



# Manual Engagement and Automation in Amateur Photography

Bernd Ploderer, Tuck Wah Leong

## Abstract

Automation has been central to the development of modern photography and, in the age of digital and smartphone photography, now largely defines everyday experience of the photographic process. In this paper, we question the acceptance of automation as the default position for photography, arguing that discussions of automation need to move beyond binary concerns of whether to automate or not and, instead, to consider what is being automated and the degree of automation couched within the particularities of people's practices. We base this upon findings from ethnographic fieldwork with people engaging manually with film-based photography. While automation liberates people from having to interact with various processes of photography, participants in our study reported a greater sense of control, richer experiences, and opportunities for experimentation when they were able to engage manually with photographic processes.

## Keywords

photography, film development, automation, social media, Flickr

## Automating Photography

The progressive introduction of automation is a key aspect to the development of modern photography. More than 100 years ago, Kodak began paving the way with gradually automating different aspects of photography (Marien, 2011). The Kodak Brownie camera, designed with a fixed focus and shutter time, meant that photographers only had to frame their subject and press a button to take a photo. Furthermore, cameras could now be sent to Kodak factories, where film was taken out of the camera, developed and printed by machines. The prints, negatives, and the camera with a new roll of film in it, were sent back to the customer. Kodak not only made photography more convenient to the masses, Kodak's automation made photography accessible to anyone wishing to take pictures without their having to know or learn how to process and print film.

What is being automated and the extent of automation continue to advance in contemporary photography. Various aspects of phototaking have been automated, even prior to the advent of digital photography, such as automatic focussing and

adjustment of exposure time and aperture. Image processing has also been largely automated, with algorithms that can apply image corrections and filters through a click on an app. Wearable cameras take automation a step further. Once clipped on, these cameras automatically and continuously take photos without the wearer having to do anything (Ljungblad, 2007). Camera traps used by wildlife photographers automatically take photos without the photographer being present. Computer vision algorithms have automated sight itself (Manovich, 1996), with cameras recognising faces and objects in the image and, thus, panning and zooming accordingly.

This paper contributes to discussions surrounding automation by drawing upon findings from an ethnographic work conducted by the lead author with a photography club whose amateur photographer members chose to manually engage with the photographic processes. The findings reflect how these amateur photographers experienced the manual aspects of photography and also their views about automation in photography. Their experiences highlight a range of perceived benefits when people take the time to manually engage with photography, such as a sense of control over equipment and oneself, the opportunity to involve one's body fully and one's senses when developing and printing photos in the darkroom, and opportunities for experimentation and creative accidents with old and imperfect equipment. It is not surprising that a study of amateur photographers would extol the benefits of manual photographic processes. However, their experiences highlight particular affective relationships to technology and automation that are of interest at a time when we are seeing increased analogue nostalgia both within manual and digital photography practices (Caoduro, 2014; Pickering and Keightley, 2006). Furthermore, a study of photographers who actively chose to engage with manual photography practices, gives us an opportunity to observe and uncover how manual aspects of the technology and manual processes could potentially afford the reported perceived benefits.

We are not, in this paper, demonizing or decrying the increasing automation of photography. The amateur photographers we spoke to have also acknowledged that automation has simplified various aspects of photography. At the same time, we urge the need to be more nuanced when discussing automation – not seeing automation as an either-or proposition but rather considering how automation could best allow

people to meet their needs, goals and experiences in their particular activities and practices, at particular moments in time.

## Manual Work and Amateur Aspirations in Photography

Even with highly automated technology, photography still requires *work* and involves a variety of manual processes. Chalfen (1987), in an often-cited study of ‘Kodak culture’ consumer photography, highlighted the work involved in curating images from birthdays and family holidays and the sharing of these images and associated stories with family members and friends. Sontag (1990) commented that photography appeals to the work ethic of many American, German and Japanese citizens, because by meticulously capturing people, objects and events, these citizens can approach their spare time in a work-like manner.

Digital photography has introduced additional forms of ‘photowork’ (Kirk et al., 2006). ‘Photowork’ is a term created to refer to the work or activities that people have to do and engage in after capturing photos. Photowork is particular to digital photography as there is now a need to manage our burgeoning collections of digital photos: downloading images from the camera; browsing, searching, selecting, and editing images; creating collections; deleting images; creating back-ups; printing; and sharing pictures (Kirk et al., 2006). Smartphones have made it possible to conduct all photowork from a single device (Gómez Cruz and Meyer, 2012). However, labour is still required to share images and perform identity work (Vivienne and Burgess, 2013), for example, through printed photobooks and text messages, and via a range of social apps and social media platforms. Following this, we are seeing different efforts to automate photo sharing, allowing photographers to capture and share photos with family, friends and online networks at the click of a button.

Before we present the fieldwork, we highlight related work that suggests links between manual work and the aspirations of the ‘amateur’ in photography. We use the term ‘amateur’ here to refer to people who treat photography as a serious leisure activity (Stebbins, 1992) – that is, people who aspire to producing outputs that bear the qualities that professional photographers and artists create, but without financial ambitions. Compared to other art forms like painting or playing a musical instrument, photography is relatively easy to learn and thus the results produced by casual

(vernacular) photographers, amateurs, or professionals can be difficult to distinguish from one another (Sontag, 1990; Burgess, 2009; Bourdieu, 2010).

One of the ways amateurs (and professionals) distinguish their work from casual photographers is through their devotion to particular manual labour, such as experimenting with new techniques to achieve unique results. Furthermore, amateurs seek to distinguish themselves through a vocabulary and standards for judging the artistic quality of images that are inspired by professional and fine arts photography (Grinter, 2005; Ploderer et al., 2012; Schwartz, 1986). Similarly, with digital photography, Manovich (2016) notes that aspiring amateur photographers and professionals devote significant effort to create a certain aesthetic for social media platforms, such as producing collections of images for Instagram. To distinguish their work from that of casual photographers, amateurs work towards aesthetics that follow either traditional professional standards of composition (e.g., rules of thirds), or the aesthetics of graphic design (e.g., reduced detail, a clear hierarchy of information). The case of ‘influencer selfies’ (Abidin, 2016) illustrates that some photographers spend hours to construct the ‘perfect’ image to stand out from other Instagram members and to generate an identity with high commercial value. In other words, being able to engage manually with various aspects of photography provides ways for amateurs to produce outputs that aspire towards standards of professional photography and to forge an identity as a credible photographer.

## Ethnographic Fieldwork with a Film-Based Photography Club

In this study, fieldwork was conducted with an amateur photography club in Melbourne, Australia. The aim was to examine the experiences of people who choose to engage more manually with the processes of photography. This club promotes traditional forms of film-based photography, and club members share a passion for vintage cameras, shooting on film, and developing and printing film in the darkroom. They prefer to have a high degree of control over the process of photography instead of using digitally automated technologies. These amateurs are not luddites who reject digital technologies. On the contrary, all of them use social media to share their photos (digitally scanned from film). In fact, the club emerged out of a Flickr group of like-minded photographers and now constitutes a registered photography club that

organizes exhibitions, competitions, and regular informal outings ('photowalks') to take photos and to socialize.

The fieldwork took place over a period of seven months and involved participant observations and interviews. The study began with observations of how club members' interacted on the club's Flickr group. Data gathered from these observations included topics of interest in online discussions, the types of photos that they take, and identifying the active club members. After a month of observation, the lead author joined the group officially and began to contribute actively to the group's online activities as well as participate in their offline gatherings. Reflective notes about how the lead author felt, his evolving perception of photography, and how his interactions with the group might have coloured his observations were kept throughout the fieldwork (Birks et al., 2008).

A series of semi-structured interviews was conducted with eight club members. The interviewees' ages ranged from 18 to 40 years, and their experience with film-based photography ranged from 3 to 16 years. All interviewees regarded film-based photography as their hobby, although some of them also did commercial work. (Table 1 contains the relevant information of the interviewees. All names have been anonymized.) These interviews sought to elicit discussion of the photographers' experiences with film-based photography. For the first interview participants were asked to bring one of their cameras to talk about their approach to taking photos, their engagement in the technical aspects of film-based photography, and their choice of equipment. A second interview with the same participants was carried out in the fourth month of the study. For this interview, participants were asked to bring photos that reflected their interest in film-based photography. These photos were used as triggers to discuss what participants value in a photo, including how it is produced and their personal aspirations regarding photography.

Name (anonymized)	Age	Occupation	# Years into film-based photography
Diane	40	Chef	4
Gary	18	Student	3
Henry	21	Student	3
Ken	25	Professional photographer	5
Martin	34	Technician, part-time photographer	6
Robert	37	Film reviewer, part-time photographer	4
Sebastian	37	Restaurant owner	16
Steve	39	Graphic designer	10

Table 1. Demographics of the participants.

While the lead author was responsible for all aspects of the data collection, all authors were involved in the data analysis. Iterative coding of the field notes and interview transcripts were carried out in NVivo with a focus on people's experiences of the process of photography (Miles and Huberman, 1994).

## Findings

A number of themes emerged when analysing participants' experiences. Although participants' personal anecdotes and comments highlight challenges and failures in engaging with manual processes of photography, they also reveal the pleasure and pride these participants take in this engagement. Quotes from interviewees are labelled to show both the person and the interview it is taken from.

### Control over Equipment and Oneself in Taking Photos

Being able to manually engage in the entire process of photography was important for the club members interviewed. This is because club members wanted control over all aspects of the process and aspired towards mastery of at least some part of the process.

In photo taking, the club members emphasised a desire to have control over subjects, location, available light, and equipment. And with equipment such as a film-based camera, one has to know how the camera works because there is no automation provided. In fact, we found that club members typically preferred older cameras,

which do not even have an in-built light meter. This meant that they had to use and rely upon a separate light meter to obtain light readings to guide adjustments of the aperture and shutter speed on their cameras. Furthermore, using such cameras effectively requires careful framing and typically manual focusing.

For example, Sebastian's preferred camera was a Leica rangefinder (see Figure 1), which, he said, delivered excellent results, yet was also, in his own words, 'painful to use'. 'It's like a wild horse, and you need to tame it; it requires mastery, whereas a lot of Japanese cameras just do it automatically'. Similarly, Ken argued passionately that 'you don't actually need a computer to get brilliant results'. He was referring to the work of Ansel Adams (a famous American landscape photographer known for his mastery of the camera and the darkroom) to argue that all you need is 'to know what you are doing'.



Figure 1: A Leica M3 rangefinder camera, which requires mastery to set exposure time, frame and focus. Image reproduced with permission from the photographer, <http://flickr.com/photos/pgoyette/236884240/>

Indeed, club members saw the challenges that come with manual control as adding to the interest and enjoyment of photography:

It [manually engaging with photography] is challenging, which is part of the fun, because you don't want it to be too easy. You don't just want to turn up and do 'click' and that's done – that's easy. It would be great to just go click and to have an outstanding photo, but it would be a bit boring, wouldn't it? (Henry, I2)

Besides interest and enjoyment, photographers persevered in part because they saw this ‘struggle’ as part of the journey other great photographers they admire have also undergone: overcoming challenges and persevering with mastering the processes, in order to produce great photographs. Also, some mentioned that developing the ability to control the camera that appears simple and yet cumbersome gave them a sense of pride in their personal agency and level of skill in photography. In other words, a good photo is not simply a result of a great camera but also, according to participants like Ken, requires a skilful photographer:

I think anyone who has a professional looking camera and can take reasonably good photos has probably had comments like ‘your camera really takes good photos!’ It happens all the time, and that’s really annoying, because if I had given you the camera, you wouldn’t have taken the good photo. And I’m not getting any respect for the photo – I’m the one who took it! (Ken, I1)

Similar to learning to master the camera and to control the processes of the camera, controlling oneself to wait for photographic opportunities is one of the key tenets of producing a ‘good’ photo. Contemporary wearable cameras and camera traps can automate this process and alleviate the need to wait for a photo opportunity. However, the photographers in our study argued that the person needs to be attuned to, aware of, and engaged with the environment prior to taking the photo. This entails sharpening and heightening their senses of their surroundings. That is why many photographers stress the importance of taking time to prepare the shot, to wait for a ‘decisive moment’ when something significant happens, and when all the elements of the picture come together as a near-perfect composition (Cartier-Bresson, 2014). The ability to wait for a decisive moment is a common skill among most photographers and not just limited to film-based photographers.

## Involvement of Senses and Time to Control Results

A second key theme was how engaging with manual processes of photography allowed people to use their bodies and senses to have some control over the aesthetics of the end product. This was often accompanied with having to slow down and attune oneself with the processes.



For those working with film-based photography, spending time in the darkroom to develop films is a very visceral experience that results in a heightened awareness of their sense and time. Some of the chemicals used to develop and print film are toxic, smell sharp, and need to be handled with care to avoid harm. The pictures on the exposed film are also fragile requiring careful handling. To expose the image onto photographic paper, photographers adjust the image by using their hands to selectively add or block light to certain areas ('burning' and 'dodging'). This manual process which results in an image gradually emerging onto a white sheet of photographic paper is described as magical and memorable: 'Nothing beats processing the film, placing it on the enlarger and watching the print develop from thin air. I still remember my first roll of Ilford Delta 100 – it was like magic!' (Steve, 11).

This manual process allows people to experiment with the chemicals to try different treatments, different papers, different duration, and colour filters. Through tinkering with these variables, people learn to refine their prints step by step. Over time they also learn ways to further manipulate the image, whether through selectively adding light to enhance contrast, or by treating the photographic paper with additional chemicals to add a slightly different tone and feel to the image. Being able to produce different prints from one negative, making incremental improvements, and holding the printed image in one's hands, all adds to the thrill and magic of learning the art of photography (see Figure 2).

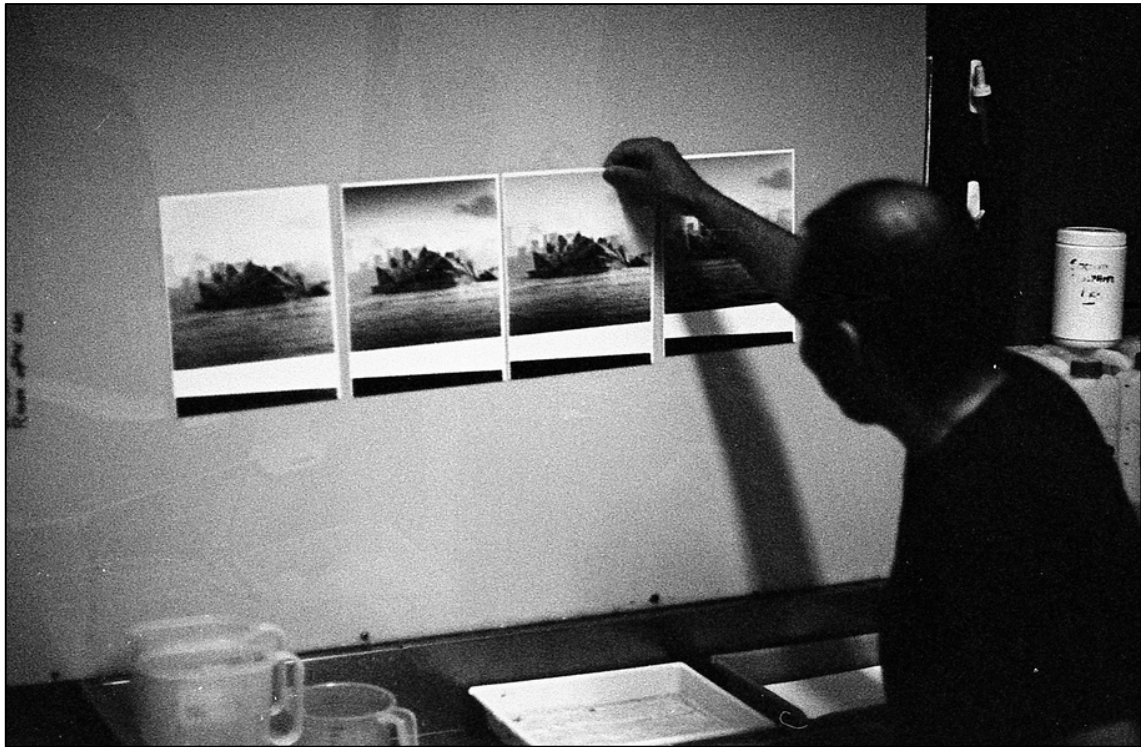


Figure 2: Different prints produced from the same image, by changing exposure time as well as by adding light to certain areas (e.g., ‘burning’ the sky in the second image to the left). Image produced by the first author.

Printing of images does take more time and is a more unpredictable process when compared to the automated process in digital photographs where this process can be supported by image editing software such as Adobe Photoshop. For club member Gary, Photoshop means

you can say ‘it’s too dark, let’s make it brighter’. Whereas for us, we have to make the print, develop it, and fix it, which takes 4 to 5 minutes before we can evaluate the impact, the effect of the settings we chose. So every time we do something, if we want to make it lighter or darker or change the contrast, we have to guess at the result and then test it, which can spin out the time required to do the work tremendously. (Gary, I1)

However, for Gary, this process offers him an ability to express his sense of aesthetics and artistic expression, and who he is as a photographer: ‘I like the process because it has a particular aesthetic that matches what I want my art to say. It allows me to present my work the way I want to. I can present it as big prints on a specific paper, which I could do with digital, but the process is different. I don’t feel as involved with digital’ (Gary, I1).

While developing and printing photos can be engaging, it is important to acknowledge that this desire to work in the darkroom is far from universal among club members. For Gary, Henry and Ken, the initial motivation to develop their own film was to save money. It was only through spending time working in the darkroom that they gradually developed their passion for developing and printing their own film. Diane, Sebastian and Steve, on the other hand, only occasionally develop and print their photos in the darkroom. Most of the time they seek the convenience of a photo lab to get their films developed and printed and for Sebastian, for instance, ,

the thrill is gone once I've shot. ... No, it's a different art. If I take good pictures, it doesn't mean I'm a good printer. If someone is a good printer, it doesn't mean he is a good photographer. Photography is very sort of fast moment, not organised. It can't be organised. It's very free. It just takes the person to press the button. Whereas chemical printing requires discipline, timing, patience, exactness. (Sebastian, I1)

Beyond that, some participants reported finding manual processes of photography, such as scanning and post-processing, to be boring and even tedious. Steve scans all his photos with the highest possible resolution so that he can potentially produce large prints from the digital copy. It takes him a long time to scan and to use Photoshop to remove dust particles that appear on the digital scans. Although this dust removal process can be automated, none of the people interviewed use this feature because it blurs the image slightly and thus diminishes the quality of the image. Steve described the rather tedious nature of scanning: 'One photo takes about 45 minutes. It takes a long time. ... Every year the pile [of photos] just gets bigger and bigger. When I get a free moment, I scan one photo. There are lots of little spots here and there and I try to remove them. It's a lot of pain' (Steve, I1)

## Idiosyncrasies and Experimentation

Manual photography not only allows the club members to better control the process, it enables them to exploit the idiosyncrasies found in imperfect equipment and through experimentation with different parts of the process. Using older cameras means dealing with imperfections. Old cameras are often not lightproof, which creates unpredictable effects upon the final image. While photographers who strive for

perfection would try to avoid light leaks at all cost, the club members embraced these flaws because they can add a unique element to a photo. One flaw is lens flare, which has become so popular that many digital photographers add it during postproduction using the Photoshop software. However, from the perspective of those we interviewed, the digitally added lens flare cannot compensate for the unpredictable and unique lens flare created by using old lenses:

What I like about this lens is the way that it handles light. Sometimes light seems to creep around, like flares. And it looks quite beautiful with this lens. It's quite beautiful to look at. (Robert, I1)

Adopting manual processes of photography means that over time, a photographer becomes more familiar with their camera and the film they use and gains a better understanding of how light behaves and how to control the camera. Participants in this study felt that this knowledge afforded them opportunities to experiment. Experimenting goes hand-in-hand with learning. One of the participants, Martin, experimented with how novel images can be created through the playful use of ice and light in photography because he wanted to take the idea of the pinhole camera further. Martin tried to freeze film in a block of ice before exposing it to light. He persevered and tinkered with the process, refining it and trialling it until he was satisfied with the results:

And then the next day I took that block of ice, which was by now a cylinder of film inside a block of ice, and I put that into a cardboard box. And the cardboard box I sealed up, and then I put pinholes on all the sides. And I put it outside for about 15 minutes. It turned out really good, to everybody's surprise. (Martin, I1)

Wanting to experiment with pattern effects on the image (see figure 3), Diane went as far as destroying her negative by putting it in a salt solution before scanning: 'the negative was destroyed, it has salt crystals on the surface; it was just an experiment' (Diane, I1).

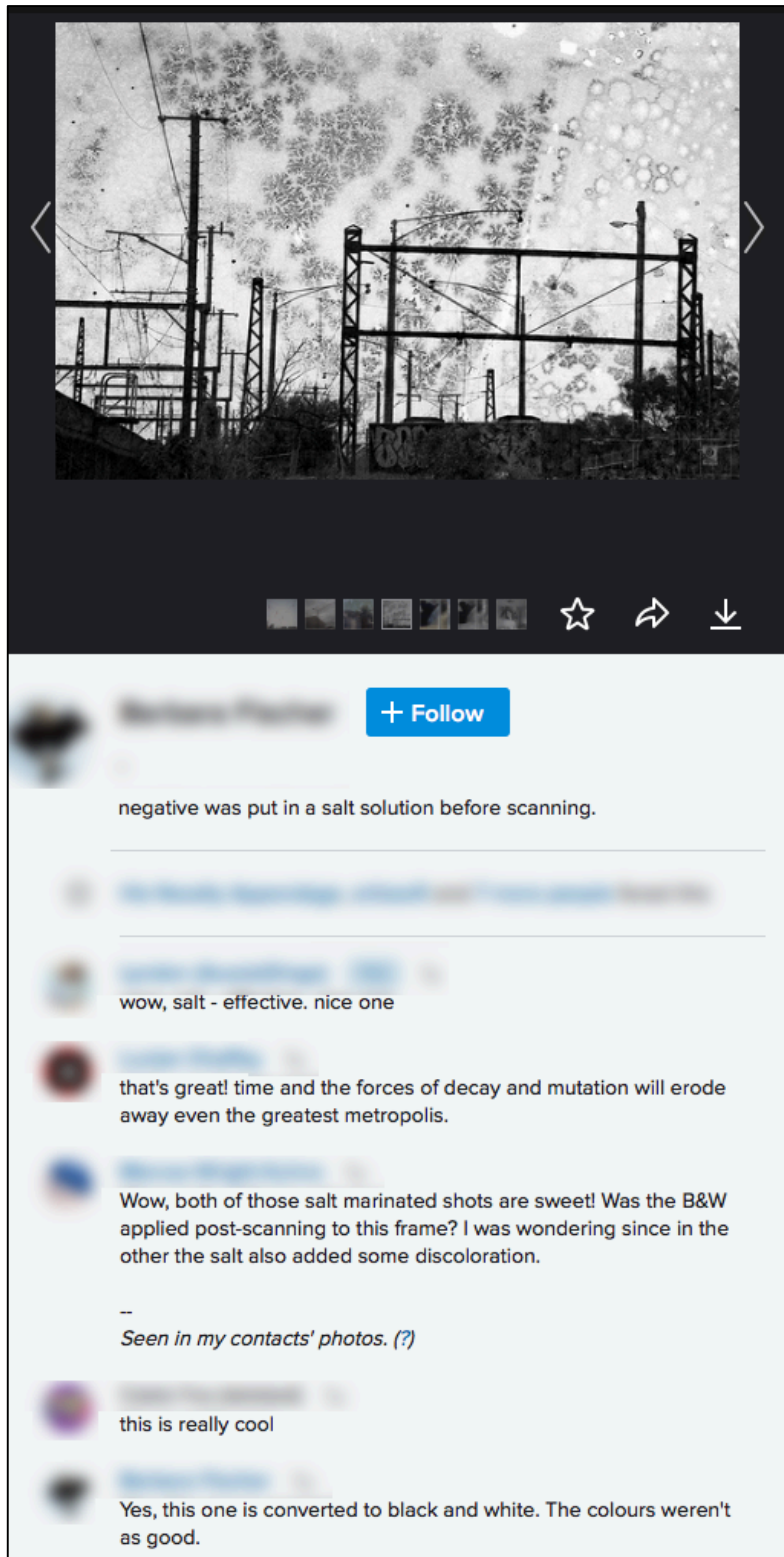


Figure 3: Experimentation with salt on negative shared on Flickr, which in turn creates opportunities for cooperation and learning.

## Discussion

The findings show a range of benefits as well as rich and personally meaningful experiences that photographers gain when engaging with photography manually. The fact that amateurs highlight experiences that they find meaningful and beneficial is unsurprising. What is important, however, is that they would have missed out on these experiences had their interactions with photography been highly automated.

We saw how manual engagement with photography could provide the person with opportunities to manipulate and improvise with the equipment and exert control over various aspects of the process, equipment and one's senses and body. Manual engagement also allows opportunities to experiment with processes to produce potentially innovative outcomes as one pursues outcomes that meet one's aesthetics and judgements of quality while at the same time learning and developing one's skills. To feel that one is able to fully control, modulate and have the opportunities to affect the desired outcomes adds to one's sense of satisfaction, pride and agency.

At the same time, manual engagement means slowing down and taking more time, which in photography supports opportunities for reflection and learning. Taking time and slowing down in photography resonates with broader trends of the 'slow movement' through 'slow food', 'slow travel', 'slow technology', and so forth (Hallnäs and Redström, 2001). 'Slow food', for example, has been a response to quick and cheap food products, in order to connect people more closely with their food and to preserve culture and traditions (Andrews, 2008). Similarly, for the photographers in this study, manual engagement is a way for them to connect more intimately with photography: to preserve traditional forms of photography, and to walk in the footsteps of film photographers like Ansel Adams and Henri Cartier-Bresson. In fact, Fred Conrad from the New York Times Lens blog (Conrad, 2009) succinctly summarizes the ideal of 'slow photography' that the photographers in this study strove for: 'One advantage of using larger formats is that the process is slower. It takes time to set up the camera. It takes time to visualize what you want. When doing portraits, it enables the photographer to talk and listen to subjects, to observe their behavior. When I use an 8-by-10 camera for portraits, I will compose the picture and step back. Using a long cable release, I will look at the subject and wait for the moment'. While manual engagement may also increase opportunities for mistakes, people get a chance

to learn from their mistakes and in certain situations, even turn mistakes into interesting and desirable outcomes.

It is important to note that opportunities for manual engagement are not limited to traditional forms of photography. In fact, modern digital SLRs provide perhaps an even greater set of controls for photographers to master than the cameras used by the photographers in our study. Similarly, one can argue that photo-editing software offers an even wider range of options for image manipulation than the darkroom. Conversely, not all film-based photographers engage manually with all processes. Even among the club members who are passionate about photography, many use photo labs to get their film developed and printed in order to save time and effort.

However, what is different with digital devices and software, is that tinkering is more difficult. Steve's experimentation in the darkroom and Martin's example of the pinhole camera highlight the opportunities for tinkering provided by traditional forms of photography. On the other hand, manufacturers or vendors of digital devices and software often limit or discourage people's ability to tinker with the technologies. As discussed by Gillespie (2006) more broadly in the context of digital media, contemporary digital devices and software are often designed as a black box, hiding their inner workings behind a user-friendly interface. Additionally, warranty settings, end-user agreements, and encrypted code prevent people from opening up a camera or software, which may constrain the agency of users and creative exploration.

## Consistency and Experimentation in the Craft of Photography

Our observations of, and findings from, the experiences of amateur photographers engaging manually with processes of photography highlight many parallels with discussions surrounding craftsmanship. The similarities include the desire for control and agency over one's processes, the preference for handwork and having physical evidences of one's labour (Treadaway, 2009), as well as the aspiration and drive to create outcomes of high technical and artistic quality (Sennett, 2008). In fact, Sennett's (2008) study of the craftsman argues that it is the aspiration for quality that drives the craftsman to improve so as to get better rather than to get by. To be a good

craftsman is to be engaged with the process, developing skills to a high degree, and in general being dedicated to good work for its own sake.

For the amateur photographers in this study, adherence to this 'craft' of photography offers them a way to distinguish their work from casual photographers, such as those that share their photographs on Flickr. While casual photographers on Flickr can produce images of high quality, having control over the processes allows club members and other amateur photographers to produce high-quality images with a higher degree of consistency. This consistency in quality is reminiscent of Pye's (1968) notion of 'workmanship of certainty', which was particularly noticeable in film processing and printing, which aims to reduce any risk of destroying the original image.

Experimentation, on the other hand, is characteristic of a 'workmanship of risk' (Pye, 1968). With manual processes, the quality of results is not pre-determined. Furthermore, the quality of the result is continually at risk during the process, or as in the examples provided by Diane and Martin, the camera and film are destroyed during the process. While automation in photography leads to consistent results, e.g., automated film-processing in a photo laboratory will reliably produce images of high quality, it is exactly that risk in the process (e.g., by putting salt on the negative, cross-processing, pushing and pulling film) that leads to unique results and diversity. By seeing how photography can bear elements of workmanship of certainty and workmanship of risk reveals both opportunities and tensions in combining automation and manual engagement in new ways. Put simply, automation promotes workmanship of certainty, where results are predictable and reliable (Pye, 1968). In other words, there are benefits for both processes.

However, we argue that automation limits people's opportunities to experiment, particularly experimentation that relies on risk and accidents. There are a number of new technologies that afford experimentation with photography. For example, unmanned aerial vehicles (UAVs or 'drones') allow photographers to experiment with perspectives, whereas light-field cameras allow photographers to play with the focus *after* taking the picture. Both technologies provide room for experimentation and both require a high degree of mastery to get refined results. What is missing from such technologies, however, is the 'workmanship of risk' that we



observed in our work with film-based photographers, where the quality of the outcomes might be diminished in the process or destroyed altogether. Many drones have livestreams to mobile phones and similarly light-field cameras have image displays that offer immediate feedback to the photographer. Hence, a photographer can assess the impact of her actions with the drone or light-field camera on the quality of the image quality in close to real-time. Such tight feedback loops between action and image feedback may foster experimentation and reduce the likelihood of having no image at all, but they also reduce opportunities for surprises and creative accidents to occur.

## Conclusion

Through presenting the findings from our ethnographic fieldwork with amateur photographers who engaged with film-based photography, we have seen the benefits that these photographers perceived through having manual control and engaging in certain manual processes of photography. However, we also see how automation benefitted some of them. In fact, if designers were to favour one over another, or – worse – to preclude one over the other, they will be depriving these photographers of valuable choices. The choice to turn to manual processes or automation, at least in what we observed with the photographers interviewed for this study, are determined by the situation, people's skills and comfort level, as well as people's goals and aspirations.

We argue that we should avoid simplistic binaries such as to include or to exclude automation when designing technologies that intervene in people's activities and practices. Instead, we need to be much more nuanced when discussing automation. For example, in photography, we need to discuss the extent of the automation. Are we talking about fully automating the entire process like what we have with point-and-shoot cameras or are we talking about automating some of the processes, such as developing the images? This means considering what is being automated and why. In technology design, we argue that much more thoughtful research needs to take place whereby automation should not just be the default stance. As the experiential data of our ethnographic fieldwork reveals, it is important to consider how automation can affect the people involved in the particular activities, the practices, the goals and so on. Through this, we hope that future technologies will not

only be easy to use but at the same time provide opportunities for people to engage actively with all their senses, to develop a greater appreciation of their activities, and also to experience technology as empowering, supportive of their goals and what they value.

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