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Smartphone Photography in Urban China

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***Abstract*—**The smartphone plays a significant role in media convergence, and smartphone photography is reconstructing the way we communicate and think. This article aims to explore the smartphone photography practices of urban Chinese smartphone users and images produced by smartphones from a techno-cultural perspective. The analysis consists of two types of data: One is a semi-structured interview of 21 participants, and the other consists of the images created by the participants. The findings are organised in two parts. The first part summarises the current tendencies of capturing, editing, sharing and archiving digital images via smartphones. The second part shows that food and selfie/anti-selfie are the preferred subjects of smartphone photographic images from a technical and multi-purpose perspective and demonstrates that screenshots and image texts are new genres of non-photographic images that are frequently made by smartphones, which contributes to improving operational efficiency, disseminating information and sharing knowledge. The analyses illustrate the positive impacts between smartphones and photography enthusiasm and practices based on the diffusion of innovation theory, which also makes us rethink the value of photographs and the practice of 'photographic seeing' from the screen itself.

***Keywords*—**Digital photography, photographic-seeing, media convergence, technological innovation, smartphone, selfie/anti-selfie, image-text.

I. Introduction

SMARTPHONE photography has become prevalent in recent years globally as well as in mainland China. Thanks to technological innovation, images can be captured, edited, shared and archived in the all-in-one mobile device. From the iPhone 6 slogan of 'smile for the world's most popular camera' to the Huawei P9 slogan of '#OO change the way you see the world', many smartphone corporations focus on camera features and market these features as a competitive strategy. Traditional camera manufacturers are moving towards the smartphone business. A current example is the Huawei P9, a high-end smartphone co-engineered by the Chinese telecommunication equipment manufacturer Huawei and the German camera specialist Leica, in which the #OO of the slogan hints at the device's dual-camera setup. Additionally, smartphone corporates have organised a series of activities, such as smartphone photography competitions and workshops led by well-known photographers, to cultivate the photography enthusiasm of smartphone users.

The rise of smartphone photography has drawn significant academic attention to topics in the humanities and social sciences, such as the aesthetic appreciation of photography [1], [2], journalism [3], the permeation of social networks [4], [5] and user-generated content [6], [7]. However, the selfie deserves a special discussion. 'Selfie' was selected as 'the word of 2013' by Oxford Dictionaries and is defined as 'a photograph that one has taken of oneself, typically one taken with a smartphone or webcam and uploaded to a social media website' [8]. 'Selfie' was not a new word in 2013, but the practice of taking selfies was popular around this time. From celebrities to common people, anyone with a smartphone can take a selfie at arm's length, a practice in which some are even addicted. Multiple academic papers have discussed selfie culture from the perspectives of self-representation [9], [10], psychological empowerment [11], [12], and visual criticism [13], [14]. It was noted that many discussions of smartphone photography, social networks and selfies are interconnected from interdisciplinary perspectives. In terms of methodology, the analyses were conducted by using big data [15] and the discourse analysis of mainstream media news reports [16].

The introduction of digital cameras and smartphones in mainland China has a specific timeline and set of characteristics. Generally, the film camera was considered a privilege for professionals long into the 20th century, and even in the 1990s, a camera shared by a family was still not commonly observed. For typical families, the first cameras were the digital, portable units at the beginning of the 2000s. It was not until several years later that the mobile phone with a camera feature became widespread, and the smartphone soon followed. The introduction of the iPhone made smartphone photography popular and fashionable, but what contributed to the significant rise of digital photos was the rapid market penetration of low-priced, domestically made smartphones that offered good performance. The well-known example is Xiaomi, a Chinese technology corporation founded in 2010 that believed that high-quality technology does not need to cost a fortune. The introduction of Xiaomi marks the critical point of the proliferation of smartphones [17].

Smartphone photography is ubiquitous in urban China. Figs. 1 (a) and (b) describe this phenomenon visually. Fig. 1 (a) (captured in 2013) shows that when faced with a tidal wave from the Qiantang River in Hangzhou, the spectators did not scatter but instead held up their smartphones to take photos of the tidal wave. Fig. 1 (b) (captured in 2016) shows a musical fountain on the West Lake in Hangzhou, where a majority of the tourists are taking photos with selfie sticks. The related research on digital photography via phone camera is associated with urban China and mainly from cultural psychology perspective, which analyses the way camera features and social networks promote self-representation and self-identity [10], [18]. However, despite the fact that smartphone photography is an innovation of technological convergence, research from the techno-cultural perspective is less developed. It is necessary to conduct an in-depth study of the use of smartphones for

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photography in contemporary China, where the practice of smartphone photography is active, but Instagram is blocked. This study aims to explore how Chinese urban residents take photos with smartphone cameras and apps, what the subjects of smartphone cameras and the characteristics of the images are, and how smartphones change our notion of photography and the way we see the world we live in.

(a)

(b)

Fig. 1 (a) Spectators are holding up smartphones to take photos of the tidal wave (b) Tourists are taking photos of the special musical fountain with selfie-sticks

II. Technological Innovation and the Diffusion of Innovation

The smartphone, a mobile phone that offers more advanced computing abilities and connectivity than a basic contemporary mobile phone [19], plays a central role of the convergence culture [20] that is transforming our understanding of media, technology, communication and society. The smartphone has replaced single-function professional devices to some extent, such as phone cameras replacing stand-alone cameras, social networks and office automation apps changing the format of face-to-face meetings, digital maps replacing maps, and iPay replacing cash and credit card transaction. Smartphones are transforming our working patterns and lifestyle.

To attain a better understanding of smartphone photography and how it changes the way we see the world, it is necessary to compare the difference between stand-alone cameras and smartphone cameras in terms of technology. This section is not designed to serve as a manual for smartphone cameras.

Three main components that form digital images include: the lens, the sensor and the image processor. Briefly speaking, the lens is used to capture light; the sensor is an area for the light to enter, which transforms photons into digital signals; and the image processor processes the digital signals. These parts are crucial for both stand-alone cameras — including single-lens reflex cameras, and portable cameras — and smartphone cameras. However, due to the size and weight requirements of the smartphone, the lens is thin and the sensor is small. However, the image quality of the smartphone camera can reach that of a stand-alone camera due to the advancement of image processors. The lens of a smartphone camera is fixed-focus. Smartphone cameras have a digital zoom feature, which is different from the optical zoom of a stand-alone camera. The digital zoom crops an image to a centred area with the same aspect ratio as the original at the cost of greater noise in the photo. Therefore, technically, the smartphone is preferred when photographing objects from a short distance.

What makes smartphone cameras more advanced than the previous form of mobile phones with a camera feature is the intelligent operational system that uses applications (apps). Thanks to operational systems such as iOS, Android, Windows, cellular mobile communication networks and Wi-Fi connectivity, the smartphone is a multiple-feature mobile device representing technological convergence. In the context of photography, capturing, editing, sharing and archiving can be performed with one device. Popular apps in the photo and video category of Chinese App Stores, such as MeituPic, BeautyCam, and LINE Camera, are much less complex than traditional editing software such as Photoshop. Sharing is a natural social act — from the in-person sharing of a physical photo to phone-to-phone sharing via messaging to cloud-to-cloud transfers on social networking platforms, all are possible due to the development of networked technology. As for archiving, the smartphone device, per se, serves as a digital storage device for photos.

The camera feature of the smartphone is obviously an important technological innovation. Research on the diffusion of smartphones has already led to important results in domains such as healthcare via quantitative analysis [21]. It is worth analysing the proliferation of smartphone photography within the framework of the diffusion of the innovation theory originated by Everett M Rogers. Rogers identified five perceived characteristics of innovation that directly influence the rate of adoption, which include relative advantage, compatibility, complexity, trialability, and observability [22, p. 15-16].

Herein, questions from a semi-structured interview are related to the diffusion of innovation, which may help us explore how smartphones affect our relationship with photography and communication.

III. Method

Semi-structured interviews and participant observation were adopted to collect data in this study. Because not all images made by smartphones are uploaded onto the Internet, it is suitable to adopt the interview method to explore the practice of smartphone photography and the images, including but not limited to those shared on social media apps.

Social networks such as Facebook, Twitter and Instagram are blocked in mainland China, but domestic-service social

networks, such as Weibo and WeChat, are active. Sina Weibo, launched by Sina Corporation in 2009, is a popular Chinese microblogging and social network site. WeChat, developed by Tencent Corporation and released in 2011, is a fast-growing social app that brings together messaging, social communication and games within one easy-to-use app. Among these features, WeChat-Moments, a special feature for mobile devices became popular shortly after it was released in 2012, which in turn promoted the wide adoption of the WeChat app. WeChat-Moments is the most popular social network platform in mainland China in recent years.

The interviewees were selected from my WeChat-Moments app and via the snowball sample method. All interviewees are individuals rather than organizations. The interviewees include those who share images with social apps frequently, regularly, and occasionally. Individuals who take photos with smartphones and share them with mobile apps are included; those who usually take photos with a digital camera and then post them with mobile apps via Wi-Fi or data lines are excluded. There are 21 participants (Table I) out of 30 preliminary interviews with in depth interviews

TABLE I
PROFILES OF THE PARTICIPANTS IN THIS ARTICLE

Name	Gender	Age	Occupation	Brands of smartphones
He	Female	27	HR	Huawei, iPhone
Hua	Female	40	Migrant worker	Coolpad, iPhone
Hui	Male	27	Photojournalist	iPhone
Jie	Female	27	Salesperson	iPhone
Juan	Female	33	Lecture in college	iPhone
Le	Female	28	Ph. D candidate	iPhone
Li	Female	26	Ph. D candidate	iPhone
Lu	Male	22	Post-graduate	Xiaomi
Lv	Female	25	Teacher	Nokia, iPhone
Qiu	Male	28	Photojournalist	iPhone
Rong	Male	27	Engineer	Xiaomi, Huawei
Ru	Female	22	Post-graduate	iPhone
Ting	Female	25	Financial consultant	HTC, iPhone
Wei	Female	40	Associate professor	SamSung, Haiwei
Xin	Male	28	Officer in the army	Nokia, iPhone
Yan	Female	22	Post-graduate	Xiaomi
Ye	Female	25	Staff of university	Huawei
Yuan	Male	27	Ph. D candidate	Meizu, iPhone
Yue	Male	27	Engineer	HTC, iPhone
Zhi	Male	42	NGO general secretary	iPhone
Zi	Female	28	Teacher in high school	SamSung, iPhone

The photo-elicitation technique was used, and further questions were asked according to the participant's answers. The interviews were conducted between November 2015 and January 2016; each interview usually lasted 45 to 60 minutes and was digitally recorded. The interviews were transcribed, coded, and organised thematically. The collected data consist of 21 interview transcripts and some images that were taken by the participants using a smartphone. The images in this paper are used with the participants' permission.

IV. FINDINGS

The goal of this study is to identify and analyse the smartphone photography practices and the resulting images that are created. Thus, the findings presented here consist of two parts: one is a brief summary of general smartphone usage, and the other is an elaboration of images.

A. Smartphone Photography Practice

1. Capturing

All participants have used smartphones to take pictures for at least one year, but not all of them have used film cameras or digital cameras before. For some rural migrant workers in cities, they began to take photos only after they owned a personal mobile phone with camera features and began taking photos more frequently after owning a smartphone. The various motivations for taking photos can be categorised into interest-driven, aesthetic-driven, evidence-based and share-driven. The release of inexpensive and easy-to-use portable cameras has transformed photography into a leisure activity in everyday life, but the camera feature of smartphones allows the photo become a work tool. The advantage of taking photos with smartphones to improve work and communication efficiency is more obvious in fields in which photos may not have been initially necessary:

In fact, I do not take photos often for leisure, but I use it [the smartphone camera] for my job. I always record the students' homework, test papers, dormitory situations and campus activities. It is easier than writing down thousands of words. The images save time and can prevent misunderstandings. It is helpful to keep records and give feedback to the parents. (Lv, 25)

Additionally, taking and sharing photos of work status, such as at conferences or activity venues on WeChat-Moments, is a method of clocking in; this leisure mobile app has blurred the boundary between work and leisure.

2. Editing

Most participants said that they capture photos with smartphone native cameras, and some edit the image in apps if necessary. Several female participants mentioned that they use BeautyCam, a selfie app, when they take selfies. The most frequent editing practice is to add filters for aesthetic enhancement and other practice, including adding stamps, captions and collages to reflect interests or to conceal personal information. However, those who did not use apps to edit photos did not cite a lack of literacy but rather did not recognise the legitimacy of the apps:

Editing photos in apps by just adding premade filters or simply adjusting the exposure is rather casual. Revising the photos with professional software on the computer makes sense. (Ye, 25)

3. Sharing

The sharing frequency is directly associated with the Wi-Fi and cellular mobile network conditions. The practice of sharing can be categorised as platform sharing and private sharing. The former practice involves posting images on social networks,

such as Weibo and WeChat-Moments; the latter practice involves sending images to a designated person, such as a partner, parents or restricted WeChat groups with only a few members. The choice to share publicly is based on considerations of privacy, particularity for middle-aged adults. Some participants mentioned that they prefer to share personal images on less popular social networks; one said:

Because many colleagues become WeChat friends, I prefer to post my personal photos of leisure activities, such as photos with my boyfriend on Weibo, where few offline acquaintances are online friends. I occasionally post a collage image with four photos on WeChat-Moments to show that I am still in this social circle, but I delete them periodically in case a new acquaintance recognises me based on historical posts. (Ting, 25)

4. Archiving

Traditionally, photos captured by film cameras are developed in a physical format, which is archived, and these photos usually end up in shoeboxes, but this is occurring less often. Most people are not aware of how to archive their digital photos. Those who are concerned with the storage of digital photos create backups on the computer or in the Qzoon. Those who are not concerned with archiving merely keep their photos on the smartphone that serves a digital store itself or regards sharing on social networking platform a method of archiving:

I am not very concerned about archiving photos. I do not intentionally back up copies on a computer or in the cloud. Many years ago, I was addicted to a popular local online community; when it was about to shut down and a notice was posted for users to transfer all their data, I did not make a copy of my data. In my mind, it is better to let it go. It is not necessary to keep everything and let this consume all of my time. (Ting, 25)

It was noted that very few photos made with a smartphone are printed, and the participants said that they hardly ever review digital photos.

B. Content Types of Images

The images depicted a range of subjects, which can be categorised by content type as a photographic image or a non-photographic image. Generally, photographic images are the traditional outcome of film or digital and phone cameras, while non-photographic images are an emergent genre of content from smartphone cameras. Out of a set of findings, four interesting findings are selected, two of each type.

1. Photographic Images I: Food

The imagery of food differs significantly from the days of camera photography. In the past, group photos were taken after dinner, but pictures were not taken of the food itself. In the age of smartphone photography, it is fashionable to take pictures of food with a smartphone and share them on the general social networks, such as WeChat-Moments, or customised foodie apps, such as *Xiachufang* (meaning 'go to the kitchen' in Chinese):

I would make desserts or dishes over the weekend using a recipe provided on the Xiachufang app and then take a picture of my work to make a comparison. (Yue, 27) (Fig. 2 (a))

(a)

(b)

(c)

Fig. 2 (a) A collage of two photos of food (b) A filtered photo of food (c) A photo of home-made dish

Technically speaking, the hardware of smartphone camera and software apps with hundreds of filters, particularly filters named 'delicious' and 'kitchen', contributes to the enthusiasm of smartphone users with regard to recording images of food, who simply add filters and them share the images on a social network (Fig. 2 (b)).

From the perspective of cultural psychology, photos of food are metaphorical. Food serves as an object of imagery. It is much more practical to go to an exotic restaurant in one's city

than to go on a trip abroad. People can easily enjoy different flavours and dishes, such as pasta and sushi, in large cities. On the other hand, photos of food serve as evidence of cooking. Cooking is a satisfying hobby, and it can be even more satisfying to share the results of one's efforts on social networks to get as many likes as possible. The photo of the food is evidence of presence and an aesthetic object through which people can construct a type of imaginary life and identification (Fig. 2 (c)). Taking a photo before dinner becomes a routine:

The expression 'practice makes perfect' means that the more meals you cook, the more sophisticated your photography and post-photography editing skills are. (Yuan, 27)

2. Photographic Images II: Selfies and Anti-Selfies

(a)

(b)

(c)

(d)

Fig. 3 (a) Anti-selfie in special poses (b) Anti-selfie by adding interesting stamps (c) Anti-selfie of person's body but not his/her face (d) Selfie posted on WeChat-Moments for commercial usage

Another new genre of smartphone photography is selfie, which is a digital version of a self-portrait and a common form of photography. The mainstream selfie is a photo of a well-featured face. However, it has been found that some so-called selfies are not created in the traditional aesthetic sense. At least two types of 'selfie' can be referred to as 'anti-selfie'. One is to conceal the face intentionally while in special poses (Fig. 3 (a)) or by adding interesting stamps (Fig. 3 (b)):

I think selfies represent a kind of feeling. There is no need to show eyes or lips clearly or well. The most important aspect of the selfies is the aesthetic mood. (Juan, 33)

The other type of anti-selfie is a photo that shows person's body but not his/her face to demonstrate participation in a particular situation (Fig. 3 (c)). Without the 'anti-selfie' genre, a different way of presenting oneself, it would not be possible to completely understand the selfie genre.

As previous research has mentioned, taking selfies is a way to self-empower and self-present:

Selfies are made for others. Selfies are made to post on WeChat-Moments to inform others. In the old days, we

communicated by text message, and now we have found a new way to present ourselves. It is a closer and more interactive way of communicating. WeChat-Moments is a platform for presentation, and in turn, it stimulates the desire to present. (Qiu, 28)

Selfies can be shared in a more intimate form between partners. A selfie of one's body serves as a method of flirtation. The hardware feature of a smartphone camera contributes to capturing the image of the body easily and, more importantly, closely. Erotic images captured with smartphones can look much more intimate and attractive. In addition, photos taken with smartphones can be shared instantly. However, selfies serve different goals than typical self-portraits and self-representation forms. Technically speaking, the photos captured with the front camera of a smartphone are automatically stored in a separate 'selfie' album of the photo library of the iPhone iOS 9.0 or later. Not all selfies are shared publicly. The interviews contribute to re-conceptualising the selfies/anti-selfies and their characteristics.

First, it was found in the interviews that some selfies are not posted on WeChat-Moments but are shared in close and imitate group chats, such as family groups and buddy groups. In this situation, the selfie serves as 'a peaceful message':

I always send selfies to my parents in the family group named Sweethearts. For example, when I am alone in the lift in the office building, I will take a selfie and post it to the group chat. The selfie image can inform my parents that I am fine and that I am dressed warmly enough — things like that. I think it is a way of saying I am fine. But I delete the selfie the moment after I send it. My parents let me know about their life in the same way. If they go hiking, they send me their selfies in the group chats, but I do not save their images in the smartphone album. (Ting, 25)

Second, selfies can serve merely as camera practice without sharing, either publicly on WeChat-Moments or privately in group chats. This type of selfies is taken for one's own pleasure:

I would take an image of myself looking beautiful and charming or sometime grimacing. It makes me happy. That is all. It is not necessary to post it on WeChat-Moments to get 'likes'. (Li, 27)

Just as the famous street photographer Garry Winogrand said, 'I photograph to find out what something will look like photographed' [23]. It is easy for everyone in the age of smartphone photography to use a camera and view photos in the same way:

Sometimes, I do not know what to wear. I would take pictures in front of the mirror and compare the different outfits. (He, 27)

Third, selfies serve as advertisements posted on WeChat-Moments for commercial usage. *Daigou* (a word in Chinese meaning 'substitute shopping' or 'shopping on someone's behalf') and *Weishang* (a word in Chinese meaning 'retail seller on WeChat') post selfies with commodities on his/her personal non-commercial WeChat-Moments page. Some are photos taken in front of a mirror while shopping. The selfies are evidence of a real presence and the real effect of the products, which are more persuasive than posters of products and the images of displayed products:

I would tell other sales representatives how to take good selfies to show how attractive they are with our lipsticks. Some of them lack photography skills and a sense of aesthetics. Posters of lipsticks are not eye-catching enough for your WeChat friends. It is you that your friends care about, so if they see your selfies with the products posted on WeChat-Moments, they would look at the pictures. (Juan, 34) (Fig. 3(d))

3. Non-Photographic Images I: Screenshots

Mutually complementary relationships exist between smartphone features. Various smartphone apps, such as shopping apps, electronic transaction apps and productivity apps, contribute to the exploration of photography subjects, and in turn, the camera compensates for the deficiency of other features. The smartphone camera is used to capture landscapes and people and conventional subjects, but smartphone owners are not restricted to capturing only these types of subjects. There is a large category that is called 'image-texts'. They are non-photographic images that typically provide information in the form of texts and screenshots of transactions, memos or text message conversations. They are not representative of the physical world directly. Screenshots, therefore, are an emergent category.

Images, rather than handwritten notes, are quick, clear, and accurate, particularly in the case of large volumes of texts and information with fleeting appearance. It is not easy to falsify images, and therefore, pictures can be used as evidence of pleasant events, as is done traditionally but also with online electronic transactions:

I would take a picture of transactions performed online as evidence with the smartphone. If the transactions were done on the smartphone, I would take a screenshot and save the picture as proof. Sometimes I would take a picture of a hard copy receipt and send it to others as unofficial proof. (Wei, 40)

In addition to saving the information as proof, screenshots of notices or text message conversations are sometimes posted on social networks for fun (Fig. 4 (a)) or for commercial usage (Fig. 4 (b)):

When I skim through WeChat-Moments or Weibo, I see many screenshots of text message conversations. Some conversations are interesting and funny; this is ok, and it amuses me. However, some conversations are about product information and daigou or weishang transactions. Some even post all transaction details to show off his/her good sales performance. I really dislike this because it is advertisement in a non-commercial account, and this is too much flaunting. (Yue, 27)

(a)

(b)

Fig. 4 (a) Screenshot of conversations posted on WeChat-Moments for fun (b) Screenshot of transactions posted on WeChat-Moments for commercial usage

4. Non-Photographic Images II: Information-Collecting

Hannah Arendt mentioned an 'old-fashioned' inclination of Walter Benjamin in her paper *Walter Benjamin: 1892-1940*: anthologise quotations.

> *At any rate, nothing was more characteristic of him in the thirties than the little notebooks with black covers which he always carried with him and in which he tirelessly entered in quotations what daily living and reading netted him in the way of 'pearls' and 'coral'. On occasion, he read from them aloud, showed them like items from a choice and precious collection.* [24, p.15]

Such anthological practices may occur in the form of pictures in the age of smartphones. The camera of a smartphone replaces the pen, and the photo albums of smartphone replace the 'notebooks with black covers'. The object we carry everywhere is the smartphone, not a pen and the paper. Our ways of receiving information and constructing knowledge keeps changing and updating with shifts in technology:

> *It is not my habit to write something down. I capture it with my smartphone. For example, I always capture the PowerPoint slides or blackboard notes with my smartphone in classes or lectures. When I compile my notes, I insert the images into the documents directly as part of the notes. I transfer the images from the smartphone to the laptop via Wi-Fi and then delete the smartphone copy because of the limited memory of the smartphone. (Le, 28)*

It seems that the smartphone photography allows everything to become our experience. What becomes our experience can be the content of these images and the practice of smartphone photography per se:

> *My first response is to share information via smartphone capture. (Le, 28)*

The combination of camera features and productivity apps, such as Evernote and CamScanner, facilities the quotation-collecting or information-collecting practice. It is efficient for collecting useful but fragmented information anytime and anywhere, especially for professionals. More so, this propels information, dissemination and knowledge sharing:

> *I would take a picture of what is touching, resonating or confusing when I read a hard copy book, and I share it on WeChat-Moments with some brief comments in the hopes of receiving some feedback or having a discussion instead of just a 'like'. (Wei, 40)*

V. Discussion and Conclusion

Smartphone photography supports a greater diversity of actions than the previous data may suggest. Narratives of interviews suggest that the enthusiasm for photography is associated with the adoption of the smartphone, particularly for those who rarely used stand-alone cameras before. The camera feature of smartphones was neglected by many smartphone users when first choosing smartphones. Based on personal past experience, they believe that the camera feature is not necessary and the voice communication and text messages features are enough. In fact, it is not common for many Chinese adults to create a family album because it was not easy to take personal and family photos in the past. Even when the digital camera became widespread, it was a family-shared device. In most cases, one family owned only one camera. The camera was used when families went on trips or at special occasions, such as weddings and Chinese New Year celebrations. There was a clear purpose and theme when using cameras.

The introduction of the smartphone has changed the situation profoundly. Because of the positive relative advantages, strong compatibility and low levels of complexity, the camera feature has become an important consideration when choosing a new smartphone. First, the smartphone is a personal belonging. Smartphone users can capture, edit, share and archive whatever he/she wishes rather than what others may want. Second, the smartphone is a portable device, and the scope of subjects is much greater and images are therefore much more trivial, from foods to pets or even flowers and trees along roads. Third, it is

easier to express emotion via pictures than words, particularly for those who are less literate. All of these characteristics contributed to the preference of smartphones to cameras once the smartphones became affordable. It became routine for increasing numbers of people to take their smartphones out, tap the camera icon, and take a picture of the moment without a specific reason. The iPhone takes better quality images thanks to its sophisticated image processor. Except for two participants who were photojournalists and whose jobs required them to purchase iPhones, most participants became photography enthusiasts after using the iPhone. However, for some photography amateurs or artist photographers, it was simple to capture photos with a digital single-lens reflex camera and edit photos on the computer. They are early adopters of the digital camera, but laggards in terms of smartphone photography. They are reluctant to use smartphones to take photos and prefer to write down notes by pen instead of capturing the information by smartphone.

Technological convergence plays an important role in the media convergence culture. The hardware of a smartphone native camera with a wide angle and fixed focus makes it suitable for capturing subjects from short distances, which explains the popularity of the food and selfie/anti-selfie genre. The operational system for intelligent apps contributes to increasing the scope of the content of digital images. It is a commonly held idea that the camera is used to capture landscapes, people and other subjects that reflect the physical world. The practice of using a smartphone to make non-photographic images has changed our notion of photos and images. On the one hand, the content of images, although not reflecting the real-world environment, can be used to predict social trends of well-being. [25] On the other hand, methods of taking non-photographic images change our way of communication and thinking. These non-photographic images, such as image-texts and screenshots, improve communication efficiency, promote information dissemination and facilitate knowledge sharing.

In the new techno-cultural context, the memory-associated value of photographs is debatable. The practice of smartphone photography can be described as 'the more you get, the more you forget'. It is known that photos have social value, [26] but the present communication value, rather than the memory-related value, is prominently attributed to easy accessibility and frictionless sharing. On the one hand, digital images can be captured and archived digitally with ease but can also be lost or deleted just as easily. As we see in the participant's accounts, they delete the photos captured by and archived in the smartphone if the smartphone storage is full because taking another photo is not difficult. On the other hand, taking photographs seems to be an act not just to preserve memory but for communication and consumption. If we said that photographs 'turn the past into a consumable object' [23] in the pre-internet age, then in the age of social networking, photographs turn the 'present' into a consumable object. Activities such as journeys and offline games are posted online in the form of photos or videos the moment they begin. Most participants mentioned that they review their photos occasionally or even never. The use of digital photos has moved photography away from ritual and memorial value to a type of object to display and consume immediately. Viewing photographs is no longer perceived as a special experience. The change of this notion is not only for teenagers and young adults [27] but also for many middle-aged adults. The simple but prevalent idea that smartphone photography helps us remember daily life — perhaps the original motivation for photography — is more complex than it initially appears.

As Sontag said, 'there was not just a simple, unitary activity called seeing, but "photographic seeing" [23,p.68]. The proliferation of smartphones has given more and more people the opportunity for 'photographic seeing'. The camera feature of smartphones expands our ways of looking at the world photographically and therefore changes the way we think. However, one question is raised at the same time: are our views and insights confined to a 5-inch screen because we are accustomed to seeing the world though the smartphone? This is a debatable question that is based on this in-depth interview-based study.

In conclusion, this study is focused on the photography practices of smartphone users and the images that are made with smartphones in the techno-cultural context. This paper examines the narratives of smartphone users on the practice of capturing, editing, sharing and archiving as well as the characteristics of images taken with smartphones by urban Chinese smartphone users. The hardware of the smartphone's native camera contributes to the photos presenting a sense of closeness, proximity and intimacy. The software technology of the smart operational system and multiple function apps explores the non-photographic practices. While the previous research has examined the use of photographic images with smartphones in an organised way, [28] the use of smartphone photography at work and for knowledge creation for individuals is less well understood. Within this study, the interviews and images suggest that non-photographic images improve the efficiency of information sharing and knowledge dissemination and shape the way we think. Moholy-Nagy's dictum that 'knowledge of photography is just as important as that of the alphabet. The illiterate of the future will be ignorant of the use of camera and pen alike' is well known. [29] However, it is smartphone photography that is causing particular concern. The smartphone screen has become a third eye, and it confines our horizons to a 5-inch screen through which see the world. Individual smartphone usage in China, for both urban and rural populations, seems likely to continue increasing. It is believed that this study prompts further interest in, and understanding of, digital images and the way we see the world in the age of smartphones.

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