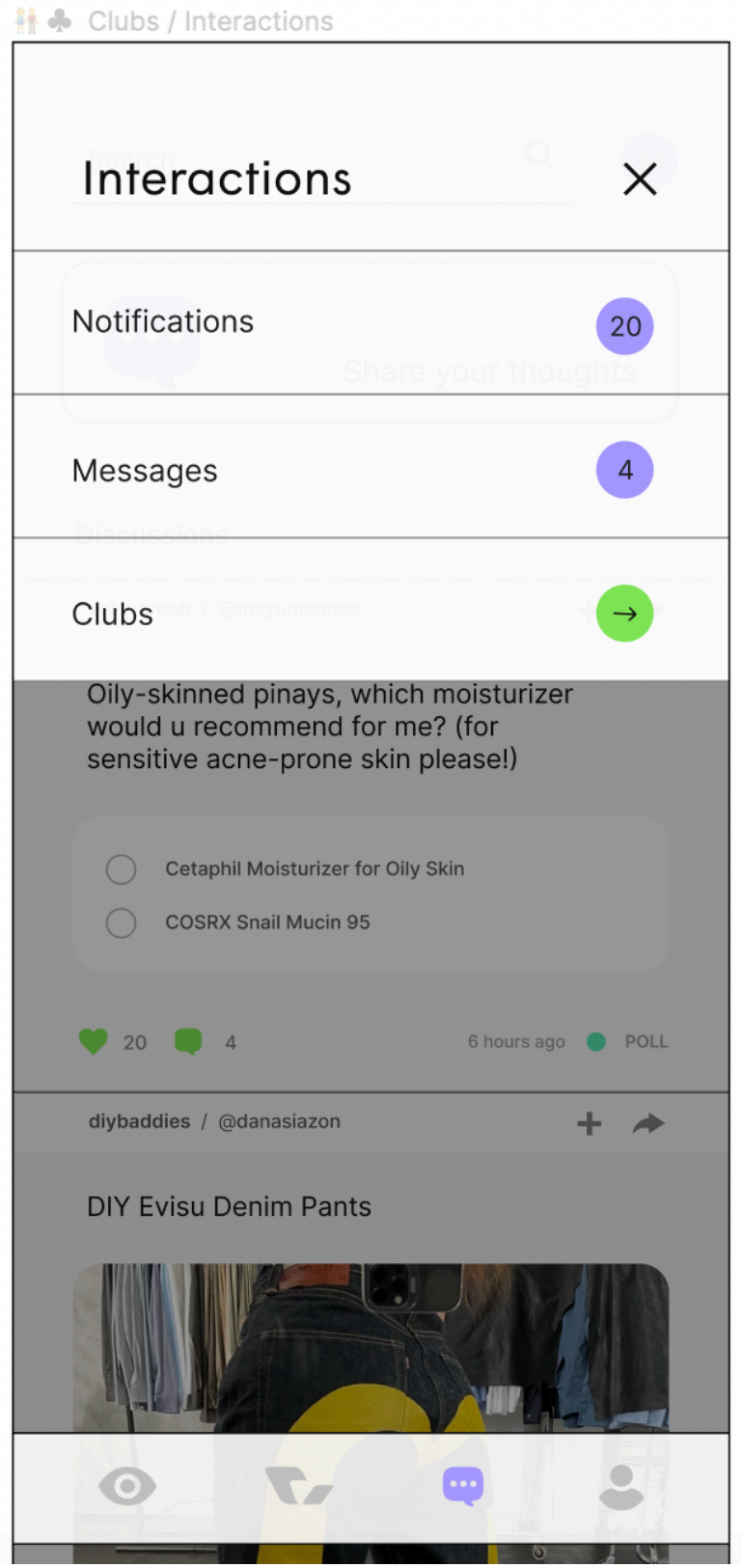


Figure iv.E.1.5

2. Community / Share

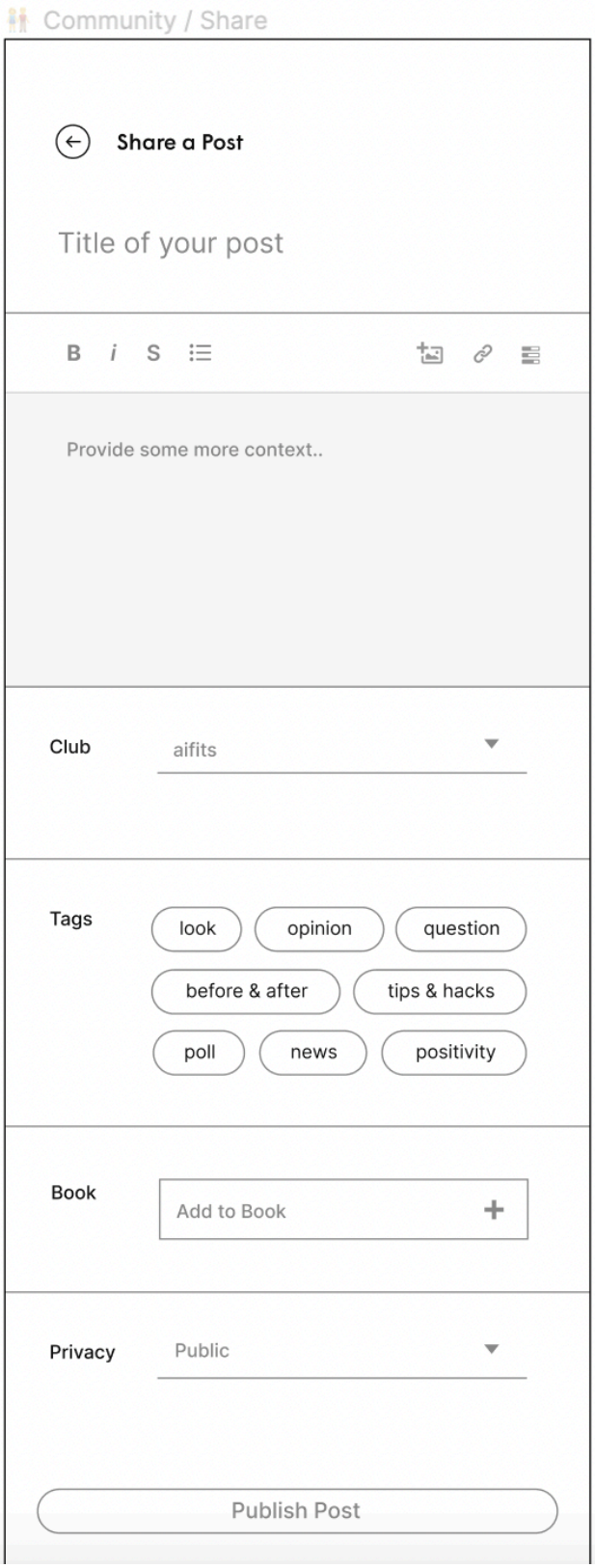


Figure iv.E.2

3. Community / Clubs

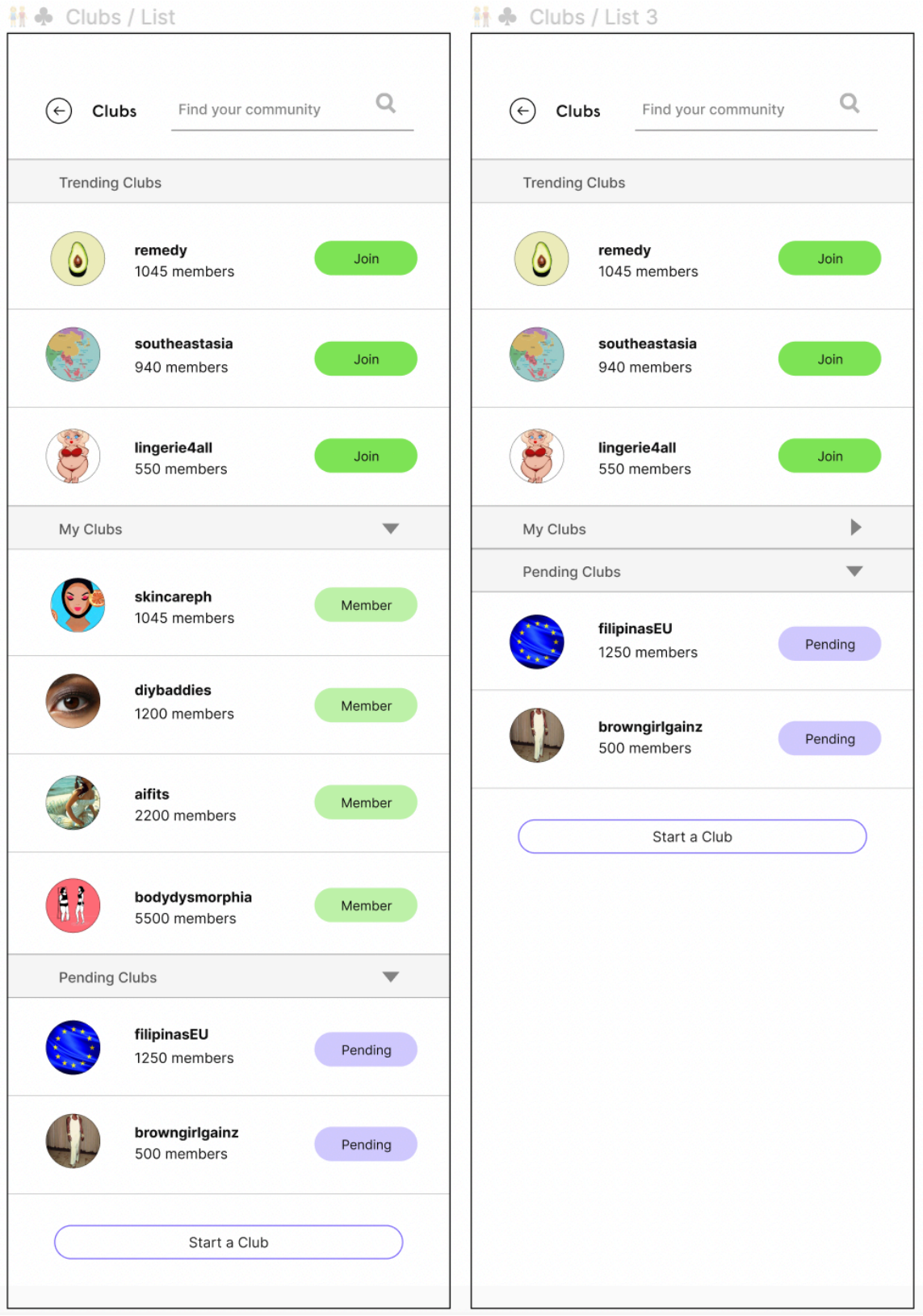


Figure iv.E.3

4. Community / Sample Club

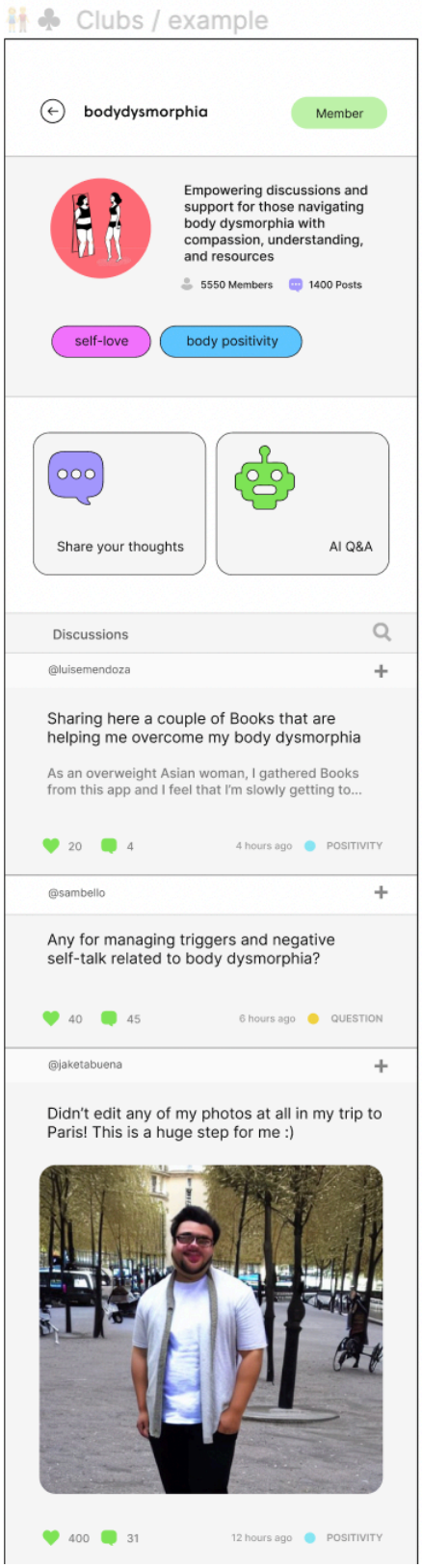


Figure iv.E.4

5. Community / Club AI Q&A

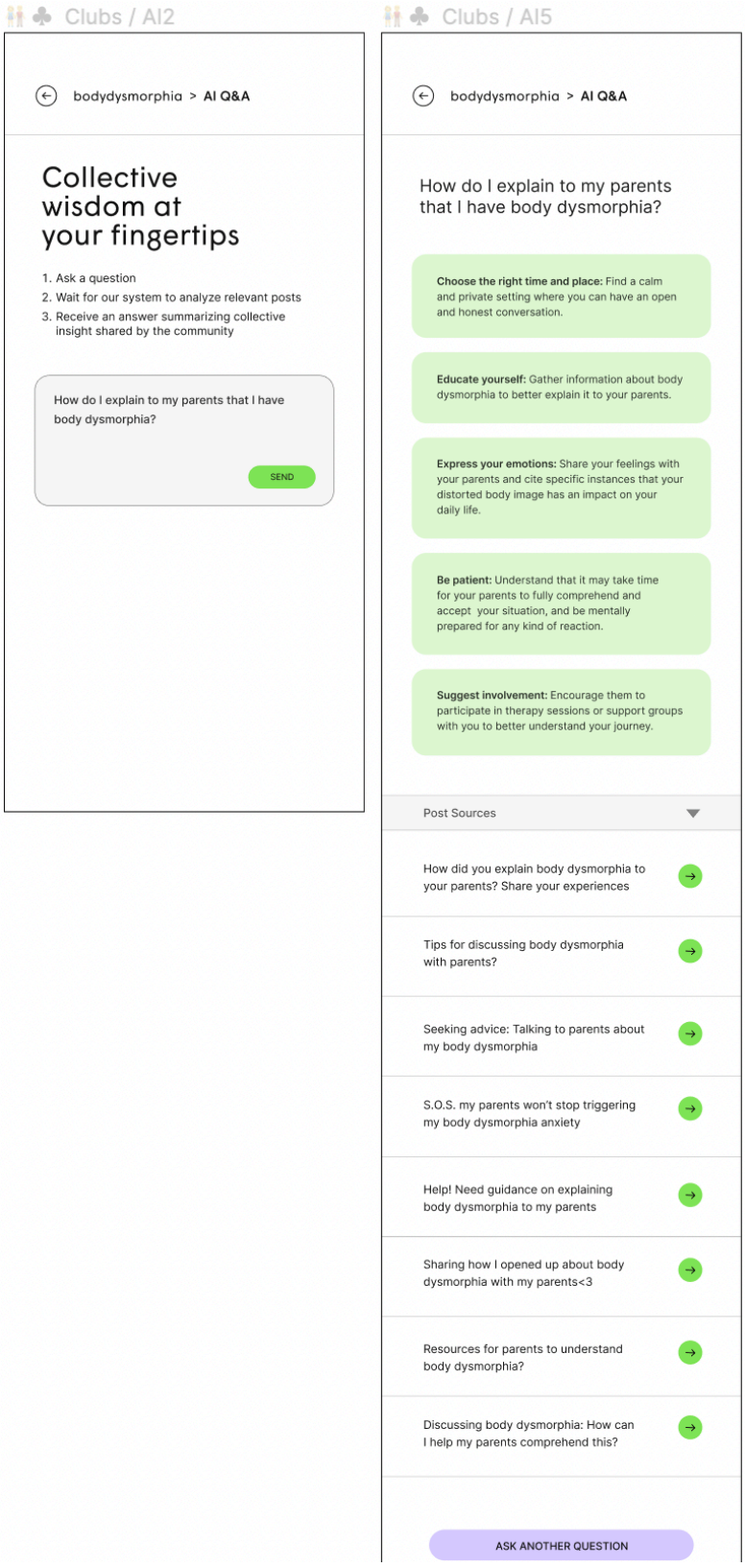


Figure iv.E.5

6. Community / Messages

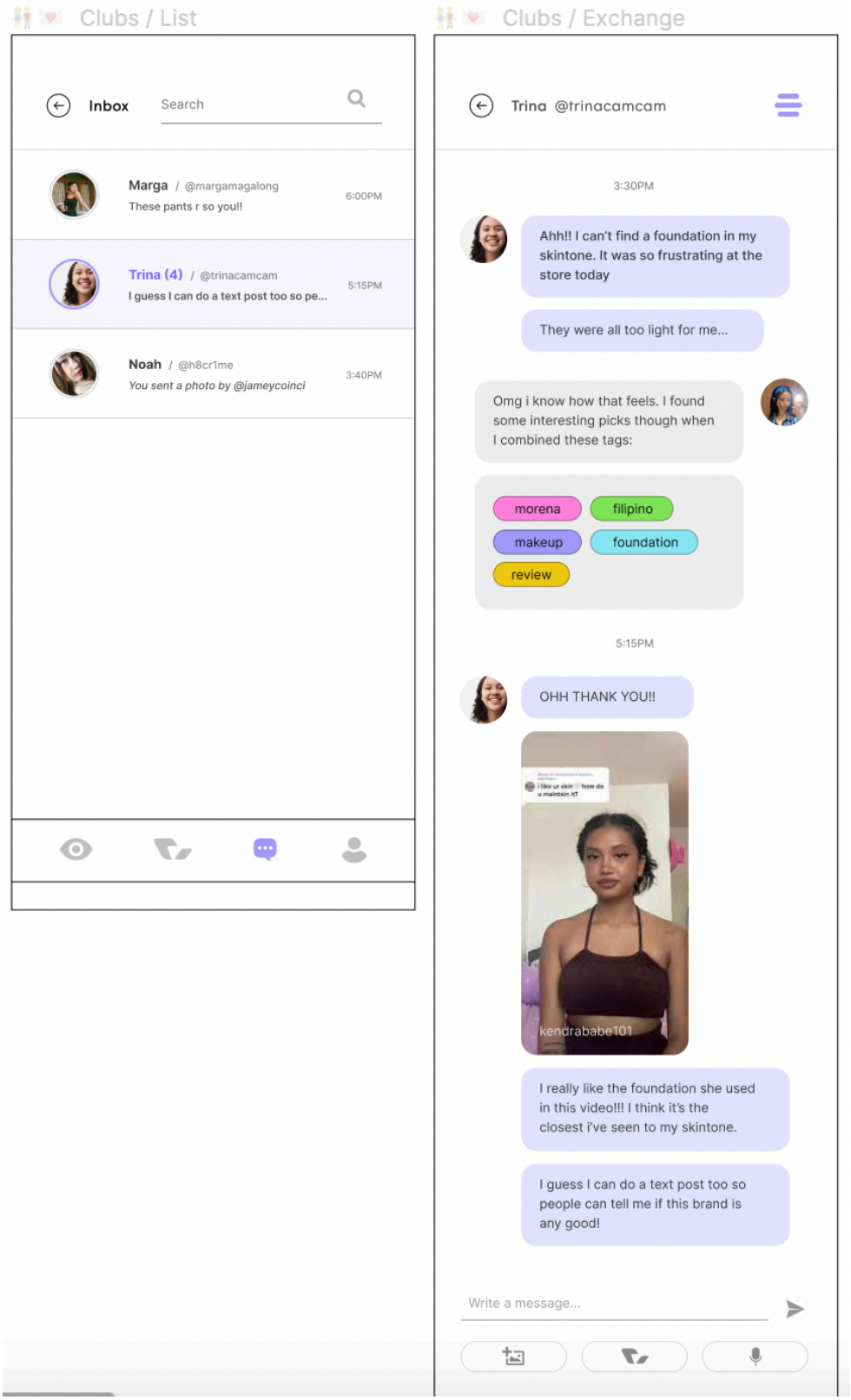


Figure iv.E.6

F. Profile

1. My Profile

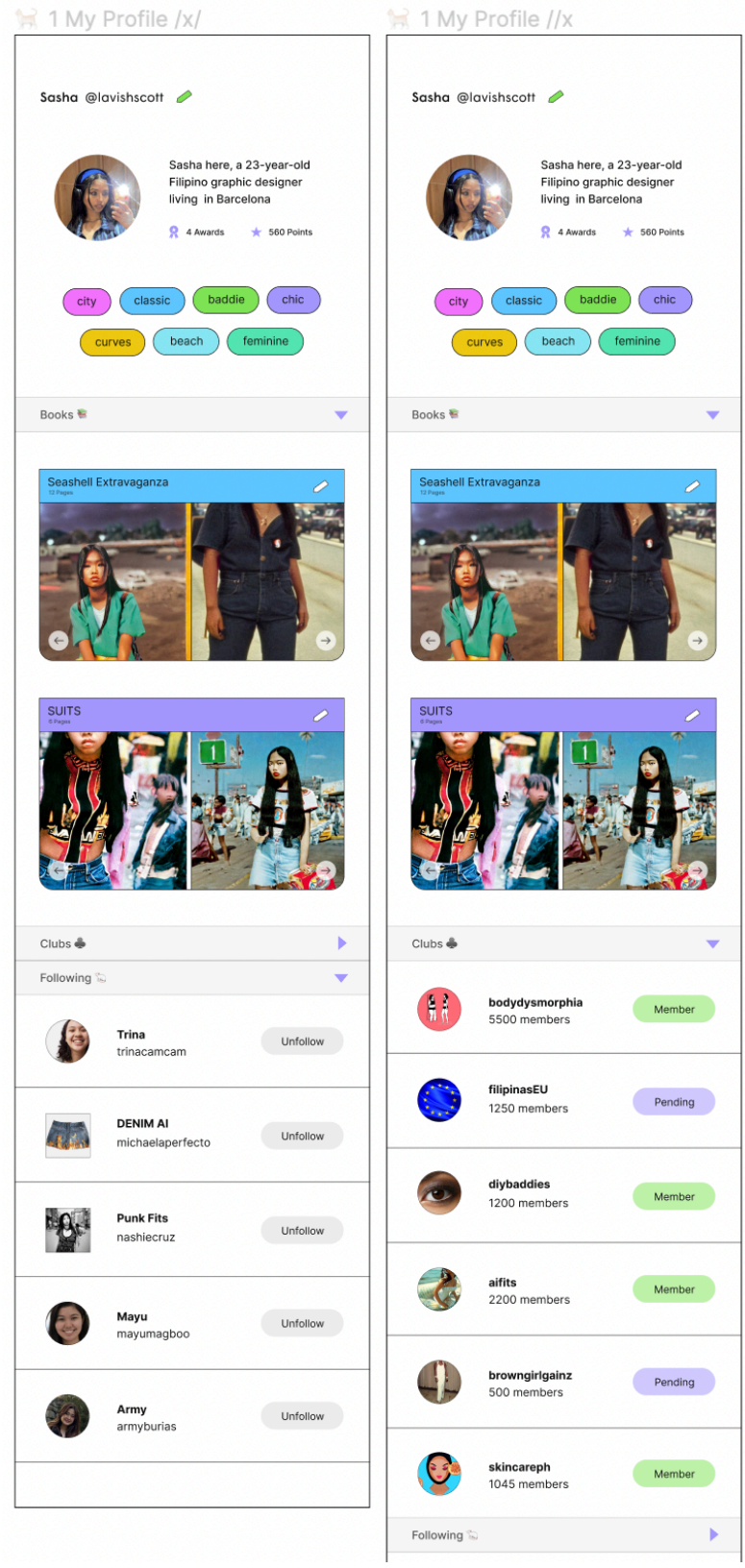


Figure iv.F.1

2. Friend's Profile

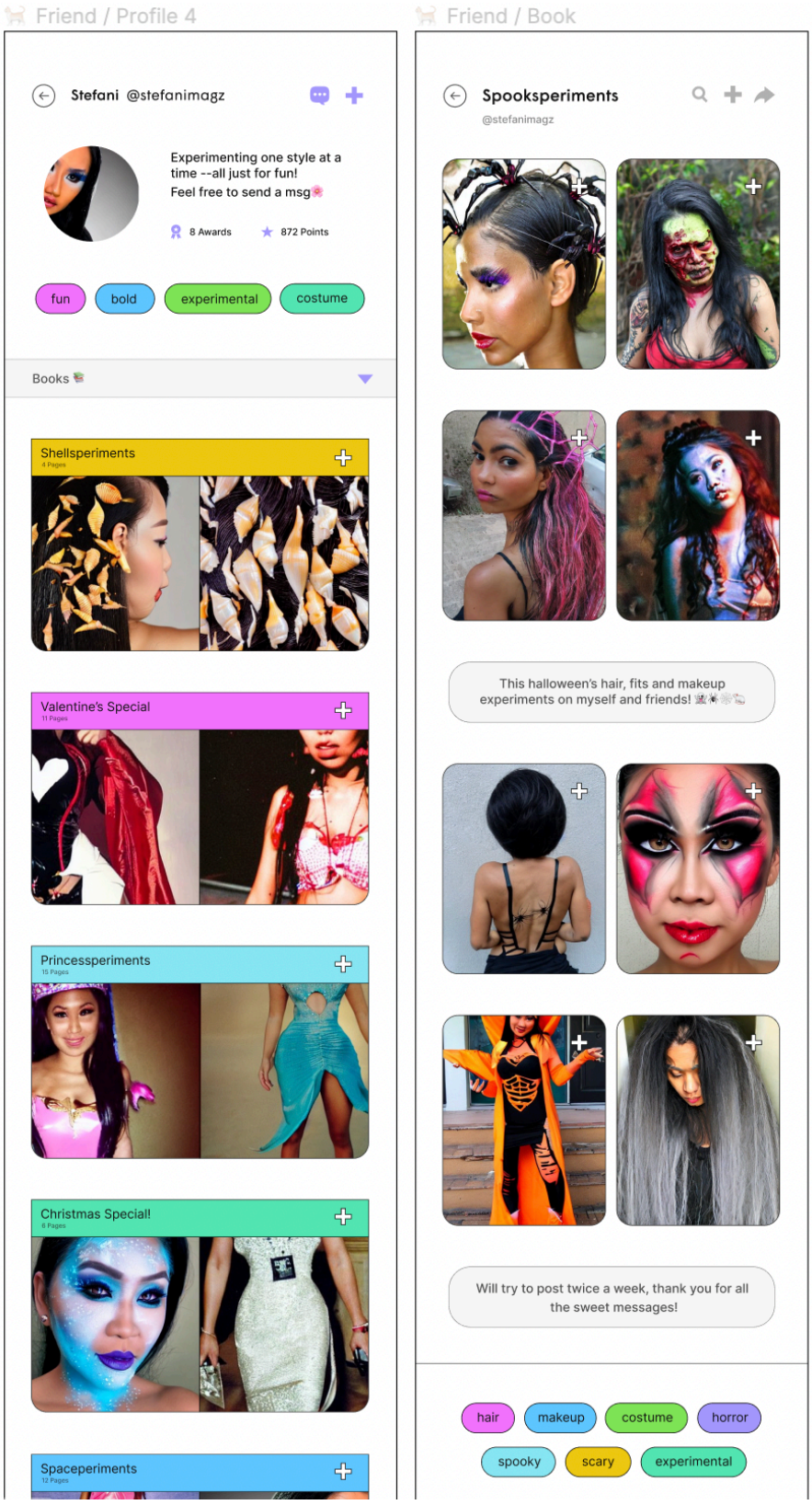


Figure iv.F.2