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A techno-feminist analysis of beauty app development in China's high-tech industry

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ABSTRACT

Drawing on a techno-feminist approach, this article foregrounds the socio-technological process of beauty app development in China's high-tech industry. I conducted semi-structured interviews with ten professionals, six women and four men, who previously worked at a leading Chinese high-tech company and participated in the development of a pioneer, popular beauty app – BeautyCam (*Meiyan Xiangji*). The research findings reveal that Chinese high-tech professionals often perceive the development of beauty apps as providing female users with a sense of empowerment and facilitating the inclusion of female professionals in the high-tech industry. Despite this feminist veneer, beauty app development poses no challenge to the status quo in Chinese society. Instead, it supports an underlying gendered logic not only by reinforcing existing standards of beauty but also in creating a niche job market that restricts female professionals' career development. The discussion sheds light on the intersection of gender and technology in an East Asian context where neoliberal pseudo-feminism is evidently on the rise.

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Becoming beautiful is a pleasant thing to do, and women can do this for a lifetime. [... Beauty apps] can help women gain pleasure through sharing good selfies on social media platforms.

(Jing, woman, product manager)

Jing, an experienced, female high-tech product manager, is trying to explain why beauty apps have become extremely popular amongst Chinese women in recent years. Today, a long list of beauty apps can be found in smartphone app stores, enabling users to edit or enhance self-portrait photos. Using a beauty app, one may easily take a selfie with 'longer legs, higher cheekbones, or whiter teeth' ready for posting on the Internet within seconds (Elias & Gill, 2018, p. 59). Amid the emergence of photo-sharing social media platforms, these apps have been adopted by millions of smartphone users across the world, with women forming their target market. The popularity of beauty apps with female users, Jing indicates, is inseparable from the capacity of the apps to address women's desire for appearance management in social media posting.

Recent Western scholarship, however, indicates that beauty apps are not at all 'feminist' but paradoxically intensify 'bodily discipline for women' by encouraging their self-monitoring/self-

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modifying practice (Elias & Gill, 2018, p. 64). In general, a beauty app automatically processes a female user's self-portrait photos by brightening or whitening her skin tone, resizing her nose or eyes, and slimming down the shape of her body (Rettberg, 2014). The 'perfect' appearance defined by beauty apps is in line with the female ideals promoted by the global beauty industry (Elias & Gill, 2018). As women use the apps to take selfies, they continue to be reminded of a ubiquitous 'surveillant gaze', which requires them to display a 'perfect' image on the smartphone screen (Elias & Gill, 2018, p. 65). While being represented as women scrutinizing each other, this surveillant gaze implies a male gaze due to the subtextual emphasis on women's sexual attractiveness (Winch, 2013). In this way, beauty apps render 'the female body and face [...] as a site of crisis and commodification', facilitating the 'intensification of aesthetic surveillance and labour' in female users' everyday technological engagement (Elias & Gill, 2018, p. 68). Interestingly, beauty apps are framed as a technology of empowerment, which enhances women's pursuit of pleasure and confidence at a personal level (Elias, Gill, & Scharf, 2017). As such, the emergence of beauty apps is symptomatic of neoliberal post-feminist governance, in which women are defined as 'active, autonomous and self-reinventing subjects, whose lives are the outcome of individual choice and agency' (Elias & Gill, 2018, p. 64). It reflects the social impact of neoliberal capitalism, which has effectively concealed structural gender inequality in Western societies in the wake of its advancement of economic agendas (Rottenberg, 2018).

Following the global trend, beauty apps are also widely adopted by Chinese women, with BeautyCam (*Meiyan Xiangji*) being the most successful in the market (Zhao et al., 2019). BeautyCam was launched by Meitu – a leading Chinese high-tech company specializing in camera-related smartphone app development. The company claims that BeautyCam has almost 40 million users (Meitu, 2019), and over 70% of them are women (Zhao et al., 2019). Similar to the popularity of beauty apps in Western societies, BeautyCam's business success is based on the ability to appeal to new forms of neoliberal feminine subjectivity that have arisen in the context of China's consumer market. This offers a form of pseudo-empowerment, which appears to give women autonomy in appearance management but rather subjects them to social norms created by the beauty industry, which requires them to constantly engage in aesthetic labour (Dippner, 2018). This pseudo-empowerment is specific to post-reform China, where women have been re-feminized in comparison with the unisex female role models promoted during Mao's era, with a re-emphasis on essentialised gender differences seemingly endorsed by the party-state (Evans, 2008). New feminine ideals of youth, fashionable beauty, promoted as aspirational and the key to women's success in life, also provide business opportunities. This post-reform social milieu not only paves the way for China's beauty industry to grow but also facilitates the development of a women-focused business model in its high-tech sector. An analysis of how BeautyCam is designed helps to foreground the gendered shaping of technology in China's high-tech industry that is specific to the post-reform social milieu.

This article is informed by Judy Wajcman's (2004) advocacy of a techno-feminist analysis, which examines gender power relations in both the design and use of technology. Using BeautyCam as a case study, I explore how gendered values and assumptions intersect with the technological architecture of Chinese beauty apps at the design stage. To this end, I conducted semi-structured interviews with ten former employees of Meitu. The informants are seven (assistant) product or project managers¹ and three programme engineers, six women and four men, who previously participated in the development of BeautyCam. I used my personal contacts to find the first informant and recruited the rest through snowballing. The interviews were conducted between December 2019 and February 2020 via Internet video calls, and each interview was 1–2 hours in length.² The interviews were conducted in Chinese, and extracts from the transcripts translated into English. The informants were given pseudonyms to ensure confidentiality and anonymity. As Meitu is a company with thousands of employees, the recruitment of former, rather than current, employees helped both to avoid conflicts of interest and to ensure that their research participation would not affect their careers.

Through the interviews, I discovered that both female and male high-tech professionals' interpretation of their participation in beauty app development is characterized by a semblance of feminism. This feminist semblance is twofold, involving first, their perception of beauty apps as technologies designed to enhance female users' self-confidence and second, the development of the apps per se as job creation for female high-tech professionals. However, this veneer of feminism poses no threat to the status quo in either the high-tech industry or society more broadly. Instead, it is indicative of how popular, pseudo-feminist assumptions are incorporated into technology design in the Chinese context. These assumptions underpin claims that beauty apps are progressive by providing women with a sense of empowerment but, paradoxically, perpetuate existing social norms that confine women within entrenched gender power relations. In this way, I challenge the assumption that beauty apps can empower women by providing a glimpse of the gendered shaping of these technologies at the design stage.

Pseudo-feminism in China

The extent to which neoliberal capitalism exists in China is open to debate (Wu, 2010). However, cultural researchers have identified parallel social trends in China and the West, in the wake of the market reforms launched by the Chinese Communist Party (CCP) four decades ago (Wallis & Shen, 2018; Zhang, 2018). The rise of pseudo-feminism is one of the parallel trends, although its evolution in China has specific indigenous roots (Wu & Dong, 2019). Throughout most of China's ancient history, women were confined to the role of family service providers by the so-called *Three Obediences and Four Virtues* (Liu, 2014). Aspects of old patriarchal norms remain today in the countryside, continuing to restrict female rural residents' participation in the public sphere (Howell, 2006). In contrast to the rural community, significant improvement of women's social status were been made in cities, due to the Mao era government's drive to include women in social production and its propaganda campaign for women's rights (Liu, 2014). However, while appreciating the improvement during Mao's tenure, contemporary feminist scholarship suggests that gender equality was never achieved in Chinese society (Howell, 2006).

The CCP's post-1970s reform of the economy has boosted China's economic growth and significantly improved living standards. At the same time, there has been a re-emphasis on 'the conventional binaries of naturalised gender differences that shore up discriminatory practices' (Evans, 2008, p. 365). Amid the government's insufficient labour legislation and promotion of individual entrepreneurship, the acceptance of gender essentialism in the labour market has amplified structural discrimination against female employees (Liu, 2014). The CCP, despite avowed support for gender equality, is reluctant to actively address structural gender inequality, which is most tellingly revealed by its suppression of grassroots, proactive feminist movements (Wang, 2015). This is not only because its current leadership prioritizes the continuity of economic growth over social justice, but also because gender inequality per se is seen as an inevitable consequence of the economic reform (Wallis & Shen, 2018). This means that the perpetuation of gender essentialism is specific to the post-reform social milieu, reflecting both the nation's 'integration with the global market' and the regime's 'ideological history that has consistently excluded the political implications of [gender]' (Evans, 2008, p. 366).

With globalization and aspects of neoliberal governmentality being internalized in post-reform China (Peng & Chen, 2021), its cultural industries have created a wide range of gender representations to cater to domestic audiences, who often show a degree of aspiration to Western consumer cultures (Rofel, 2007). Representations of women in Chinese popular cultures highlight their physical appearance (Liu, 2014), through which women's bodies become 'a key resource for manipulation by the state and the market' (Wallis & Shen, 2018, p. 379). The prosperity of China's beauty industry is not only an outcome of consumerism but also suits the CCP's agenda of re-feminizing women so as to 'meet the demands of labour reduction for a market economy' (Yang, 2011, p. 335). Focusing on Chinese beauty culture, Jie Yang (2011), for instance, has identified two notable representations of

Chinese women: first, the 'tender', young woman (*nennü*), who is sexualized and constantly appears in popular cultural texts, the 'ripe', older woman (*shunü*), who requires repair through beauty consumption. The emergence of such gender representations reflects how the market economy transforms the 'communist ideal of woman as producer into the neoliberal image of woman as consumer' in the post-reform era. Interestingly, the consumerist transformation of women is often masked by a progressive, feminist veneer, by linking women's appearance management to the notion of liberation (Chen & Machin, 2014). While posing no threat to structural gender inequality, it provides Chinese women with a sense of empowerment in their daily consumption of beauty products (Wallis & Shen, 2018). In the process, pseudo-feminist discourse becomes widespread in Chinese society, similar to the propagation of neoliberal post-feminism in Western democracies (Wallis & Shen, 2018; Wu & Dong, 2019).

With the widespread penetration of digital technologies, such as smartphones, mobile cameras, and social media apps, aspects of Chinese beauty culture have become evident in women's everyday social media posting (Li, 2019). Existing studies of Chinese beauty culture tend to adopt a representational approach, focusing on the gender power relations encoded in popular cultural texts (Chen & Machin, 2014; Meng & Huang, 2017). This scholarship offers a feminist critique of trending popular cultural phenomena, but it does not pay sufficient attention to the technologies that facilitate them. In particular, recent research shows that the reproduction of beauty standards on the Chinese-language Internet not only occurs in the representational realm but also in women's everyday embodied practices (Teng & Poon, 2020). Such bodily behaviours and experiences are associated with the prevalence of beauty apps designed to facilitate women's engagement in aesthetic labour (Li, 2019). A comprehensive understanding of contemporary Chinese beauty culture cannot overlook the interplay between gender and technology.

A techno-feminist approach

The configuration of gender dynamics in technology design can be unpacked through a techno-feminist lens. Techno-feminism, a term coined by Judy Wajcman (2004), following Cynthia Cockburn (1983), refers to a theoretical approach to the 'intersecting vectors of gender and technology studies' (Sikka, 2017, p. 110). This approach resonates with critical cultural studies, uncovering how gender is implicated in both the design and use of technologies (Wajcman, 2004). As is well-documented in the history of science, women are often excluded from technology use, and their contributions to the development of technology are often ignored or defined as non-technological (Cockburn, 1983). In this way, gendered values become historically institutionalized within technology (Sikka, 2017), evidenced by the fact that using technologies was once thought to be symbolic of masculine power (Wajcman, 2004).

A techno-feminist approach addresses the gender-technology axis by unpacking the 'process of mutual shaping' that occurs between gender and technology (Sikka, 2017, p. 110). As a result, a techno-feminist analysis facilitates the examination of women's various forms of 'interactions with [...] technologies' (Chan, 2018, p. 300). It foregrounds not only how women may use technology to push for gender equality or simply pursue a better life but also the extent to which this possibility is restricted by the socio-cultural contexts in which the architecture of the technology is designed and appropriated.

Along the same lines as techno-feminist scholarship, Cara Wallis (2013) examines how female Chinese migrant workers use smartphones to navigate gender boundaries in their everyday lives. Her research findings suggest that smartphones hold the potential to enable female migrant workers to transcend physical boundaries to meet and communicate with others for romantic matchmaking. Yet, these female migrant workers' social mobility remains restricted by their disadvantaged socio-economic status in China, where class and gender inequality is increasing (Ho, Jackson, Cao, & Kwok, 2018). These female migrants' appropriation of smartphones is contextually reshaped by the male-

dominated, socio-economic structures of Chinese society, contributing to the persistence of the gender order in women's everyday lives (Wallis, 2013). These findings resonate with a wide range of existing studies, which show that gender inequality is largely reproduced in Chinese digital cultures (Wu & Dong, 2019; Zhang & Hjorth, 2019).

Taking a relatively optimistic view, Lik-Sam Chan (2018) provides a techno-feminist analysis of locative dating apps, which unveils the feminist potential of these technologies in Chinese society. Locative dating apps are an emerging type of smartphone apps, which are specifically designed to facilitate matchmaking between strangers (Liu, 2016). Through interviews with young, middle-class urbanites, Chan (2018) discovered that locative dating apps were employed by many female users to express their sexual desires, enjoy the pleasure of gazing at male bodies, and report sexual harassment when encountering such issues on the apps. However, Chan (2018, p. 298) notes that the feminist potential of locative dating apps is restricted by the 'structural gender inequality embedded in the sexual double standard, marriage expectations, and state policies', which influence female users' everyday engagement with digital technologies.

While existing techno-feminist literature has provided insights into the interplay between gender and technology in the Chinese context (Chan, 2018; Wallis, 2013), much of it focuses on female users' experience of interacting with technologies. Little attention has been paid to the high-tech industry (Sun, 2019), which is key to the engineering of the technological architecture that influences women's everyday experience of technology use (Wajcman, 2004). In particular, the design of technology does not occur in isolation from the socio-cultural context in which it occurs, but reflects a socio-technologically entangled process (Ash, Anderson, Gordon, & Langley, 2018). To understand the gendered values embedded in technologies, it is necessary to fully account for high-tech professionals' contributions.

BeautyCam as a case study

In general, young women tend not to post photos in which they 'do not look [their] best' on social media platforms (Elias & Gill, 2018, p. 67). Digital filter-based beauty apps are, accordingly, launched by high-tech companies to target these anxious young women (Rettberg, 2014). While many different beauty apps are now available in the global market, common to all is that they enable female users to easily take filtered self-portrait photos in which an 'ideal' appearance of them is displayed (Elias & Gill, 2018). Focusing on a niche market, the development of beauty apps offers scope to address how gender power relations intersect with technology design from a techno-feminist perspective.

Previous research reveals a gendered divide in the types of mobile apps adopted by Chinese smartphone users. BeautyCam, launched by Meitu, is representative of the apps mainly installed on women's devices (Zhao et al., 2019). Unsurprisingly, my interviews with the developers of BeautyCam have confirmed Meitu's emphasis on female users at the design stage. As Tao, a former product manager at Meitu explains, 'about 70 to 80% of [BeautyCam's] design features specifically target women'. The shift to female users offers a glimpse of the changing business model in the industry. In the past, digital technologies were often engineered with an assumption of men being the target users (Wajcman, 2006). Considering the relatively balanced female-male ratio of the Chinese Internet-literate population today (CNNIC, 2021), the situation has significantly changed. Increasingly more high-tech companies are exploiting new business opportunities provided by women. Capitalizing on women's familiarity with aesthetic labour developed through cosmetic consumption and social media posting, the shift to female users reflected in Meitu's business strategy illustrates a larger market trend in China's high-tech industry, in which women come under the spotlight, due to the increase in their purchasing power (Meng & Huang, 2017).

Representing the app's focus on female users, the architecture of BeautyCam, according to its developers, is not engineered to be generic but shaped in such a way that it specifically provides women with an optimized experience of human-technology interaction.

The functions or features [of BeautyCam] invite female users to enter certain usage scenarios [...]. For instance, what filter is set as default when they take a selfie [...]. We smooth the process through which female users enter the service and start with what kind of functions.

(Zheng, man, programme engineer)

Zheng – a former programme engineer at Meitu explains the optimization of BeautyCam's human-technology interface with reference to the assumed socio-cultural specificities of women. This optimization strategy has two key aspects, including what he describes as the 'entrée' and the 'use-in-progress' phases. At the entrée phase, the designers of BeautyCam assume that their female users already want to take a selfie with the help of beauty apps. It is assumed that these users often have specific reasons for making this decision and a range of hopes and concerns attached to what beauty apps can do. For instance, they may wish to upload enhanced self-portrait photos on their personal social media accounts but fear that the photo-editing process is complex and time-consuming. Accordingly, the design features of BeautyCam are engineered to meet female users' expectations so as to invite them to proceed to the use-in-progress phase. This design rationale is inherently gendered, as it is built upon the developers' image of female users' mentalities.

We design the icon and user interface [of BeautyCam] by using a lot of arcs, smooth corners, and rounded letter fonts [...]. The main colour we use is also pink [...], so the app looks 'Kawaii' [...]. This guides female users to find, download, and play with the app that suits them.

(Qin, woman, project manager)

As Qin points out, different modular units of the user interface of BeautyCam are put together visually to connote a sense of Kawaii. The sense of Kawaii, in the project manager's terms, persists into the design of the use-in-progress phase, when women use BeautyCam for self-portrait photo-taking.

Filters, by default, are activated as soon as users enter [the stage of using] BeautyCam. They automatically adjust the exposure and tone up the brightness to make you look 'Kawaii' in the camera.

(Qin, woman, project manager)

According to Qin, the emphasis on Kawaii makes BeautyCam stand out, when comparing the app with its Western counterparts. Kawaii, originally a Japanese concept, emphasizes 'immaturity, vulnerability, and cuteness' and is generally linked to the performance of femininity (Chen & Machin, 2014, p. 289). With the globalization of cultural consumption, this concept has been appropriated by China's cultural industries, forming an important aspect of the representations of women in contemporary Chinese beauty culture (Chen & Machin, 2014). It is worth noting that the notion of Kawaii in the East Asian context is slightly different from cuteness in the West, where such quality in women is associated with obedience and dependence (Kinsella, 2013). Instead, it is implicitly associated with a degree of rebellious spiritedness, as it allows Asian women to use the performance of youthfulness and immaturity as a way to distance themselves from certain traditional women's duties, such as 'devotion and conformity [...] to parents and husbands' (Chen & Machin, 2014, p. 289). In this sense, the notion of Kawaii invoked in the design of BeautyCam's user interface and default filter setting can be understood as addressing women's autonomy in their appearance management by guiding them smoothly into using the app.

However, the incorporation of Kawaii in BeautyCam design, similar to Kawaii representations of women in popular cultural texts (Chen & Machin, 2014), is paradoxically affirmative of existing gender power relations. It encourages women to adhere to a performance of ultra-femininity that, signalling a reproduction of social norms in the design of beauty apps. In this sense, the gendered shaping of BeautyCam does not occur in isolation but is entangled with existing understandings of gender, which influences how womanhood is understood by both men and women themselves in Chinese society (Liu, 2014). Tao, a male product manager, is particularly blunt about this: 'We try our best to provide them with a "brainless" experience [...]. Women can use it even without thinking.'

In Tao's terms, a key aspect of female users' socio-cultural specificities refers to their perceived relatively 'low technological literacy' compared with men. Technological literacy refers to one's ability to use, manage, and understand technology (Petrina, 2000). The long history of male dominance in science has turned such literacy into a quality stereotypically associated with men and masculinity (Wajcman, 2004). It emerged from the interviews that this gender stereotyping is accepted by the designers in the development of BeautyCam, which is revealed by their imagination of women as low technological-literacy beings, who are in need of 'a brainless user experience'. Unlike the male informants, their female colleagues tend to reject the generalized assumption of women's technological illiteracy, presenting a gendered note of discord at the interviews. However, these female professionals' objection is mainly associated with their professional identity, through which they distinguished themselves from other women; many of them accepted aspects of the 'low technological-literacy' assumption. As female project manager Qin said, 'differences between women and men [in technological literacy] do exist'. The women-centred design of the beauty app is paradoxical. While the developers strive to demonstrate concern for female users' needs and desires when designing BeautyCam, their actions affirm entrenched gender power relations, manifesting an implicit denigration of women within China's high-tech industry.

The design of BeautyCam is based on the results of Meitu's market research, in which women aged between 20 and 30 comprised the overwhelming majority of the subjects. How the BeautyCam team elicits knowledge about female users' experience, according to Fei, involves portraying the beauty app as a 'feminist' (*nüxing zhuyi*) technology. The feminist potential of BeautyCam is elaborated in relation to the potential of beauty apps to provide women with a sense of empowerment. Interestingly, Fei avoids using the alternative, more radical term for feminism, *nüquan zhuyi*, (where *nüquan* refers to women's power or rights), in favour of a softer, less confrontational form of feminism. Yet she does seem to be aware that the empowerment to which she refers does not address the structural inequality affecting women's rights and social status.

You can see that society is very unfriendly to women [...]. Women are judged by their appearance in the marriage market [...]. In a way, [BeautyCam] helps women build confidence.

(Fei, woman, project manager)

Fei provided this commentary on the basis of the results of the market research she personally conducted for BeautyCam. She references a female research subject who was concerned about being overweight and gratefully thanked Fei's team for launching BeautyCam, which helped to 'restore' her confidence. The confidence restoration was accomplished by allowing her to post enhanced selfies that improved her popularity on social media platforms. At first glance, Fei's point appears to be supported by evidence, but neither she nor her research subject questions the cultural standards by which beauty is judged, the social milieu that undermines the self-confidence of women deemed 'unattractive' or the way that beauty apps contribute to perpetuating the judging of women by their appearance.

Echoing her former colleague's 'feminist' portrayal of BeautyCam, Jing describes taking selfies in which they look their best as a 'natural' for women and enthusiastically praises the ability of the app to help them gain pleasure in the digital realm. She uses a catchy phrase 'becoming beautiful is a pleasant thing to do, and women can do this for a lifetime' to make explicit her enthusiasm about BeautyCam's potential for women's empowerment. Jing's claim is endorsed by her former colleagues, especially the women, who use BeautyCam in their everyday lives, underscoring a consensus within the team she once led.

Suggesting that appearance management is a means by which women can gain confidence, Jing and Fei reveal the gendered values embedded in the BeautyCam project. In Chinese society, where the prosperity of a family is historically associated with a reliance on male offspring, the government's four-decade implementation of birth control policies has created a notably imbalanced female-male ratio in the population (Liu, 2014). This imbalance often leads to the assumption that women have a privileged status in the marriage market since there are more single men available

than single women (Peng, 2020). However, below the surface of the seemingly privileged status is the status quo, in which the qualities of women are assessed against naturalized understandings of femininity that justify gender inequality (Ho et al., 2018). Fei's commentary on the association between women's appearance management and their popularity in the marriage market specifically addresses women's subordination and evaluation in sexual and reproductive terms. This situation heightens women's anxiety about their face and body, which turns the management of appearance into a top priority in their daily agenda (Teng & Poon, 2020).

Within the status quo, beauty apps, such as BeautyCam, do indeed provide female users with a sense of empowerment in social media posting by making their appearance management easier than ever before. However, any sense of empowerment subjects female users to the sexualized evaluation of women by reminding them of the surveillant gaze on their bodies (Teng & Poon, 2020). The 'progressive' discourse of beauty app development used by high-tech professionals is a form of pseudo-feminism. The pseudo-feminist nature of beauty app development becomes more apparent when the role it plays in the rise of *wanghong* face in Chinese beauty culture is examined.

Displaying a *wanghong* face

Wanghong face, a buzzword on the Chinese-language Internet, refers to female Internet celebrities, whose facial features are 'characterised by big eyes, double eyelids, white skin, a high-bridged nose, and pointed chin' (Li, 2019, p. 3, p. 023). The emergence of *wanghong* face underscores the standardization of beauty aesthetics in Chinese society (Zhang & Hjorth, 2019). While often mocking this standardization, references to *wanghong* face rarely question its sexual attractiveness, which is confirmed by huge numbers of men who follow these female Internet celebrities on social media platforms (Dippner, 2018). This highly localized and standardized idea of beauty has become associated with success as a woman. This has encouraged female Internet celebrities to apply makeup and undergo cosmetic surgeries in order to meet this beauty standard (Li, 2019). Beauty apps, such as BeautyCam, act as accomplices in the digital realm, facilitating the perpetuation of standardized beauty aesthetics by enhancing female Internet celebrities' ability to display their perfectly altered *wanghong* faces on social media.

You cannot say that BeautyCam has created '*wanghong* faces'. However, we have to admit that the inbuilt filters exploit this trend [...]. Internet celebrities are using our app, and our app makes it easier for [female] users to take selfies of a *wanghong* style.

(Zheng, man, programme engineer)

While Zheng denies BeautyCam's responsibility, he admits that it has a stake in the rise of *wanghong* face in Chinese beauty culture. This view is endorsed by his former colleague, Fei, who confirms that a popular function of BeautyCam is to enable a female user 'to obtain a *wanghong* face with just one click'. The emergence of the *wanghong* face in Chinese beauty culture shows how a localized style of neoliberal female entrepreneurship is exploited as a business opportunity through a discourse of empowerment: the popularity of *wanghong* face appears to have elevated the social status of a relatively small group of Chinese women, such as female hosts on streaming media, who are 'empowered' to capitalize their own aesthetic labour. However, the *wanghong* beauty trend simultaneously facilitates 'social normalisation with more and more constraining effects' (Dippner, 2018, p. 19). Such constraining effects exert influence on both female Internet celebrities and ordinary Chinese women (Zhang & Hjorth, 2019). In terms of the latter, it fuels anxiety about their appearance by making the visual representations of *wanghong* face ubiquitous in the digital space and also perpetuates the standardization of beauty by making *wanghong* face per se more accessible to them than ever before (Dippner, 2018).

As Elias and Gill (2018) note, beauty apps are branded as 'virtual makeup' tools, which enable women to digitally monitor and modify their appearance. While claiming that the app liberates women from accepting real, painful cosmetic surgeries to obtain a *wanghong* face, the designers of

BeautyCam do not deny that its technological architecture requires women to participate in the mediated self-monitoring/self-modifying pattern of technological engagement in exchange for using the service. At first glance, BeautyCam appears to address female users' anxiety about their bodies, but its technological architecture amplifies anxiety by characterizing their unaltered appearance as imperfect and even undesirable. In this way, beauty apps constitute a digital extension of the surveillance of women's bodies. Yet, Chinese high-tech professionals' explanation of the design rationale conceals the regulatory mechanism by repeatedly stressing the 'feminist' potential of their beauty app. This pseudo-feminist discourse associates beauty and personal achievement within a neoliberal ethos of self-actualization to tempt women into aesthetic labour that is profitable to businesses (Dippner, 2018). Yet, considering the CCP's past official endorsement for beauty contests and current commitment to a consumer economy that encourages women's performance of femininity (Yang, 2011), it underlines China's localization of neoliberal governmentality within an authoritarian state that is actively promoting 'digital China' as contributing to economic development, an assertion of national prestige and a means of enhancing state surveillance.

Restricting female professionals' career development

The advocacy of the 'feminist' characteristics of BeautyCam by its developers, especially those who are women themselves, is, in part, associated with the impacts on gender dynamics that beauty app development brings to China's high-tech industry. These impacts come from the extensive inclusion of women at the design stage, which provides female professionals with a sense of empowerment in the workplace, just as they believe beauty apps do for female users.

At Meitu, there are more female employees [...]. I mean compared to most other leading Chinese high-tech companies, such as Tencent and Alibaba [...]. You can say [beauty apps] create jobs for women.

(Huan, woman, programme engineer)

As Huan notes, the female-male ratio of professionals working at Meitu is significantly higher than the average in the high-tech industry, and the company is not an isolated case. The extensive recruitment of female employees at these high-tech companies engenders a perception of women possessing an advantageous position in the job market related to beauty app development.

Developing these apps requires you to be patient and to be familiar with different makeup [...]. This is what we [women] do every day, and we are often interested in researching the effects of different filters ourselves [...] because it is fun for us.

(Fei, woman, project manager)

For Fei, the perceived advantageous position of female professionals in beauty app development is a result of them sharing the gender of the target users – and she also assumes shared skills, knowledge, and pleasures. According to her observation, approximately '60 per cent' of Meitu's product or project managers are women. In the positions responsible for testing the effects of inbuilt filters, this percentage is as high as '90 per cent'. In Fei's words, the extensive employment of female professionals at high-tech companies, such as Meitu, is, in part, due to the 'gender differences between women and men', which allow female professionals to constantly reflect upon their own experience of makeup use and selfie-taking for work purposes. In general, Fei's observation is endorsed by both her female and male former colleagues, indicating that the perception of women being offered opportunities in beauty app development appears to be a consensus in this industry.

Because Chinese high-tech professionals naturalize and essentialize gender differences, they have no foundation on which to challenge gender stereotyping in the high-tech industry (Sun, 2019). Specific to the BeautyCam case, the inclusion of female employees at Meitu through beauty app development restricts them to relatively 'low-tech' positions. As all the informants agree, men still

comprise the vast majority of programme engineers at Meitu, with most female programme engineers being assigned the task of effect testing, which is considered 'easy' in their profession. Moreover, very few female professionals have reached senior, managerial levels in the hierarchy; the glass-ceiling effect is still evident in this profession.

I am not sexist [...], but you have to admit that women and men are different. Women have a lot of good qualities, such as circumspection and patience [...]. However, it is a fact that they are not as good as men [...] in jobs like programming.

(Zheng, man, programme engineer)

Zheng's remarks clearly illustrate men's perspective on the status quo in China's high-tech industry. While distancing himself from discriminatory attitudes, his words reveal his pride in being a man in the profession and his prejudice in assessing his female colleagues. Zheng's claim is endorsed in some way by almost all the informants, including female programmers, who see 'being women' as a disadvantage in 'real high-tech positions'. Male professionals' discrimination against women has been largely taken for granted, even by female professionals themselves. Female professionals' internalization of gender discrimination is probably not surprising, given that they live in a time and place where any critical inquiry into gender issues is 'socially and politically unacceptable' (Evans, 2008, p. 380).

Existing techno-feminist research demonstrates that the male dominance of the high-tech industry is a powerful driver inscribing gendered values into technology (Wajcman, 2004). While women have evidently contributed to the advancement of technology, their contributions are usually framed as non-technological to provide gendered narratives of the history of technology design (Cockburn, 1983). This is also the case in China's high-tech industry, which emerges as a masculine field, where the traits stereotypically associated with male employees and the tasks assigned to them are most prized (Sun, 2019). In line with this tendency, it becomes apparent that claims about the job opportunities created by beauty app development are nothing but another form of pseudo-feminism. The industry appears to empower female professionals but actually reinforces the traditional boundaries between women and men in the socio-technological processes of technology design. Gender dynamics are, on the whole, still patriarchal in China's high-tech industry, despite the opportunities that women are offered there (Sun, 2019). Female professionals, regardless of their positions in the hierarchy, are struggling with negotiating gender power relations, and their disadvantageous status in career development has not changed. The status quo certainly reflects the historical marginalization of women in the global high-tech sectors (Wajcman, 2004). More importantly, it also reflects the convergence between neoliberal capitalism and authoritarianism in post-reform China, which offers its female citizens more personal lifestyle and consumption choices in exchange for the suppression of their political rights, which creates the social conditions for gender discrimination to persist in its market economy (Wallis & Shen, 2018).

Conclusion

This case study of BeautyCam developers' experience reveals that both women and men in the profession see BeautyCam as a technology of empowerment, which addresses female users' anxiety about their appearance. This pseudo-feminist discourse deflects attention from the profit motive underlying the engineering of the beauty app and its facilitation of the surveillance of women's bodies, which reinforces the standardized beauty aesthetics within the market economy (Elias & Gill, 2018). In the Chinese context, the gendered design of beauty apps is specific to the post-reform social milieu, in which the refeminisation of women through their beauty consumption is encouraged, both politically and economically (Evans, 2008). Beyond the context of technological architecture, the emergence of beauty apps is also perceived by Chinese high-tech professionals as promoting the inclusion of women in the industry. However, while creating a niche labour market, where female professionals seem to have obtained an advantageous position, it paradoxically

reinforces the existing stereotyping of women that hinders their ability to transcend gender boundaries in the profession. The perceived 'feminist' potential of beauty app development is, therefore, mythological; it neither elevates the status of women in the hierarchy of the profession nor assists the progress of gender equality in wider society. These high-tech professionals' seemingly feminist interpretation of beauty app development is indicative of the rise of pseudo-feminism in Chinese society today.

During Mao's era, significant progress made in improving women's social status. However, underneath the surface of progress was an essentialist understanding of gender, which has been perpetrated and re-emphasized in the post-reform era and which facilitates the widespread penetration of pseudo-feminist discourse in Chinese society (Wallis & Shen, 2018). In terms of the market forces involved, the rise of pseudo-feminism in China can be seen as a parallel to neoliberal post-feminism in Western nations (Wallis & Shen, 2018). Yet, it is also specific to China's Party-State polity, where critical gender analysis is ideologically restricted due to its political implications (Evans, 2008). Against this backdrop, gendered values are increasingly being disguised as progressive through a form of popular pseudo-feminism (Wallis & Shen, 2018). Chinese high-tech professionals' interpretation of beauty app development both draws on and feeds into this pseudo-feminism. For now, both the business interests of such companies as Meitu and the assumptions about gender that inform their work, align with the priorities of the party-state. Business operations in China are never fully independent of the state or free from political interference, which can sometimes appear to be arbitrary (Peng, 2020). As such, businesses targeting female consumers are constantly testing their strategy within politically defined boundaries.

With the voices of grassroots feminists being silenced in the post-reform era (Wang, 2015), feminist researchers have paid attention to gendered values within Chinese digital cultures (Meng & Huang, 2017; Wallis & Shen, 2018). There are two distinct approaches to the investigation of these gendered values: representational and techno-feminist. While a representational perspective analyses gendered discourse within mediated communication (Peng, Cummings, & Li, 2020; Wallis & Shen, 2018), techno-feminism involves analysing gender dynamics in the everyday use of digital technologies and the role technology plays in configuring gender dynamics in society (Chan, 2018; Wallis, 2013). Chinese techno-feminists focuses mainly on the interactions between female users and digital technologies (Chan, 2018; Wallis, 2013), with very limited scholarly attention paid to the pivotal role high-tech professionals play in these processes (Sun, 2019). Addressing this omission, I have sought to shed new light on the relationship between digital technologies, their users, and designers. In this way, I point towards a new research trajectory in feminist studies of digital technologies in the East Asian context.

Notes

1. Project manager and product manager are interchangeable job titles at Meitu.
2. The research has been approved by Newcastle University's ethical review committee (LimeSurvey Response ID: 18,645).

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