



DProf thesis

The 'hybrid image practitioner' in Hong Kong; a critical review of technological developments and their impact on simultaneous creation of still and moving images

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The 'hybrid image practitioner' in Hong Kong; a critical review of technological developments and their impact on simultaneous creation of still and moving images.

A project submitted to Middlesex University in partial fulfilment of the requirement for the degree of Doctor of Professional Studies (Photography and Cinematography)

Middlesex University

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John Curran

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Abstract

The simultaneous gathering of still and moving images by the same professional (the hybrid image practitioner) is defined as a newly emerging role that has subsumed the skillsets and knowledge of the still and moving image practitioners to produce both from a new and unique viewpoint. This process has the potential to encompass dual roles through the use of new technology for the production of media content in a wide range of productions. Whilst the proof-of-concept of this approach has been promising, the viability of practice and the demand on practitioners is still not clear.

The primary aim of this project was to examine why, how and if practitioners and industry are producing both still and moving images within the same production with a particular focus and overview on the impact of lighting and technological change. To achieve this a mixed methods methodology gathered data across a questionnaire, interviews and case study.

Care was taken to ensure ethical practices, including anonymity and privacy of all participants, and to avoid researcher bias where possible throughout the project. With this in place the three data sources allowed a deep and triangulated insight into the process of change in the industry using qualitative and quantitative data gathered in the questionnaire, interviews and case study. This was then used to investigate the extent of change present in practice and the range of influences in the workplace affecting that change.

This project is the first doctoral research to investigate hybrid image production in Hong Kong. Data analysis led to findings and conclusions in practice and theory regarding hybrid image gathering. A new type of professional was proposed as a result – the hybrid image practitioner. A new concept for considering lighting practice was proposed and the use of assemblage theory as part of a conceptual framework for practitioner research was examined. This was illustrated with an assemblage of the hybrid image practitioner produced through the projects data and integration of theory. These areas led to a proposal for future research into an integration of still and moving image theory, and additional research into the aesthetics of hybrid image production.

The value of auto ethnographic research in periods of change, where other forms of data gathering may not be accessible, was used effectively through the project's changing nature as a result of the pandemic and social change in Hong Kong following the 2019 protests and ensuing legislative changes.

Primary findings in industry practice showed the significant impact of LED light sources and smartphones on image gathering and creative lighting for hybrid image production. A secondary finding regarding practice was the significant lack of lighting knowledge and use by new practitioners. Thirdly, the research showed that still and moving image professionals and industry in Hong Kong maintain a distinct separation of still and moving image gathering. This is a significant concern and perception would need to change before hybrid image production can become more effective.

1 Introduction, background, and context

Part 1 of the paper starts with an introduction of the project, a definition of the project's use of 'hybrid image production' and hybrid practitioner, and the project's purpose, aims and objectives. This section is followed by discussion of the project's intent in more detail, expanding on its purpose, aims and objectives, and includes a brief introduction to ethical design.

The relevant background on the significant challenges during the period of change the research occurred in and their significance to the project is then discussed. These changes include the new National Security Legislation in Hong Kong and restrictions as a result of the COVID-19 pandemic and their social and professional impact. The relevance of the researcher's professional background in connection with the project is also discussed.

The final section of part 1 then examines major areas of professional context including an overview of media production in Hong Kong and relevant government initiatives.

Introduction

Still and moving images have traditionally been produced by separate practitioners with discrete skill and knowledge sets. However, with recent technological advances the same device can now gather both image types and this has enabled practitioners to begin crossing between still and moving images in their professional practice.

The project aimed to examine technological impact on practice in hybrid image production. It provides an overview and analysis of technological change that impacts still and moving image creation. It examines how these changes impact practice in hybrid image production with a focus on the creation of still and moving images in the same setup on the same device and by the same professional. This process of hybrid image gathering raises many questions about the role of photographers and moving image practitioners which the project aims to provide insights into.

The project's focus arose from my observations of the changes in image gathering technology and how that was affecting professional practice. Lighting technology had changed rapidly, with advances in LED sources providing a wide range of low power high output mobile sources with a wide range of colour controls and integrated control technology.

Developments in camera technology delivered hybrid image devices to the professional workplace, beginning with DSLRs and then moving to mirrorless cameras and advances in mobile phone camera capabilities. Mobile phones then provided access to delivery platforms

such as Instagram, which were integrated with the gathering devices. This significantly changed how quickly images could be shared with clients and audiences.

In a very short period, both still and moving image creation, had shifted from separate professional spheres to conjoined roles, enabled for most of the population at the click of a button on the mobile device they carry with them every day. The shift in delivery and output options to social media platforms also changed the perception of image creation from an expert skill set to an integrated aspect of everyday communication.

With this shift in perception, the expectations of professionals delivering still images or moving images are that they can therefore deliver both. This expectation did, in some cases, drive client demand for delivery of both still and moving images in the same shoot or project, from the same professional without consideration of the additional aspects of the professional process.

The project aimed to gather insights from an array of sources and relevant participants, providing a breadth and depth of research within a Hong Kong media industry context, in order to provide valuable insights and potential recommendations for creative image professionals in Hong Kong.

Hybrid Image Production and the hybrid image practitioner

This project discusses hybrid image production and the hybrid image practitioner throughout and a short definition of their use is provided here. When the project refers to hybrid image production it is referring to the recording of still and moving images in the same place. This place is the professional setting of the practitioners work and will vary from project to project. It is also concerned primarily with this production of still and moving images by the same professional, the hybrid image practitioner. This hybrid role for the practitioner is enabled by devices that can record still and moving images equally well.

In summary, hybrid image production or hybrid image gathering refers to the capturing of still and moving images by the same professional (the hybrid image practitioner) on the same device in the same setting. The discussion of this process, including the impact of recent lighting and camera technology, is the focus of this project.

The hybrid image practitioner is a combination of previous roles that were previously separated by technology and practice. The gathering of still and moving images have been separate professional roles for the majority of the past one hundred years and only in the last decade has the shift to a new hybrid image practitioner role become viable. The research has showed that across a range of professional and non-professional roles the impetus to a hybrid image practitioner skillset and role is inevitable and in a range of cases already present in the workplace.

The hybrid image practitioner then is a new practitioner capable of producing still and moving images and in the same setting with the same image gathering device, whether that be a camera, or a camera integrated in a smartphone or other device.

Project Purpose, Aims and Objectives

Purpose

The purpose of this project was to review how and if the demand to produce still and moving images in the same shoot have changed the way freelancers work in Hong Kong. It asked if changes have prompted the stills photographers to learn video production and for moving image creators to produce still images, with a specific focus on the lighting aspects of that process. The project aimed to produce a set of guidelines for how lighting for stills and video at the same time can be achieved in the workplace and how it may be affected by further potential technical, creative, network, social and cultural developments. The project aimed to provide results that would allow the delivery of an effective proposal for the future image creation professional.

The research data examined technology and lighting for stills and moving images through documentary review including professional journals and academic journals. This was combined with practitioner questionnaire data and interviews with experts in the field. This was supported by an online questionnaire and a small case study allowing a mixed methods study of the practitioners and clients who are experiencing this changing practice most distinctly.

Aims

This project had two broad aims:

1. To critically evaluate image capture and lighting technology, together with approaches for gathering still and moving images, and analyse the differences to discover how they are similar and to what level they can be integrated into a single lighting schema.
2. To investigate production in Hong Kong that requires delivery of still and moving images at the same time and analyse how this affects lighting and shooting the final images to meet local industry expectations and assumptions around image and content.

Objectives

This project had five specific objectives:

- 1 To examine the technological difficulties of shooting both still and moving images simultaneously and to evaluate the effectiveness of this approach in delivering viable still and moving images for professional use.
- 2 To examine production of still and moving images within a Hong Kong context to establish cultural and social factors and expectations of the image, including the impact of social media and online communication.

3 To examine changes in image gathering technology and practice and its effect on the role and perception of the image creation professional.

4 To identify the changing lighting equipment and relevant technique requirements of professionals involved in image creation using photographic and moving images.

5 To identify and analyse specific lighting approaches that can deliver professional results when simultaneously delivering still and moving images.

Research questions

To address the projects aims it attempted to answer the following key research questions:

1. How and why are practitioners using lighting techniques and modifiers when aiming to gather stills and video from the same shoot?
 - a. This research question gathered insight into how current techniques and modifiers are similar across the two approaches. This allowed further data to be gathered to assess the viability of the approaches for gathering still and moving images in the same situation.
2. How do lighting and camera technologies make the gathering of stills and videos from the same setup achievable for professional practitioners?
 - a. This question allowed the research project to assess what lighting and camera technologies enabled the gathering of still and moving images from the same setup. This data allowed for analysis and assessment based on additional sample images that can be examined through the staged data gathering process to discover which technologies, if any, are enabling the two approaches to be blended.
3. Why and how have practitioners and clients moved to deciding the types of shoots likely to be achieved using a hybrid approach?
 - a. This research question allowed the discovery of factors that can limit the real-world use of the technologies assessed with research question 2. It allowed the project to discuss which lighting techniques are suitable and the contexts in which lighting techniques can be used.
4. How does delivering stills and video from the same shoot (hybrid gathering) affect the professional practitioner?
 - a. The research project examined and analysed an image gathering paradigm shift that is already affecting a range of image creation professionals and has the potential to affect an even greater number in the future. This research question focused on analysing the direct effect on their working practices and the very definition of what an image creation professional is.
5. How does working in image creation in Hong Kong, an international city, affect shoots that require the production of stills and video and why have recent changes affected the sample groups within Hong Kong.
 - a. The impact of the cultural impact on expectations and practices from practitioners and clients on demand for dual gathering was examined to validate the project in the

professional workspace. This research question examined this fundamental aspect of workplace change.

Project intent

To be of value to practitioners I wanted the project to review the changing demands on professionals in still and image creation in Hong Kong. There would be a specific focus on the demands of hybrid production and lighting approaches for that type of production. With my experience of filming and shooting the still and moving image for almost three decades, with the last decade in Hong Kong, I wanted to understand how technological developments and other factors were changing this area and how professionals were responding. I hoped the project would provide insight into what the new demands on practitioners were and whether those demands are achievable.

As a practitioner I knew that the image was not produced in isolation but as a result of multiple interactions between professionals' creativity and interactions with clients and technology. I had used new technology almost daily in the hybrid production process and wanted to investigate if and how the technology had a significant impact on the role and its demands. This included technological changes in camera technology, lighting, mobile technology and modern image focused social networks.

My professional experience with hybrid image creation and traditional still and moving image production provided an insight that lighting would be a significant challenge in this transition. How professionals lit for stills and video at the same time and what those industry professionals thought about would therefore be of primary importance to investigate. Combined with observations and insight into the technological change already mentioned, a valuable picture of change could be gathered. With support from industry research and theoretical insight I aimed to provide some suggested approaches for a combined approach to still and moving image creation.

This project then set out to ask how these technological changes were affecting the professional image creator in changing photographic and lighting approaches for image creation in hybrid scenarios. In the process of gathering that data the research encountered the question of how this affects the image practitioner and asked where do we go next as professionals? What is the future for professional image creators? Will there in most cases be no specialist? Have we all become enabled professionals?

To see how change affects the lighting of an image the project focused research on where still and moving image creation is now and where it is likely to go. It aimed to deliver recommendations for moving forwards with image production in a rapidly changing industry. The context of the project examined impact on the professional within the Hong Kong area, focused primarily on the role of image creators working in relevant production areas where hybrid gathering was more likely to occur.

The changes in demand, expectations and practices have affected two groups of practitioners involved in image capture probably more than any others: photographers and

videographers. Many photographers have accepted video as an inseparable part of their future toolkit (Dutile, 2016). A third group has also seen the increased demand for gathering both still and video at the same time; journalists (Costa, 2012). These groups composed the primary practitioner sample groups for the survey and case study, with other related industry professionals composing a section of the interviews.

Much of my expertise and experience in Hong Kong was in these areas and this defined a separate range of factors that impact the professional amid the contextual factors within the project's analysis.

The project reviewed how and if the demands to produce still and moving images in the same shoot have changed the way freelancers work in Hong Kong and whether more projects have specifically required stills photographers to learn video production and for moving image creators to produce still images.

The research examined lighting for stills and moving images through documentary review, including academic journals, professional journals, online discussions, moving image content, questionnaire data and interviews with experts in the field. This was supported by a questionnaire and small case study allowing a mixed methods study of the practitioners and clients that most directly are experiencing this changing practice, together with additional data from camera and lighting equipment manufacturers.

Assemblage and the creative image practitioner

The creative image practitioner is reliant on the interaction of many factors from artistic vision to client demands and technological capabilities. Technology brings new possibilities with each new development to the image, not in isolation but as a result of interaction between multiple factors from physical objects to artistic inspiration.

At a very practical level the shot and the practitioners' thinking and the production space around the shot are an assemblage of interacting elements. Each interaction creates new capacities for the practitioner and the object/image, from lighting, to colours in the scene and on objects, to refraction through the atmosphere. Our creativity draws from lens design to the physics of light on surfaces, from the iridescent shimmer of an insect wing to rainbow in oil on water. As practitioners we have to build an innate understanding of these interactions to allow us to build the world each image requires.

‘They all (films) have a definite identifiable universe in which they exist: it consists of the locations, the sets, the wardrobe, even the sounds, but to a large extent these visual worlds are created through the cinematography. All these elements work together. Everything in visual storytelling is interrelated.’ (Brown, 2011, p. 17)

This view of the image and the practitioner by practitioners gained through experience makes an ontological framework of interactions and generated possibilities particularly

relevant and accessible for the intended participants and recipients of recommendations from the research. This makes assemblage theory's territorialization process with new capacities generated by active interactions between elements (DeLanda, 2016) particularly effective in visualising social constructs (DeLanda, 2006) in a manner that image creators will find intuitively attractive.

Later, In the literature review, valuable insights from assemblage as part of a conceptual framework (Antczak and Beaudry, 2019) helped provide a foundation for its application in this project. This enabled the project's conclusion to include changes in the practitioner role visualisation and equally potential new applications using assemblage theory as an element of a conceptual framework for a creative assemblage. We also see how assemblage is being used in application to an assemblage of practice by Ureta (2014), which illustrates a starting point for its effective use in practitioner research.

Rationale and Scope of the Investigation

Over the last decade there has been much discussion in professional circles and even non-professional circles around the ongoing changes in image creation tools. How do these technologies affect image creators from the more serious amateur, the average person posting on social media and the professional working on commercial projects. (Yoshida, 2019)

My own professional experience as a lighting camera person and director of photography, as well as my work as a shooting director and producer, allowed me to see and experience the changes as they happened. I could also examine my own practice to consider where the industry was going in the future. In my early moving image career, the skills and knowledge I had gained during my years taking still images informed my lighting and composition. These skills were then expanded with motion and the sequenced temporal aspects of moving image production. It also added the additional considerations of the image as one aspect of the final production and its relationship to the other aspects such as sound and graphics.

As the technology arrived that allowed both still and moving images to be captured by the same device, the hybridity of new roles was one I found fascinating and embraced for my career. It was also key developments in this technology that would create huge impact in areas of the image making industry and lead many practitioners and observers to point to its destruction of the photojournalist among other roles. (Costa, 2012)

But while there has been much discussion there is little thorough research in the area and even less in lighting for hybrid image creation approaches. Manufacturers of lighting sources are creating a range of LED sources using a wide array of approaches that have a direct effect on the ability of the image creators to attain lighting appropriate to their projects. In addition, image creators are finding new and unexpected ways to use them (Van Helder, 2020).

With these changes in image capture and illumination technology the potential for hybrid image creators to attain valid results continues to increase and this project aimed to investigate where, how and if the role of the hybrid image creator is a growing aspect of the industry. Through the active discussion with industry professionals and clients it aimed to examine what

the difficulties and benefits are in a hybrid image creator approach and how technology can assist, hinder or be the inciting factor in its continued importance.

The project aimed to examine the impact on the image creating industries and professionals in Hong Kong who work in those areas and study how, at practical levels, experience and theory can combine across artistic and technical arenas to allow the technology-based image creator to deliver in this rapidly changing sphere.

Ethical design

Throughout the process of research design and undertaking, ethical considerations guided the process. Efforts were taken at all stages to ensure all participants had clear engagement. All data gathered in the project was kept anonymous and secure with as little possibility of recognition through data analysis when presented in the project. A more detailed discussion of the ethical considerations and design and undertaking are given in the ethics section later in the methodology discussion.

The project was designed to meet Middlesex University ethics requirements and data gathered is to be kept secure and anonymous as required under the university's adherence to the EU data privacy regulations, (Mondschein and Monda, 2018). During the process participants were informed of the project's purpose and the use of their data. All participation was voluntary, and participants were informed of their ability to withdraw from the research at any point with their participation being kept secure and anonymous. If participants withdrew all of their data would be removed from the project. Examples of the data gathering form in the appendices section 8 illustrate this design.

Care was taken to ensure that the responsibility of the doctoral researcher, the application of ethical design and interaction with the participants, both before and after their data was gathered, would function as a care-based approach. I felt a particular moral obligation to ensure the research provided the very best care for the participants beyond the well-defined doctoral responsibility. This approach delivered a more care-based approach than the legal responsibilities considered in media production when planning for rights access to participants and interviewees.

Benefits of research for the practitioner/researcher

A Doctoral research project is not something undertaken without a concrete reason to do so. The doctoral research process planned to bring significant benefits to my knowledge and practice, with additions and developments to my professional network as major areas of beneficial impact throughout the programme (Miller, 2019). It would provide new knowledge and skills applicable in my professional work and academic work, from research skills to a leading knowledge of technological developments for hybrid gathering.

Along with planning for professional interactions and ensuring their effective and ethical undertaking, it was equally important to plan for the extended period of a doctoral project. This included planning for personal time management as it is challenging to maintain focus across

such a long period. This planning, structuring and delivery of such a long-term project would also bring new organisational skills, knowledge and insights for my future (Bradley, 2022).

I also expected to gain a degree of personal insight as the reflective manner of practitioner research required asking questions about oneself that would not normally be asked or answered. The reflection in my MProf taught me how valuable this aspect of work-based learning can be.

Choosing a practitioner research project and work-based learning

The application of a work-based learning doctoral research project was both professionally and experientially suitable for my research. I have worked as a television professional and as an academic for almost thirty years and as a photographer for even longer. Alongside that image creation work I delivered multiple training programmes for professionals and those beginning those careers from CPD to undergraduate and postgraduate courses.

During the majority of the past decade, I have also been delivering work-based learning programmes in Hong Kong within my work as an academic. The experience of working with students delivering practitioner-based projects gave me a clear insight into how effective the process can be in analysing the workplace.

The insights gained from operating as a worker researcher and becoming an active reflective practitioner (Schon, 2017) can lead to direct actions and the possibility of the researcher/practitioner becoming an active agent of change in the industry to produce new knowledge that is likely to be trans-disciplinary in nature (Garnet, 2009).

As a practitioner research project would require interaction with many colleagues in a new and formal manner, I planned to maintain my professional identity and be open to personal insights through the research process and change of interactions with colleagues. These insights would hopefully benefit from the insider researcher position to provide deeper analysis of my professional identity and the associated roles of the broader image creation professional.

I planned these interactions with other image professionals aware that I would be changing from colleague to insider researcher and back again. I hoped these new interactions would provide insights otherwise unattainable from an external researcher. I also expected these changes in perception to allow me to interact in new ways and promote the building of existing professional networks and relationships with the research.

Indeed, the project nature crosses a range of disciplines as I believe most workplace developments in higher level areas of research must in today's rapidly developing networked business place and a work-based approach is therefore highly relevant and suitable.

'WBL is concerned with knowledge, which is often unsystematic, socially constructed and is action focused in order to achieve outcomes of significance to work.' (Garnet, 2016, p. 305).

The project examined recent changes within my professional sphere as a moving image and still image creator. The change in technology, social expectation, civil change and practice has occurred at a rapid pace, needing new insights from analysis across technological developments, artistic intent and interpretation, interpersonal communication and networked environments reacting to a real world. With creative professionals reacting to restrict or expand their creativity within existing definitions of their creative roles. This complex interwoven development needed a reflective and integrative answer to its recommendations for change which the trans-disciplinary nature of work-based learning lends itself to.

‘Transdisciplinarity is concerned with creating new integrative knowledge to address the complex problems of the world...’(McGregor,2015, p.9) and ‘Such a transdisciplinary lens on the world has the potential to open our eyes to multiple realities and thus suggests how we might better understand the complexities and contradictions of our world.’ (Garnet, 2016, p. 309).

The appeal for a practitioner of a practice led programme was also that it ‘feels’ to be an active part of the work process. It allowed the observations, considerations of change, and moment to moment advances in knowledge and experience that have occurred within a professional environment to be valued and to produce applicable responses to be distributed to a wider professional audience.

‘Practice-based and practice-led doctoral programmes, in which knowledge production, knowledge management and research processes are tied with the context of their application, prove to be more responsive to the fluid character of knowledge creation that characterises the contemporary world.’ (Costley and Pizzolato, 2018, p. 5).

It allowed myself as researcher and practitioner to make significant changes to aspects of my workplace and to have that change help transform the professional space that I and other practitioners live in. The development of answers to active problems and developments in the workplace through the application of a range of research tools that are suitable to the problem is consistent with professional practice with its pre-emptive response to addressing those problems whenever possible.

‘Transforming a ‘real-world’ situation through research is a key aspect of professional doctorates where candidates work at the interface between situated practice and academia. As the projects are often problem-focused and/or creative in nature they do contain at the onset, an analysis of the expected impact upon communities of practice, the professional field, and society as a whole.’ (Costley and Pizzolato, 2018, pp. 8-9).

The choice to use a work-based learning (WBL) programme of study is also cohesive with my own ethical viewpoint. With the output of my project aimed at informing a wide audience of peers and newly engaged professionals of beneficial information and practices. This position of sharing, social engagement and benefits to other professionals and academics has always been central to my working life. I value this shared knowledge transference in the workplace as more beneficial to everyone than intellectual protectionism and profitability in a competitive market. I believe that knowledge should be shared with others, and it is a position I have acted on throughout my career. This moral characteristic is central to my belief system that we are and should be inclusive in all aspects of life, education and sharing of knowledge. This makes the decision to undertake an WBL programme a logical progression as WBL can be one way to deliver inclusive education as Nikolou Walker discusses:

“It is believed by some scholars that the concept of inclusive education can be realised through WBL. Its programmes are structured upon the premise of learning partnerships. The make-up of these partnerships can be tailored to the individual and consists of various stakeholders. (i.e., “student”, “teacher”, “parent”, “employers” ...)” (Nikolou-Walker, 2019, p.91).

Background

Professional Background

Throughout and beyond the research the role of image creator as part of my identity has informed my experience of my practice and interaction with others but also with my perception of the world around me. I spend a large amount of time assessing what I see from the viewpoint of the camera and that learning, both conceptually and corporeally, informs multiple layers of my professionalism and practice that are challenged by developments investigated in the research.

At the same time as these tidal shifts in image creation were happening, I moved to Hong Kong and continued working as a freelance camera person for news organisations and corporate production teams. I brought a set of cultural expectations with me around my work and rapidly discovered a place surprisingly similar and different in its concept of image use, image quality, production processes and social norms. A city where couples would have both pre, during, and post wedding photos and videos produced. A city where media production was considerably looked down on as a career and where I would discover entire undergraduate student bodies studying journalism with no interest or intent in pursuing a career in media at all. At the same time, I found a cultural and social richness of image and image/text creation and a body of talent that came to the image creation process from a very different viewpoint than my own.

The following decade saw changes in the professional role because of demand driven by impact from changes in perceptions of image creation and delivery in Hong Kong and on social media platforms/mobile devices. Clients began, slowly at first, to ask for stills and moving images. Journalists I worked with explained that having a camera person was a rarity and journalists would gather still and video content by themselves on stories in most cases. These demands and expectations have just increased in certain types of productions over time and as mobile devices continually improve through technical and software including AI and post processing and AI and in-device processing to achieve results beyond the physical capabilities of the initial capture device. We cannot also ignore recent cultural and social changes in Hong Kong including the protests and nature of images in the protests and the creation of those images by 'amateur' and 'professional'.

In my time creating images, both still and moving, the world has changed. When I started taking photographs, still images were only recorded using film. Film that ranged in size from 110 film cartridges to large format (9x12 inches) and from processed negative and positive to instant film.

The physicality of the image was never conceptual and always present as I handled the camera, loaded the film and exposed by it, to develop, whether by using a 35mm drum developer, or shaking an instant sheet to the reveal the image slowly forming, or laying a large 120 or (9x12) sheet in a developing tray. And then I could print (if needed) or just take the image and would hold a physical image as a permanent representation of that fluid temporal moment.

I later worked as a photographer and then moved into television production and have worked as a lighting director and Director of Photography for over 20 years. During my career I built knowledge and expertise in a wide range of technical and artistic areas. Within image creation in still and moving images that expertise encompassed technical knowledge including lighting and camera use. These necessary skills included film and sensor response characteristics to evaluate and predict how the image would look in terms of colour rendition and dynamic range.

This would be further controlled using on-camera filters, including neutral density filters to position scene illumination within the optimal range for the sensor or filmstock being used. The relevant calculations for exposure would be used to add reliability to production of the desired image and help decide on the type of filtration needed on the camera or on the light sources. This would combine with knowledge of lighting sources and their output characteristics, control and power requirements to decide on the effective use in each production instance.

For this to work choices would be made using knowledge of those lighting characteristics and control of them using colour 'gels' (plastic sheet placed in front of lights) and glass filters on some fixtures to achieve the desired colours and illumination on the subjects and in the scene. These choices were made through application of aesthetic appreciation and calculations from the physics of light output to electrical supply calculations.

Electrical calculations in these instances were required to control supply characteristics for incandescent lights to avoid unexpected colour change if the voltage dropped over a cable run, which would be affected depending on cable type and length. Knowing and using the relevant

calculations was an active part of productions with lights using high voltage and power requirements. A location shoot would need to assess local supplies or generator capacities and studio productions would need to assess power draw of multiple fixtures and the impact on the dimmers being used.

This wide range of technical and practical knowledge and skills was always used in pursuit of the creative vision. In each case, whether deciding on the equipment for a single camera shoot or designing a studio complex capable of multi-camera shoots with hundreds of lights, the knowledge of creative possibility from technical capability was always applied. This enabled my career to range from location news and documentary production to live multi-camera studio work and large visual effects projects.

Technology has changed so much that, using current broadcast camera equipment and modern lighting, I can take all my equipment for a factual shoot in a wheeled camera bag and a tripod bag where when I started if I needed to light anything I would have at least an estate car full of equipment and often would need a lighting truck to bring everything I needed. The physicality of the image was still in place, although one step removed as I would film on tape and need to transfer that tape to another and use a tape deck to physically play it in post-production. By the time I had moved to Hong Kong the image was ephemeral, digital and virtual. I would film digital files and transfer them by computer to the internet for clients who I would never physically see. This was mirrored in the commercial world as YouTube, Flickr and countless other sites became Facebook, WhatsApp, and Instagram.

The phone then became a viable production tool where I could write, film, edit and distribute and communicate along with the rest of the world and I asked myself where the line was now between the professional and the amateur. These developments raised many questions for the still and moving image creator with developments and changes within the video production and stills industry during the last decade, introducing new demands and approaches from individual project content and cross-project collaboration in journalism (Perreault and Stanfield, 2019).

With technology enabling still and moving image capture on a single device and social media making the distribution easy, public perception has shifted to assume that such image creation must be easy. A consequence of this perception is increased demand over a wide range of client groups, but largely corporate clients and news organisations, who are increasing their demand more significantly than other sectors (Sony, 2018) and here is where the project is focused.

My professional experience in still and moving images for the last thirty years gives me a unique expertise and insight into this research area. I began as a photographic laboratory technician and stills photographer and after five years moved into television production as a lighting camera person. My career in television developed my image creating and lighting as a Director of Photography (DOP) and a Lighting Director (LD). It should be noted that in the United Kingdom a Director of Photography is the camera person in charge of lighting and filming, in control of the look of the programme and in charge of the other camera operators in multi camera shoots. A Lighting Director designs the lighting for multi-camera, typically studio-based programmes.

The experience and day to day working with lights and image in these years gave me a detailed understanding of the two areas and a skill set that allowed me to deliver a wide range of creative project briefs from entertainment programmes to drama, documentary and music. This experience would shape my future as a Studio Director, LD and DOP and as an educator in the rapidly changing industry.

My work as DOP and LD let me produce work that was broadcast on BBC, Channel 4, ITV, and Sky 1 as well as a range of other digital channels. My professional work allowed me to have membership of BECTU as a freelancer and my L.D. work gave me membership of the Society of Television Lighting Directors (STLD). I filmed all the content for one of the first winners of the interactive BAFTA and moved from Camera and Lighting for a period to Head of Studio Directors for Ideal Shopping which, at the time, was one of the largest digital and cable channels broadcasting in the UK.

Working in the industry as the changes in technology and practice happened, with early insight into the coming changes I designed and wrote the BA Television Production degree which would become the beginnings of the Television Studies department at Middlesex University. After a period away from the university, where my professional experience continued to cross between academia and professional practice as the head of vocational training for a large west London charity that delivered training to industry practitioners and refugees and asylum seekers, I returned to Middlesex University and with colleagues added BA Television Journalism to the TV Studies department followed by BA Television Production Technical arts, which I created and ran as programme leader, between 2005 and 2010.

An important reason for the development of the programme was change in the television production industry, where small multi-skilled teams were delivering programmes usually reserved for larger production teams. At the time media, television and film courses in the UK were focused on established practice and separation of roles from production to technical. Multi Skilled teams needed to have a range of skills across these areas to function effectively and the BA Television was designed to help new entrants develop these skills.

Even with this degree of convergence in roles occurring within television production thanks to developments in video camera technology a similar convergence between still and moving images was not yet occurring. Similarly in lighting technology the shift to LEDs that would be so significant later had not occurred yet although a few very expensive low power LEDs were making their presence felt in feature film production. (Litepanels, 2020).

This first fifteen years of moving image production gave me a wide range of experience in lighting from large- and small-scale studio productions to large- and small-scale location shoots. I worked on documentaries, news, drama, music and corporate content and each added new skills in lighting and shooting techniques. As mentioned previously this period had a degree of significant role convergence enabling small video production teams to deliver entire programmes in ways not possible on the same scale before. In lighting however this convergence had not really happened.

Studio lighting systems allowed the installation of complex power distribution and control systems for incandescent lights and for intelligent motorised moving head fixtures. These

power and control systems were not possible on small scale productions so the approach to location lighting was still very different to that of lighting in a studio complex.

On some studio productions I had hundreds of fixtures running and drawing hundreds of amps of power from dedicated mains supplies to racks of dimmers all controlled through advanced lighting desks enabling shows from pre-recorded to live content to be produced. Location lighting setups productions would typically be limited to the power supply of a domestic feed typically a maximum of 30 amps in the UK which only allowed a few lights to be used at any one time without blowing fuses. These power limitations alone separated approaches that smaller crews could undertake with their lighting.

Studio productions for television were also typically multi camera productions which required a different approach to lighting than the single camera approach used on location. As cameras would range around the studio set and gather a wide range of shots from close-up to wide shots of the entire set, lights needed to be rigged above and beyond the limits of the shots.

This limited the type of fixtures that could be used to fixtures with long throws and tightly controlled beam angles. In many cases this would be delivered using Fresnel fixtures whose beam could be varied and cut effectively with barn doors to illuminate only the areas it was required to illuminate. This affected the look of lighting on faces and surfaces as almost all light sources used in these setups would deliver hard light with clean edged shadows. Often combined with a 'standard' three-point lighting approach using a key, fill and back light in each studio subject position to control lighting contrast on the subject and help add separation in the image from the background many studio productions had a similar feel.

To try and get away from this look in one studio production I rigged the entire studio front with a 20-metre x 5 metre diffusion panel and then lit that entire panel with multiple sources to produce a single soft light source that felt more like daylight than artificial light when filmed.

In location lighting the limitations of power and control systems were compensated for with the flexibility of lighting positioning and size relative to the subject. As the camera could be moved close to the subject and did not need to avoid other cameras the light source could also be brought as close as required to the subject. The size of the light and distance to the subject could also be altered as required allowing a much wider range of light looks from distant hard light to close large soft light.

With power demands of lighting sources changing with the recent developments in LED sources and the integration of control systems these differences, although still present, are potentially changing in the future as I discuss later in the project.

After leaving the United Kingdom for Hong Kong in 2010 I worked as a freelance DOP and Lighting camera person as well as a shooting director/producer. My work in Hong Kong covered news content, documentaries and corporate productions. During this time, I increasingly used DSLR cameras for video in corporate and documentary work, despite their failings which included largely non par focal lenses and difficulty in producing broadcast quality audio without external audio recorders.

Working in Hong Kong on my arrival was a surprise in many ways. I had an image of Hong Kong as a leading-edge technological city and rapidly discovered that was not the case. When I started getting freelance work CNN were still shooting on Beta SX, a digital tape format that Sony had tried unsuccessfully to market as the successor to Beta SP. Beta SP had been the analogue videotape format of choice for news organisations and corporate productions worldwide during the 90's and early 2000's. However, Beta SX was limited to SD resolution images in a world that had moved to HD and FULL HD recording and delivery and already begun to step away from tape as a recording medium to solid state formats such as P2 from Panasonic and, what would really drive the death of tape, Sony's own XDCAM format which was stored on a range of media from magnetic disk to random-access solid-state storage.

CNN were not the only company that had invested in old technology and were slow to move forwards. ATV and TVB were largely still producing in SD and on tape and some cable channels were even editing on tape using tape to tape edit machines rather than nonlinear systems. In addition to my work as a filmmaker I ran a range of academic programmes in Hong Kong with a focus on media production and professional development. For Middlesex University's East Asia Work Based Learning Centre (EAWBLC) I ran the MA WBL in Photography as programme leader where a range of professional photographers produced real world research projects in Photography in Hong Kong. I also ran Journalism programmes for the University of Canberra at Lingnan University. As well as my higher education programmes I ran CPD courses in Camera Lighting and Colour Grading for professionals and ran workshops and sessions as a media consultant for Baptists University and several Corporate entities among others.

In 2015 I suffered a stroke because of a carotid dissection which left me with a potential for a higher risk of further strokes and forced me to rethink my career at the time. I had spent the majority of the previous two decades developing as a camera person and lighting person and most of my freelance work in Hong Kong involved using ENG style cameras and heavy broadcast video tripods in addition to large amounts of lighting equipment. With the risk of additional strokes increased if combined with weight on my right shoulder (where an ENG camera is placed when operating handheld) I looked at options that could reduce weight for camera and lighting equipment.

The changes in equipment that had occurred over the previous decade with the ability for small DSLR and mirrorless cameras to shoot video had already moved a significant amount of my b-camera filming to using the smaller equipment and so I moved my A and B camera equipment to small mirrorless bodies. I also moved my lighting equipment to reflectors and largely supplemental lighting units that could shape and accentuate existing lighting rather than produce a new lighting schema separate from the real world. This approach was further enabled through the introduction of high CRI small LED units with either small battery power or with built-in batteries.

During this period, I also began to gather requests from clients for still and moving images a link that I always intuitively linked across many aspects in my practice. This increase in hybrid gathering became the seed that grew into the research tree for this project.

Technology, the image and creative intent

For over a hundred years, photographic still images and photographic moving images have been captured and shared with other people. From family to colleagues to galleries, theatrical audiences, broadcast television viewers and the online audience images have been viewed the world over.

From the early experiments in photography represented by "View from the Window at Le Gras" (1826) by French photographer pioneer Joseph Nicéphore Niépce (Marignier, 1990) the photograph became a worldwide success. The Lumiere brothers first theatrical showing in 1895 followed quickly by early television experiments in the late 1800's and early 1900's allowed the moving image to bring a new visual perspective alongside the photograph. The dream of communicating through a 'realistic' rendering of our world became a reality that in a short time spawned new areas of creativity and industry.

The process of photographic, cinematic and televisual image capture can be seen as a purely mechanical process that captures an unambiguous record of the real world and it was often viewed as such during photography's early years (Lerner, 2014). Others equally argued that from painting on cave walls to painting with oils and canvas and photography, the still image has always involved being an expression of the individual (Kriebel, 2007).

During the early history its creative and representative possibilities became clear to many artists and creative individuals and photography became a mode of artistic output (Sontag, 2008). The following decades separated the amateur photographer and home film maker from the professional photographer and cinematographer and later the television camera crew. A professional had access to equipment, knowledge, processes, access and entire industries of support to create images that the amateur could rarely achieve. This built careers and industries that are still in place today but are suddenly shifting in unexpected ways. (Moyer, 2009)

After decades of mass media broadcast television and theatrical productions the internet and the world wide web arrived. First a curiosity for the computer literate few, in a surprisingly short time it became a media platform seemingly controlled by individuals rather than large organisations (Lemind, 2021).

With the unforeseen rise of social media and ease of navigation through the world wide web it rapidly provided engagement for a mass audience that spanned the globe. Access to handheld, network enabled devices (smartphones) capable of image capture, with accessible interfaces and advances in ease of use allowing so many more people to express themselves visually. Combined with their ability for media consumption and network distribution, they provided a mass audience and content creator network for a multitude of competing platforms. (Morozov, 2012) We had arrived where the communication platform was at a scale unlike anything the world had seen before with the rapid rise of social media platforms that would be dominated by a few:

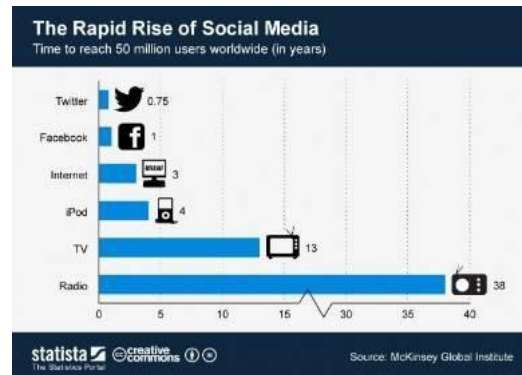


Figure 1: (Mckinsie global/statista,2012)

Throughout this transition the image became central to online communication once the world wide web was the predominant online communication system (Luis, 2019). Professionals grappled with the low resolution of early digital cameras and upload speeds that would sometimes require minutes to transmit a single image. As both increased still and moving images became viable to upload and view on the world wide web.

Image professionals became requested to deliver to online platforms and now most of the content is delivered for viewing online and expected to be viewed on mobile devices. This has changed image criteria to be more accessible on these devices including vertical frame composition where data showed higher viewing rates for online content in this format (Allen, 2017).

The medium has changed but the demand for the image maker to embrace new skills and technology continues. Each new rapid development challenges them to see its potential for a new image or to enable delivery of expected images in new ways. They continue to see their intent as the creative moment independent of the technology being used but working in cert with it. From positioning of the camera to controlling the lighting, exposure of the image and post-production they create the image using their creativity with new technology. Hopefully this project can provide insight into both the technological developments and the potential for creativity with them.

Positionality

My positionality has been shaped through my experiences in personal and professional life. The last two decades of my professional work was split between still and moving image production with a parallel career in education. This was largely focused on vocational education or higher education programmes with a high level of industry synchronicity. In addition to this

the last decade has allowed my development of work-based learning education as both a student and lecturer, enabling me to assess my position as a work-based learner.

The work-based learning experience allowed me to see myself as an insider-researcher (Costley *et al.*, 2010). I could draw on the shared language, social and professional cues and insights that operate on an unsaid level within my area of practice and among the variety of colleagues that I worked with. I work within shared areas of trust that have been developed with colleagues and this positioned me to gather information within that expectation of trust (Costley *et al.*, 2010). I also acted as a practitioner researcher where the research was undertaken by myself as a practitioner and occurred in a manner that was under my control within my practice. This allowed insights that would have been difficult to gather from a non-practitioner position (Schon, 2017).

My interactions as a professional and as an educator let me see ways of connecting theory and discussion to practise and examining the interconnections between areas of professional practice. This is one of the reasons that Delanda's development of Deleuze and Guattari's assemblage theory appealed to me as an ontological position. It was a key reason to examine the way we as professionals construct still, moving and hybrid images through the process of conception, action and delivery.

More than two decades of working as an image creator has been driven by a fascination and passion and curiosity for creating those images. This was one of the key motivations for my focus on this developing area of practice change. The area of change also affected my own practice directly and the process of research allowed me to develop further in my practice while furthering my career knowledge and insights to benefit myself and other practitioners. With a career that had always paralleled academia and professional image production, gaining a doctorate was also a valuable progression for myself within academia and in my role as a media consultant.

I am fundamentally a camera person. It has become a part of my identity as it does with so many other image creators and it is from this position and with a passion born of the creative soul that I entered this research project.

2 Context

Introduction

The following section begins with an outline of the social changes in Hong Kong as a result of the 2019 protests against extradition law and the subsequent implementation of the Nation Security Legislation. These are related directly to their effect on media and press freedom and production in Hong Kong.

This is followed by an account of the project's response to change during its undertaking. This context relates the project undertaking to changes in Hong Kong relating to changes at an organisational level with Middlesex university in Hong Kong, at a local level with the Hong Kong protests and resulting legislative and social change and at a global level with the impact of Covid 19 on the project.

A brief introduction is given to Hong Kong's unique position in relation to China and the West which is then followed by other major areas of context relevant to the project. These include the Freelance Professional and SMEs in media production in Hong Kong, and their involvement in the projects and insight into the needs of the project.

Technological change is then discussed to provide an overview of major areas of impact in the project area. This is followed by an overview of online use and media consumption change in Hong Kong. Media production in Hong Kong provides an overview of the industry in Hong Kong and Government initiatives regarding production and role establishment. This includes areas of television and film in Hong Kong and the links between media in Hong Kong and mainland China.

The context of this project will focus on areas that influence and can be influenced by changes in professional practice and the new insights gained through the research. This will cover technological change, Media consumption change, media distribution change and media production norms in Hong Kong. These areas provide interconnected aspects of media production where still and moving images are in high demand.

Social change and its effect on the media

Any project examining aspects of communication in Hong Kong cannot ignore the effect of the cultural shifts that happened during 2019. The Hong Kong protests serve as an example of shifting perceptions and placements from diametrically opposed social constructs. Who tells the story of Hong Kong? How does the still and moving image get expropriated among the rapidly changing messages in a social media conflict. And 'whose' voice is shown to be unsupported compared with presented interpretation of the images in and after the fact.

Journalists, camera people, protestors, police, security systems and even the PLA created content portraying different views on the context. This played locally and on a wider global scale with Twitter reporting having to close over 900 Chinese state-backed accounts alone

(Twitter Safety, 2019). These outputs and messaging used the still and moving image as the starting point of strands of communication and demonstrated the importance of the image producers, professional or otherwise. As Veneti, Karadimitriou and Poulakidakos point out with reference to the 2014 umbrella protests.

‘...the protests’ momentum, the media systems, the new information communication technologies, and certain geopolitical interests—are involved in the dynamics surrounding media coverage of protests and as such they greatly influence the framing process’ (Veneti *et al.*, 2006, p. 1).

After June 2020 the implementation of the national security law and the resulting procedures imposed made a significant impact on media production. This included the registration of acceptable media companies under the Government News and Media System (GNMIS) and police no longer recognising local press accreditation. University of Hong Kong student Thomas Yau Chin-pang, chairman of the student union’s Campus TV, said the change would make things harder for student reporters.

“Originally, the police general orders said media representatives include TV reporters, and we have argued with policemen that we are indeed TV reporters,” Yau said. “Sometimes police officers refused to accept our argument. They [the police] said TV reporters referred to those employed, registered with the GIS, or are members of HKJA. Now it’s definitely much harder for us to make our case.” (Leung, 2020, p. 1).

These changes increased pressure on Journalists to self-censor even after assurances that freedom of the press would be retained in Hong Kong with the National Security legislation in place. The arrests of significant media figures only increased this need to self-censor, and this seemed only likely to increase as the validity of the media professional identity became dependent on the police recognition. Christy Leung of the SCMP explained the changes in media recognition.

‘Before the revision, media representatives were defined as reporters, photographers and television crews in possession of proof of identity issued by individual newspapers, agencies, TV and radio stations, or a membership card issued by the Hong Kong Journalists Association (HKJA) or Hong Kong Press Photographers Association. The revamped edition redefines the category as reporters, photographers and television crews in possession of identification issued by media agencies registered under the Government News and Media Information System (GNMIS), or internationally recognised and reputable non-local news agencies, newspapers, magazines, radio and television broadcasters. That means those who hold only a membership card issued by the HKJA or Hong

Kong Press Photographers Association no longer qualify as media representatives.' (Leung, 2020, p. 2).

This change increased the pressure on media freelancers, student reporters and unregistered online media outlets, some of whom relied on membership cards issued by the Hong Kong Journalists Association (HKJA) or the Hong Kong Press Photographers Association (HKPPA). The association also issued membership cards to trainees, or students training in journalism or serving a form of apprenticeship.

Pressure on journalists to self-censor did indeed continue as cases against voices in opposition and in reporting opposition viewpoints increased under NSL legislation and caused large changes in the Hong Kong media landscape. The HKJA commented on the decrease in press freedom as the international Federation of Journalists reported:

'In a statement, the HKJA said that the closure of Apple Daily and Stand News in June and December last year respectively, as well as the persecution of the association's staff, were key factors contributing to the decline.' (IFJ, 2022, p. 1)

From protests to covid and the impact on productions

Throughout the start of the project social factors in Hong Kong changed significantly as a result of two major changes. As mentioned in the previous section social unrest and protests at the Hong Kong government were ongoing since June 2019 and resulted in the NSL. This combined with the global pandemic and resulting restrictions of Covid 19 to create a growing body of conflict and change in the city.

In June 2019 protests arose against an extradition bill which would have made it possible for someone charged in Hong Kong to be extradited to China, (SCMP, 2019). The protests which started as large scale peaceful events with hundreds of thousands of protestors were suddenly dispersed with police use of excessive tear gas and riot police rushing the crowds of protestors. (HKFP, 2019)

The scenes were covered live by local and international journalists and camera people on a range of technology from DSLRs, mirrorless cameras, video cameras and finally mobile phones. A sea of visual information was produced daily on most events and from different angles as multiple recordings and live streams happened simultaneously. As the year progressed it also became clear that the police attitude to the press had changed to a confrontational position with journalists having been pepper sprayed (HKFP, 2020) and forced to sit in groups on the ground and stopped from recording events in several cases.

A further shift in use of police power was seen on 27th May 2020 as the National Anthem Act was to be debated by the legislature and seen as the latest possible flashpoint for mass protests. Riot police blocked all MTR exits in central Admiralty and Wan Chai, districts that have access to LegCo. They stopped and searched anyone near LegCo and all journalists staying at nearby hotels were stopped and searched on leaving the hotels even though clearly wearing

journalist identification. Large groups of people at lunch were forced to sit outside a mall in causeway bay with no clear charges being made and no obvious protestors in the groups (the Standard, 2020).

With tension high in the city at the end of 2019 and subsequent Covid restrictions in the city from the beginning of 2020 there was little or no production work for many still and moving image professionals apart from news production. As the year progressed productions slowly came back but to a significantly smaller number than in previous years and with many restrictions on how they could be achieved with Covid still affecting practice in the city and globally (SCMP, 2021). Productions could take place later under strict covid guidelines, but social gathering restrictions and mask mandates made many productions non-viable during 2020 and into 2021.

Project change in response to change in context and subject.

Amid the chaos and uncertainty that was Hong Kong in late 2019 and early 2020 I was completing my data gathering through the second-round interviews and a planned case study. With no work available during the data gathering period and the planned project to base the case study on being cancelled it was decided with my advisor that I would undertake a retrospective case study. This would use a previous project that had characteristics of the planned production applying reflexive observations on my own practice with the observations.

Such an approach enabled deep insight into changing practice through close analysis and reflection using an auto-ethnographic narrative case study for the case study component. Additionally, it allowed the case study to inform the project with my own expert knowledge and observations on practice.

The restrictions on gathering created logistical problems when gathering data including arranging suitable locations, both real and virtual. These needed to be suitable for participants and each participant had personal, social and health concerns that needed to be considered during protests, post protest legislative landscape and covid 18. Negotiating access to participants over the extended period of data gathering produced by this interaction of social and healthcare challenges enabled careful interview techniques for gathering data.

Having placed the quantitative component in an online space was designed to allow ease of access and in the case of covid-19 and mass protests allowed professionals to complete the questionnaires at a location suitable for them. This meant that the final survey submissions could still be submitted during the protest and covid-19 restrictions in the city. In the same way the use of online platforms for most of the second-round interviews meant that the interviews I needed to complete after covid-19 affected face to face communication with everyone wearing masks and with significant restrictions on meeting in public, could be completed using Skype and WhatsApp.

The shift to online interviews was not without problems as the shift to online work for many professionals including my interviewees, meant that timetabling online conversations became more problematic with many of them now spending their working days and even evenings

working online and had less availability as the learning curve to shift to entirely online work increased their workloads.

Impact of Institutional change at Middlesex University in Hong Kong

When the project started Middlesex University had an active presence in Hong Kong from undergraduate to masters and doctoral programmes. Doctoral students would receive visits and support during the year from UK supervisors or members of the UK doctoral team in Hong Kong. As with any doctoral research

Even with this intermittent local support the challenge of doctoral research and its inherent isolation was significantly psychologically taxing. (Frederick, 2006) In 2016 Middlesex University closed most of its programmes in Hong Kong and shifted the mode of the DProf in Hong Kong to a completely distance learning programme. Combined with the isolation of research on a doctorate with the isolation felt on distance learning programmes (Croft *et al.*, 2010) the undertaking of the research became significantly more demanding on the researcher.

It should be noted that the research degrees department at Middlesex delivered much online content to support research degree students. This included workshops on a wide array of research skills and feedback sessions. They also supplied significant support during the transition to completely online learning and contact with the project advisor was invaluable during the project undertaking and completion.

Hong Kong

During Hong Kong's time as a British colony from the 1800's (Carroll, 2007) the continued ties between Hong Kong, mainland China, Britain and other Asian and International influences shaped a unique society. Hong Kong continued to develop as a culture where China and Europe mixed but in many areas remained separate in the following decades (Marchetti and Lam, 2015). From the mid 1980's to late 1990s Hong Kong entered a period of uncertainty that would be reflected in film and media (Lee, 2009) as it approached the 1997 end of lease for the New Territories. Negotiations between Britain and China encountered many difficulties in meeting the agreement for Hong Kong to self-govern after 1997 as a Special Administrative Region (SAR) as informed by Deng Xiaoping in 1982 and jointly agreed in 1985. During this period many Hong Kong Citizens migrated and/or gained dual citizenship in other countries to prepare for the uncertainty of rule by the People's Republic of China (PRC).

In the decade after 1997 many people returned and Hong Kong self-governed with relatively low input from the mainland, even allowing mass protests and marches such as the 2003 march against security legislation which was repealed as a result. However, in 2004 PRC stated that any attempt to modify Hong Kong election laws must be passed by the PRC and a popular vote for chief executive was ruled out.

Hong Kong continued during the 2000's and 2010's with a degree of freedom not found anywhere else in the PRC including its media content which was often critical of Beijing and the government (Earp, 2016). This continued until 2020 when the addition of the national security

legislation to Hong Kong's Basic Law allowed an unbridled control of the population by police and security forces including extradition to mainland China to be decided by a national security panel with no oversight from other areas of the Hong Kong judiciary.

Hong Kong in 2022 is a busy city trying to cope well with the global pandemic, despite having some of the highest population densities globally (Tufekci, 2020). It has a population of approximately 7.5 million with a slightly higher female to male ratio.

Hong Kong became the world's most services-oriented economy, with services sectors accounting for more than 90% of its GDP (HKTDC, 2021). The main industries in Hong Kong are financial services, tourism, trading and logistics and Professional services and other producer services. Among other significant industries Cultural and creative industries are noted for their societal benefits (HKstatistics, 2019).

In 2018 Hong Kong was the largest source of overseas direct investment in Mainland China and by the end of that year 46.3% of all the overseas-funded projects approved in Mainland China, were tied to Hong Kong interests. Capital moving into China through Hong Kong was approximately US\$1 billion, which accounted for just over 50% of the national total (HKstatistics, 2019).

As well as bringing money and investment into China, Hong Kong was also the leading destination for Mainland China's international investment. Statistics from the Chinese government show that in 2018 foreign direct investment (FDI) going to Hong Kong from China reached over US\$1 billion, just over half of China's FDI total outflow that year (govHK, 2020).

China has also invested heavily in Hong Kong with the HKSAR Government statistics showing that stock of Hong Kong's investment from Mainland China came to approximately to US\$5 billion or just over a quarter of the stock value in Hong Kong in 2018 (govHK, 2020). These continued investments from China and through Hong Kong into China help Hong Kong to retain its centre for financial services in the region and this in turn promoted areas of development such as media services.

The freelance professional and media SME in Hong Kong.

A major context of the project is that of the media professional who in many cases is a freelance photographer or videographer or hybrid image maker. In this project as a major stakeholder, John Curran Freelance Image Maker, acts as all three depending on the project being undertaken. As a freelance image creator in both still and moving images this area of research had significant potential impact on knowledge and practice approaches.

On my arrival in Hong Kong in August 2010 I began searching for work in video production and through contacts in international news agencies soon had work with CNN and Reuters bureaus in Hong Kong. This was rapidly followed through expanding contacts with other production teams who were filming the same events. Further work followed with several corporate production companies including Peter Kline Associates and Moray Media.

As a freelancer I was used to making contacts and working on short briefs to deliver content in a wide range of project types from my UK work. In Hong Kong I applied this experience to

deliver effective content and gain more work. Alongside my freelance work I gained several projects as a media SME acting as a producer/director and employing sound and camera operators to work with me. 'John Curran Freelance Image Maker' company's mission statement is:

“We provide the best images required for both photography and moving images across a range of projects from corporate to commercial, drama, music news, drama and documentary content. We deliver to broadcast standards and to client specifications for online and terrestrial viewing including theatrical projection.

Every project is carefully discussed with each client to ensure your individual vision and technical specification for image and delivery are met. We can scale productions to deliver large AV team delivery or small, even single operator delivery as required including all areas of the audio and visual team from camera to sound and lighting.

Our Director and Director of photography John Curran brings over twenty-five years' experience and creativity across award winning delivery to your projects. “

The range of clients for John Curran, Freelance Image Maker in Hong Kong have ranged from broadcast news including CNN, BBC Reuters and Bloomberg, to a wide range of clients in corporate production. These clients have included Microsoft and The American Club. Other productions have included music videos and independent feature productions.

Typically, these projects are short videos for online content when dealing with corporate clients, although there are also a smaller number of clients looking for still and moving images for online and still images for print.

Moving from the UK to a city where broadcast television was largely run by local Cantonese speaking crews, my largest reduction in types of work was that of large studio productions. Instead, I found myself working on largely single camera lit interviews or two camera lit interviews. Larger event coverage would be shot in environments lit for performance and for viewing by a live audience and not lit for camera.

With a wide range of projects as freelancer both directly for broadcast organisations and corporate clients and indirectly through other productions I was employed as a camera operator, lighting camera person and director of photography. As the 2010's progressed some clients asked if it was possible to get still and moving images in a single shoot. Initially this happened when a client could not organise a photographer and hoped I could deliver still from the video. At 1080P this was not viable but once cameras were capable of 4K footage this became viable for online use. Between 2015 and 2020 the number of hybrid roles increased with clients who knew I could deliver both. While undertaking freelance image creation work in Hong Kong during the past decade the ability to deliver a hybrid skill set has been valuable across a range of projects

Over the twelve years of operation in Hong Kong, client communication channels have changed immensely. They have moved from face-to-face briefings and delivery of rushes on tape to online delivery of rushes directly from wireless equipped cameras. Timescales reduced from days for feedback and reshoot schedules, if needed, to live feedback from remote clients allowing reshooting instructions to be given while in situ. Clients are able to now review the footage through online platforms like Sony Ci or FrameIO (Trainor-Fogelman, 2021). These are a significant improvement on early online sharing such as Dropbox as clients can view and place timecode accurate comments on the online footage. This can include marking the image to highlight specific changes and share that feedback immediately.

These delivery changes also changed the pace of working. This has been both positive and negative for the freelance professional. It allowed feedback to change the shoot, guarantee the shot and help ensure more cooperation between client and freelancer even when they are working remotely from each other. Such communications have made working with international clients much easier thanks to that immediate remote access and feedback. Where it would sometimes take days to get feedback if rushes needed to be physically shipped to New York before being viewed, now clients can see shots immediately and discuss any changes with you.

Many of these changes as we can see are driven by technological change and the freelance image professional and SME in Hong Kong needs to keep up to date with the latest and very broad range of technology to remain employable. This knowledge and skill chasing is very demanding on the professional but an inherent part of the job as clients will often ask for the latest camera or software codec or even particular microphone or light to be used. This has increased as online content has grown to highlight new technology on platforms such as YouTube and Instagram.

But the image professional must balance skill, knowledge and equipment chasing against the value to the professional and the cost to acquire them. Camera and Lighting expertise and new technology costs in time and money and with high end video equipment and hybrid cameras we are very quickly accumulating tens of thousands of pounds worth of investment that needs to be earned back through work. Each professional then evaluates the cost/benefit ratio against new purchases before they make them to hopefully make the correct choice in knowledge and equipment investment. Equipment hire is therefore a key part of many professionals' working process as it enables them to hire equipment that may only be used a few times or in order to assess if it will work for them before purchasing it.

An Example of the rate of change has been that of popular camera types in the last decade working in Hong Kong. Cameras have moved from video cameras with integrated lenses and separate stills cameras to DSLR's being requested on many shoots. Then followed mirrorless camera bodies and cinema camera style bodies and the need for cinema lenses with a focus puller as well as a camera operator. More recently we have seen the resurgence of the ENG style lens with a large zoom range being used on larger format sensor cameras with grips assuming something of a mid-ground in physical functionality between a cinema style camera and an ENG camera.

Over the same time lighting technology in Hong Kong moved from traditional sources including incandescent such as dedolights or redheads, fluorescent lights such as Kino Flo's and HMI's such as ARRI daylights, to LED sources being used everywhere. A decade ago, some LED panels would be used occasionally to supplement existing lights, but they have developed so fast that many professionals entering the industry in the last decade may have only worked with LED lights in Hong Kong.

Their flexibility, literally in the case of flexible LED panels, and their low power high output and colour changing ability made them capable in a wide range of areas where other lights might struggle. In terms of saturated colour output alone RGB emitters from LED's can produce consistent colour at saturated levels that lights through filter gels cannot match as the colour dyes burn off and the saturation drops. Freelancers and this freelancer have therefore purchased many LED sources that are invaluable in a wide range of content production.

Clients also have technology expectations and as a freelancer or SME in Hong Kong we must deliver those expectations. With the advent and popularity of the DSLR driven by the arrival of the Canon 5D MK iii many clients requested the 'DSLR look' marked by a very narrow depth of field thanks to the large sensor size and fast optics available for stills cameras. At the time of arrival in Hong Kong (2010) there were no readily available large sensor video cameras and that would. My experience of stills photography and cinema cameras with use of prime lenses provided me with the skills and knowledge to use this equipment and deliver the content clients requested. This contrasted with other Hong Kong professionals who at the time had experience with the wide zoom range lenses common on ENG cameras. For the freelancer and SME in media production in Hong Kong the significance of technological developments is not to be underestimated

The largest cause of change in recent times, however, has been the protests of 2019 and the ensuing national security legislation and the ongoing effects of covid-19 restrictions in the industry. When covid-19 initially arrived the Hong Kong population began to wear masks as Hong Kong had suffered greatly during SARS in DATE and the population did not want another shutdown of the city.

Although in terms of everyday living this worked to a degree, for production work other factors had a huge effect. With a rapid shift to online working and gathering restrictions many corporate clients had to cancel existing media production plans. These typically required interviews and shoots in offices which were now empty. Another large area of corporate production that was immediately affected was event coverage.

With concerns over covid and new government regulations in 2020 over social gathering size, large events closed entirely (Retail in Asia, 2019). For many freelancers and SMEs with large investments and loans in equipment and rental this was a disaster. Many freelancers had to leave the industry in 2020 (Valenzuela, 2020) to try and gain other employment to cover their costs.

The government did put support systems in place (HKMA, 2020) however for many they were not enough to cover ongoing expenses and had requirements to receive that others could not meet. As the year progressed and many countries put systems in place for living with covid

Hong Kong's restrictions for social gathering and mask wearing remained in place. Towards the end of 2020 guidelines on productions from the Film and Media department would allow maskless actors in front of camera as long as they masked once filming was complete. For many freelancers this year of restrictions and lack of work ended their media production careers.

For 'John Curran Freelance Image Maker' 2020 was a very hard year with intermittent work and conversations with established local and overseas clients to reassure them that work in Hong Kong was still possible but in different ways. Some clients moved to producing content using edited recordings of zoom calls or moved to using existing content with new edits and the addition of graphics or previously unused footage. Being able to provide clients with images from my archive library was also very important in maintaining work in 2020.

Since 2020 Hong Kong has maintained its social gathering restrictions (Gov.hk, 2020) which has varied from no more than two people gathering to no more than twelve in restaurants with no more than four people gathering being the case for much of the time. Mask wearing in public places is still a legal requirement for the population and this still influences what can be filmed in Hong Kong. Busy shots of smiling faces in public spaces are still not possible in most cases as one example.

When filming, groups of the production team and cast still must be careful to not gather in large groups and only those being filmed can remove their masks during the production (FSO, 2020). However, for many areas such as sports masks are not required (FSO, 2020) so footage can be gathered that is back to normal. Filming in Hong Kong has recovered but not completely, but it has recovered enough that freelancers and SMEs in media production can now still make a viable living even if not to the degree that was possible before covid.

Technological change

For the professional the major factor that has enabled many recent changes and additional challenges for their practice is technological change. Cameras and Lights have changed in the last decade at a pace unlike any before. For cameras the change has directly affected their ability to deliver still and moving images. For lighting the shift to LED sources and their rapid development has moved a relatively minor technology to a position as the predominant lighting source for the majority of moving image illumination and for an increasing number of still image situations.

A range of technological changes have positioned the image and its creation as central to many peoples online social interaction. As a result, the requirements for ease of image production that enables this use has driven further emphasis for technological developments in image creation and modification in an increasingly fast delivery cycle. We have seen an unprecedented increase in still and video production, both professional and consumer related because of social media communications and wider internet use during the last decade. In 2021 over 500 hours of video content were being uploaded to YouTube every minute (YouTube, 2021) alone and over 50 billion photographs have been uploaded to Instagram to date (Omnicores, 2021). These are only two of the most significant media sites outside of China which

has a smaller list of state controlled social media platforms reaching over 800 million individuals in 2019 (Thomala, 2020).

Within the professional markets, technology from DSLR and mirrorless camera developments allowed video and stills to be produced at qualities acceptable in both professional marketplaces and from the same cameras. This changed the use of the camera from a stills capture device to a hybrid capture device. The larger sensor size of these cameras allowed use of narrow depth of field video at a lower price point and in a more compact camera than even much more costly professional video cameras. Many video professionals then needed to use both styles of cameras alongside each other to deliver the results that clients were then asking for.

A key cause and ongoing driver for the shift in expectations and capabilities of an individual producing still and moving images was the developing capabilities of smartphones. Continuing developments in phone cameras, computational photography for photographic/video processing and editing apps have allowed the mobile device to function as capture and edit devices. This has brought capabilities far beyond that of even recent high-end professional camera equipment to mobile phones (Wylie, 2021).

Online networks and image sharing /social media could not work effectively without mobile devices capable of producing still and moving images. They have become reliant on instant access and seamless integration in apps that capture and process the still and moving image to enable our moment-to-moment representation of 'us' to be presented to the world at large (Bohn et al , 2018).

Phone cameras have moved from single fixed lens arrays to multiple lens arrays that can cover wider focal length ranges combined using computational photography algorithms to produce images of wider dynamic range (light.co, 2021). Computational/AI photography/video processing has become a key area in enabling mobile photography to deliver equivalent results to larger sensor cameras. It includes object replacement, colour processing, technical correction and artistic emulation and increased dynamic range. It can accommodate compositing shots to provide results impossible in-camera without processing. These have included portrait alterations and facial recognition to define facial photography to the user's preferences including virtual make-up. It is a technology race driven by an immense market where the traditional camera model struggles to compete.

'...because traditional cameras can't compete on another category of hardware that's just as profound for photography: the systems-on-chip that contain a CPU, an image signal processor, and, increasingly, a neural processing unit (NPU).'(Byford, 2019, p.2).

Technology has developed at a rapid rate with both photographic companies and broadcast and film camera companies competing for different market demographics among domestic and professional users. We have reached a point where video cameras can capture 8K and even 12K resolution video at high dynamic range. They can deliver stills from those moving image frames

at high enough quality, including RAW formats in some cases, to be usable for still image use. Hybrid cameras such as the Sony A1 are able to capture 45 megapixel still images and 8K video (Sony, 2021).

The camera sits at the nexus of technological and sociological change driven by advancing network platforms and communications. It has developed to integrate network features including Wi-Fi and Bluetooth protocols. Ethernet ports are now available on certain cameras to meet the demands of the connected world it operates in. The image it produces, both still and moving, has become an element of the rhetoric of a multi-platform social interaction. Interaction centred on the sharing and/or immediacy in spatially, socially and networked aware dialogues between individuals and audiences/social groups. The taking of the picture/video integrated the camera as part of the device and the moment itself.

We see the social media 'us' presented to a live representation of the world in a virtual world. We have come to express ourselves in that space with the image and the image of ourselves. Hess comments, when discussing the selfie as a specific example of the social media construct, that the 'selfie-assemblage articulates four elements, the self, physical space, the device and the network.' (Hess, 2015). The camera as the device, or as an element of the device when used as a component of a smartphone or other connected media device, is becoming an element of our own self. The camera and our self-expression with the image have become an important representation of our identity in the moment. We can see that the importance of the image capture device will continue as our online self develops and will raise the significance of our social online presence as individuals and as entities such as companies and organisations.

Lighting change in the last decade has happened alongside the development of the social media landscape and camera technology. Both technology and technique have raised their presence beyond professional use. There has been a huge increase in the use of a particular style of very polished fixed angle portrait lighting in social media with sales of ring lights for webcams selling by millions. These enabled the perfect Instagram and YouTube shot looking into the camera and the social media audience's soul. With the increase of online communication during the pandemic the use of the ring-light has increased even more rapidly (Novet, 2020) and is likely to continue to increase in the future.

LED technology has developed at a rate that was totally unexpected even ten years ago. LED sources have increased in brightness, battery life for battery powered units and in colour quality, allowing their use in every aspect of professional use. LED sources can produce single colour temperature light and are available with bicolour emitters allowing colour temperature to be changed (Litepanels, 2019). They are even available with RGB and RGBW sources as well as other arrays that can produce everything from saturated colour output to white light with variable colour temperature.

We have also had the creation of LED and dual continuous light sources with strobe facilities that delivered a light source that can serve the two masters of still and moving images equally (Rotolight, 2019). LED lighting became the de facto lighting source in use in both still and moving image production because of these feature and cost advantages over other traditional lighting sources.

These technological changes in camera and lighting technology directly impact practice and are discussed in more detail in the literature review section.

Media Consumption change

Media viewing has also changed in Hong Kong with a significant shift to approximately 50% mobile first content (OFA, 2018). At the same time Hong Kong has undergone fundamental movements in its relationship to the mainland and China's increasing overt and less transparent pressures on media content. This shift was seen through a move to digital first and digital only platforms for voices other than mainstream media and press. A mainstream where journalism and content has often been regulated and self-regulated to concur with the party view from mainland China (Frisch et al, 2018). These changes have increased the demand for image creation, both still and moving.

In addition to these cultural and social shifts there have been significant cultural and social norms within Hong Kong that directly affected media production demand for stills and video from the same settings. This included the accepted extension of the traditional pre-wedding dinners and confirmation of engagement (Wordie, 2021) into a media extravaganza. Here couples have pre-wedding photographs and videos that are used as part of the wedding day, as well as photographs and videos from the day (although the day itself is so full there is little chance to take photographs) and costs can reach 50,000 HKD (approx. 5000 sterling) (Lam, 2019).

The project's case study, practitioner and client groups have all been affected by the unique, shifting cultural and social melting pot that is Hong Kong. The city has developed a vibrant and large-scale image production industry, with still images covering everything from family portraits to international marketing campaigns. Although it should be noted that in 2020 as discussed above many of these image creation scenarios were not possible.

The range of moving image creation in Hong Kong has also been equally wide and has covered projects from corporate communication videos to internationally acclaimed feature film productions. Hong Kong alone took 17% of the mainland Chinese audience share in 2017 (HKTDC, 2019). With this creative output within a small city, the expectations and cultural demands of clients and professionals affected all aspects of production and professional practice. However, it should be noted that traditional photo sales were up to 24 million USD in 2019 from 16 million USD in 2018 (Scheider, 2019) and the marketplace for the traditional workflow for many areas from corporate to fine art was still viable.

Cultural changes, shifting media to a digital first and digital only delivery, may be very important regarding the stills and video ratio in the future as media is consumed and produced. With pressures on journalists and media communication having increased to deliver 'regulated' or self-regulated' is no longer an academic question regarding the future of media in Hong Kong. 'Media capture with Chinese characteristics' (Frisch *et al.*, 2018) were already emerging patterns in Hong Kong news and media and this is only reinforced through direct policy and action beyond 2020.

Changing media context and assemblage theory

The delivery medium of social media platforms has fundamentally changed where we put still and moving images. It has changed how we access them, how we see them, as permanent memories or fleeting instances of 'currency'. This area of image perception demonstrates very effectively aspects of the assemblage theory's changeable nature of reality (DeLanda, 2006) and can be illustrated with discussion of relevant model articulations. To address these factors of change and their impact I will be discussing the related image perception. The use of social media from image delivery to image platforms including their variety and rapidly changing nature of large-scale user access and Image use.

“Indeed, according to a 2015 report, the average smartphone user has 630 photos stored on his or her device.” (Macmillan, 2016, p. 1).

The move of the entire production chain and distribution platform to a single device has shifted media from a group of monolithic broadcasters and studios to a sea of countless voices. (Moyer, 2009)

In the moving image industry large teams still dominated high budget production and largely from scalar quantities that cannot be met by a single person with their mobile device. They cannot coordinate multiple actors, lighting, prop and other production team members while feeding everybody daily and still produce content. Those individual creators and small teams have been enabled to make materials that until only a few years ago would have been the remit of an entire studio system. And this observable fluidity is where assemblage excels as a structural model of objective and subjective social impermanence. As elements shift the links and articulations of an assemblage can be shown to rearrange within our social model. (DeLanda, 2016)

At the same time social norms have changed, with the rapid rise of network social spaces and the predominant uptake of smartphones providing network enabled photographic and video capture as integrated parts of wider social interaction. Facebook accounts covered 72.5 % of the population in February 2019 and on Instagram (an image sharing social platform) alone, “There were 2 260 000 Instagram users in Hong Kong in February 2020, which accounted for 29.8% of its entire population...” (Napoleoncat, 2020) and,

“Twenty-four percent of U.S. teens say they’re online “almost constantly.” Now much of that time, it seems, is spent incessantly compiling and navigating vast collections and streams of images.” (Macmillan, 2016, p. 2).

These cultural shifts to digital and mobile first media production and consumption changed our perception of the image. With a social shift to production of the image as a fleeting, temporally tied social action, completed by anyone and everyone, have moved the perception of the image away from 'professional' to 'everyone'. This has increased the assumption that

anyone can produce images. If that is so then a professional should be able to produce still and moving images at the same time, or that they are in fact one and the same as representative recordings of the social present. The assemblage of the hybrid professional has taken shape through the active interaction of these multiple factors.

Media Production in Hong Kong

Media has a long history in Hong Kong and because of Hong Kong's unique position and development between 'East' and 'West', the use and expectation of image style and content have a range of stylistic tendencies specific to the city. The two primary industries for moving images were Film and Television with additional content for corporate and events coverage not gaining widespread viability until the development of video cameras in the 1970's and 1980s. Photographs have been an important aspect of daily communication in Hong Kong's local press marketplace since 1842 with several papers formed at the turn of the century. This included the South China Morning Post in 1943 (Carroll,2007), still operating today, where images form a key part of their print output with an increasing use in online media and communications.

Hong Kong Film and Television

Hong Kong feature film production has had periods of creative success and periods where it has struggled. From delivering to its local market, expansion and overseas distribution and more recently with distribution into mainland China and the huge audience available there. Recent approval of preferential access to the China market for video and film production through the Closer Economic partnership Arrangement (CEPA) (May and Ma, 2014) has increased this possible distribution area.

Hong Kong Cinema really began in the 1930's with the creation of the first Hong Kong owned studio by the Shaw Brothers. During this period Hong Kong was not as successful as Shanghai which was the centre of production in China. The city began to build its local production focused largely on Wuxia (martial heroes) and Chinese Opera story lines and would continue this way as the dominant genres in the industry into post-war Hong Kong. An additional challenge for early Hong Kong film was the conflict between delivering Cantonese or Mandarin language productions. This theme of linguistic choice in film making has continued until the present day and was accelerated post war when the PRC implemented Putonghua as the national language of China. (Marchetti and Lam, 2015).

The Hong Kong cinema golden years

The 1970's to the early 1990's were a golden period for Hong Kong cinema with the city producing hundreds of films annually. Global distribution gave access to a marketplace that would contribute to the worldwide success of films and movie stars such as Bruce Lee and Jackie Chan within the kung fu genre and Wong Kar Wai with *Chungking Express* (Marchetti and Lam, 2015). It also saw the new studio Golden Harvest created as a more flexible production approach than the established Shaw Studios and one that rose rapidly to become a major competitor.

The exact reason for the decline in the industry's fortune is debatable but as Lee (2009) discusses the advent of China as a new marketplace and production centre played a significant role. With competition from Western imports and a more selective wealthier middle class choosing higher production value films over the cheaper and arguably more crass stylings of Hong Kong's locally produced content combined with the negative effect of the Asian economic crash and SARS (Lee, 2009) the decline seemed inevitable.

By the end of the 1990's Hong Kong's cinema output had declined significantly with the number of productions falling by over 40%. Despite different approaches the industry has never regained the position it held through the golden years and in recent years has moved to a model echoing high production value action movies from Western studios with the aim to take advantage of its more open access to the mainland Chinese market.

Hong Kong Television

While Hong Kong Film developed, so too did Hong Kong Television, with the first television station, Rediffusion Television (RTV), being approved and beginning as a cable service in 1957. It moved to free to air broadcast in 1973 by which time it had been renamed Asia Television (ATV). During this time TVB launched in 1967 and in 1975 RTHK began making and broadcasting Television (it had previously been a radio broadcaster). This model would continue until 2016 when ATV had its broadcast licence cancelled by the Executive Council. With Hong Kong having two official languages ATV, TVB and RTHK all broadcast channels in Cantonese and English. The ratio of channels is several Cantonese channels and one English Channel as most of the Hong Kong population usually speak Cantonese as their first language and Putonghua or English as their second, or not at all (GovHK, 2021).

There have been some points where the media in Hong Kong has been affected negatively by legislative focus on other areas of the city's economic focus on finance and property. With the film industry's success from the 1970's to the 1990's the city built a thriving media position in Asia with many overseas companies having their Asia or Asia Pacific headquarters in the city. In the early 1990's - 2000's Singapore saw the creative industry as a key part of its future and implemented initiatives to attract overseas media companies. With inadequate response from the Hong Kong government many companies moved their regional headquarters to Singapore, including MTV, Discovery Channel, HBO and BBC (Can-Seng, 2006) and left a smaller city focused operation in Hong Kong with mainland offices operating from Shanghai and Beijing.

By 2020 there were over thirty TV broadcasters in Hong Kong, including digital to air, digital cable and online platforms. In addition to local companies' multiple overseas companies had set up bases in Hong Kong and remain.

Recent changes in the city's legal base impacted this position as news stations from overseas had already begun to relocate after the implementation of the national security legislation. It has unclear guidelines for what may and may not be able to be reported or discussed by journalists and stations. One early example is the New York Times which moved most of its staff and operations in the region from Hong Kong to Seoul in 2020.

Hong Kong's media industry now.

Although the Hong Kong film industry may not be the behemoth of its golden years, the city still functions as a key industry hub in Asia with over 500 Film production and media production related companies. International news agencies including the Financial Times, The Wall Street Journal, The New York Times, TIME Asia, Agence France Presse, Bloomberg and CNNI retain a presence in the city (HKISD, 2020). The media and cultural industries employed over 200 thousand people and contributed over \$100 billion to the city in 2017 (HKstatistics, 2019) and the media industry brings a sizable contribution to the city's wealth.

Examining specific areas of the media and cultural industry that have a direct impact on production of image includes Film, Television, Broadcasting, Online content, Design, Computer games and interactive media with Press and Print news. According to the Hong Kong Trade Development council report in 2019 Film, Video and music added \$3.3 billion to the city's economy and employed over 15000 people during 2018. Television and radio in the same year contributed 6.6 billion and employed over 6000 staff.

In 2019 there were eighteen television licensees including three domestic free television programme services, two domestic pay television programme service licensees and 12 non-domestic television services with one government-funded public service broadcaster. These services have a significant local production base and employ many professionals in image creation. There are also a wider range of broadcast services supplying over 800 local and overseas channels, however many of those do not produce locally, although they do normally have a limited editorial team based in the city.

Publishing, including newspapers and magazines, has seen a decline in its economic value with competition between the wide range of local papers keeping prices low. This has combined with free papers and online portals reducing public spending in the sector (although there were still 82 daily newspapers and 531 periodicals in 2019). In 2018 alone it saw an almost 40% decline in its value as a contributor to the cultural and creative industries sector. What we have seen, however, is a transition by many companies to online and mobile platforms with business models based around ease of access and advertising budgets. This shift has moved the financial contribution from publishing to the online and interactive media sector, so the 40% decline is more likely to be a shift of finances from sector to sector. Despite the shift the value of the publishing sector to the Hong Kong economy was still in excess of \$13.4billion with over 35,000 people employed (HKTDC, 2019).

In 2019 Hong Kong was still a major international media centre in Asia and served as the regional base for a range of media groups. These included the Financial Times, Bloomberg, CNNI, The Wall Street Journal, The New York Times International, TIME Asia and Agence-France Presse. However, changes in 2020 because of the new national security legislation has already begun to affect this position as a media centre.

In other areas that demand still and moving image production computer games and interactive media continue to develop in Hong Kong as in other economies bringing a value

added of \$53 billion to the city's economy. The city's design talent has also expanded and brought a value added of \$4.5 billion to the city in the same year (HKISD,2020).

The Hong Kong International Film & TV Market (FILMART Online) closed its four-day virtual content marketplace, with some 2,100 film and TV productions having been released and promoted and attracting nearly 7,000 international buyers from 73 countries and regions. (Filmart, 2020). This is indicative of Hong Kong's position as a key market centre in Asia for film from China and into China, a position which The FDC comments is greatly improved in 2020. They point to the Central Government's relaxation of several factors allowing Hong Kong Film productions access to the mainland market as a key reason.

These factors are, removing the restriction on the number of Hong Kong practitioners participating in a Mainland film production. They have removed the restriction on the percentage of Hong Kong artists and removed the requirement for Mainland-related plots in Hong Kong-Mainland co-productions. They also removed the fees for establishing co-productions with the mainland authority, and allowed Hong Kong films to participate in Mainland's film awards which may raise the profile of Hong Kong films in the mainland. These actions should encourage the Hong Kong film industry to participate in Mainland film productions more often and should provide further opportunities for co-productions (FDC,2020).

Hong Kong Government initiatives for the Media industry

As the film and television industries have still been important aspects of Hong Kong's creative economy, the government in recent years has developed several initiatives to support the development of talent and products in these areas. This has helped maintain the level of production where higher end moving images are used. Although this segment may not directly affect the hybrid image creators as budgets allow still and moving image professionals to be hired separately, it has informed the perception and style of the image in Hong Kong, and this affected client and professional expectation for the arenas where hybrid professionals may be found.

The Film Development Fund (FDF), created in 2007, provided financial support for projects that can potentially add longevity to the local film industry. The fund supplied \$300m in 2007 and expanded to finance small-to-medium budget film productions. This aimed to encourage more commercial investment in film productions, and through increased production and expansion of new roles and starting opportunities revitalise the ailing industry (createHK,2021).

Hong Kong also has a Film Development Council (FDC), which over the years, has funded about 60 film productions and identified 40 new directors through various film production subsidy schemes (e.g., "Film Production Financing Scheme" and "First Feature Film Initiative") under the Film Development Fund (FDF). The "Sponsorship for the Sale and Distribution of Hong Kong Films (Cantonese Version) in the mainland" scheme and the "Sponsorship for Local Films Nominated to Participate in Film Festival Overseas" scheme under the FDF have also funded about 100 Hong Kong films to expand into the mainland and overseas markets. The FDC

will continue to support the further development of the Hong Kong film industry through the FDF.

In 2009 the CreateSmart Initiative (CSI) was created to provide financial support for the development and promotion of creative industries in Hong Kong which allows a wider remit than the FDC and FDF which are both limited to the film industry (createHK, 2009). The initiative is designed to promote and speed up the development of local creative industries. It aims to make Hong Kong into Asia's Creative Capital through financial support to projects for the development of creative industries in Hong Kong. These include nurturing talent, funding start-ups, exploring expanding markets and fostering a creative atmosphere in Hong Kong's community. The CSI is administered through Create Hong Kong (createHK, 2009).

Summary

The context of the project is driven by multiple factors across social change, technological developments and the resulting impact on media and practise for the image maker in Hong Kong.

We have seen social change from national security legislation and shift in police power to gathering restrictions under covid regulations have a huge impact on media and practice. From self-censorship for many media professionals to an exodus of professionals from media practice as work began scarce to non-existent during 2020 and continued to be restricted with Hong Kong's covid regulations on shooting and gathering.

These changes were difficult for the freelancer/SME in image creation in Hong Kong. Changes to content creation and editing along with use of archive libraries for delivery allowed John Curran Freelance Image Maker to continue working through the period when gathering images in Hong Kong for clients came to a standstill.

These changes also had a direct effect on the project with a redesign of data gathering approaches taken to address legal restrictions in Hong Kong and participant reticence to enter public spaces with the pandemic in 2020. This was further challenged with the move away from a local delivery and support model on the DProf at Middlesex University to a completely online method. In both cases the projects undertaking needed to be adjusted to address the changes through an increase in online gathering and changing the case study to an autoethnographic case study.

We saw in this chapter that technological change in lighting and camera technology with camera integration into mobile phones has driven a wide range of perception and expectation change. This affected the professionals' knowledge and skill requirements and demands investment in new technology as part of ongoing image delivery.

Lighting developments in LED technology has changed the use of light sources to this new de facto standard and opens new creative possibilities with their wide range of features. Both camera and lighting developments have opened the delivery of still and moving images to a much wider group of people and have changed the perception of the image and image maker.

Hong Kong has a valuable film television and media industry that is, often like any industry, slow to respond to new developments. With the majority of funding targeting film and television it tends to support existing media structures and reinforces existing standardisation of practice and roles in companies. Through those government initiatives hybrid practice perception has become delegated to a less valued position. Even new areas of funding such as the CreateSmart Initiative tend to deliver to established businesses and continue to reinforce established norms and practices rather than developing practices.

As creativity and media are not monolithic activities but rather interconnected and influenced by multiple factors, we see how we can view them through assemblage theory's interconnection and generation of new properties through territorialisation and de-territorialisation. This context of interactions applies to the practitioner and is a significant reason for the relevance of assemblage theory in this project.

3 Literature review

Introduction

The literature review examined significant literature topics relevant to the project which focused on creating an image using a photographic device with the use of lighting. That device may record a still or moving image, both of which are an abstraction from the real world interpreted through the image creator's choice of viewpoint, lens, technical processing in-camera and during post processing. The process takes place in the real world and has many factors affecting it. In order to examine this area, the literature review examined the photograph, the moving image, Camera technology (both) Lighting technology (both) Lighting approaches (both) and still and moving image practices.

It also examined assemblage theory with an intent to incorporate assemblage theory into the project's conclusion to help analyse the project's data and findings. Assemblage was examined regarding its position as a materialist ontology and as an effective part of building conceptual frameworks. Two areas of the image that are significant for the practitioner and are worth commenting on separately are those of flicker and depth, both of which are discussed below.

Sections 3.4 to 3.9 provide a basis in literature for supporting analysis to meet aim 1 through detailed research on lighting technology and lighting approaches that are standard in still and moving image production. Combined with primary data this information aimed to help meet aim: 1. To critically evaluate lighting approaches for still and moving images and analyse the differences in approach and equipment to discover how they are similar and to what level they can be integrated into a single lighting schema.

The literature sections were also designed to provide insight into key areas to meet objectives 1,3,4 and 5. Objective 1 'To examine the technological difficulties of shooting both still and moving images simultaneously and to evaluate the effectiveness of this approach in delivering viable stills and moving images for professional use' required investigating both camera and lighting technologies and the underlying practice. As such sections 3.1 to 3.9 should all provided some degree of valuable data for later analysis. Following this, literature from 3.1 to 3.3 and section 3.10 (Photography and cinematography) supported analysis for objective 3 'To examine changes in image gathering technology and practice and its effect on the role and perception of the 'creative image creation professional' .

Section 3.4 to 3.8 supplied information in support of objective 4 'To identify the changing lighting equipment and relevant technique requirements of professionals involved in image creation using photographic and moving images.' This is followed by section 3.9 regarding lighting approaches that aimed to provide literature insight to objective 5 'To identify and analyse specific lighting approaches that can deliver professional results when simultaneously delivering still and moving images.'.

Within these sections the literature review also examined recent changes in relevant technology. This included the hybrid image online creator, lighting technology and uses, AI and computational image creation and camera technologies. Literature on cultural and social impact on the project area in Hong Kong are presented in the context chapter and within the following section on methodological considerations and design. These sections also examined areas of creation/distribution, mobile image capture and processing/distribution as part of the key impact areas of networked media production and social media impact in the professional workplace.

The shift in image perception needed to be analysed against a history of how we create and perceive the image and how the changing social constructs imprint themselves on that creative and perceptive process. However, my project did not wish to analyse the history of image perception from antiquity to its present form but needed to accept and attribute the current transitions to existing themes of image creation and interpretation. The literature review therefore needed to focus on some history of still and moving images to place the now in the context of when and how it has arrived as the now.

I looked at the changes that have occurred and are relevant to the project's area of image creation as the changes in that area are driven using image to communicate and its shift in who communicates moving from the artistic/creative professional to the body of humanity at large.

From simple scratches on cave walls to the sociologically representative imagery of the Sistine chapel and the fantastical visions of superhero movies to the hard reality of news imagery we have felt the need to communicate visually with each other. Ashton (Ashton, 2006) comments that Deleuze and Bergson placed the world in an image, a point which may illustrate how we function in the moment and later helps form a link between this project's ontological framework and DeLanda's modification of Deleuze's own work on assemblage theory. For most of us vision is our first perception of distant features as mountains break through a distant haze or a person appears around a street corner. We interpret the world around us through a sense of vision and have endeavoured to communicate that visual impression to each other throughout history (McIver, 2016).

We have spent a large amount of our history creating written histories, but even longer creating pictorial histories (McIver, 2016). We can all take our fingers and draw a circle and point to the moon or the sun to make our meaning clear or draw a stick figure under a crescent to show someone at night whether we have learnt a written language or not.

This is not to say that we all become artists, or that artistic language and expression does not need to be learnt, after all that is what we have spent our visual history doing. Leonardo did not walk from the Neolithic cave and paint the Sistine chapel. Each generation built on the developments of previous generations, sometimes taking and accepting the artistic stylings of those before and sometimes rejecting them to make a leap in how we express ourselves visually (Honour, 2013). Each step over time has developed our ability to express ourselves through art and its expression of ourselves and the reality around ourselves, whether realistic or philosophically consistent with our view of reality.

We now find ourselves at a point just under one hundred and fifty years since the first mechanically recorded images were created (Kriebel, 2007), where we can create a realistic or abstracted photographic representation through still or moving images and where the demand for both is higher than ever. The written language may be in decline, but visual expression and communication is in its ascendancy with no signs of slowing down soon.

3.1 The photograph

The photograph has been through several physical incarnations from Nicéphore Niepce and his use of heliography using a camera obscura, and pewter plate with a mix of bitumen of Judea and lavender oil (Marignier, 1990) to Louis-Jacques-Mandé Daguerre's daguerreotype. This formed an image on a plate of iodized silver and that could be developed and made visible by exposure to mercury to create an image, which he was later able to fix permanently by using a solution of table salt to dissolve the unexposed silver iodide. (Lerner, 2014) and other competing developments in that time.

The use of emulsion on film gave a stable physical form to the photographic negative to the photographic positive which has lasted until today. Now most photographs no longer exist in a physical form but are held in electronic storage for display on a wide variety of display devices, from smartphones to laptops and televisions among others. This development of the photograph has placed its relevance and relationship to where and when it has come from and how we perceive it.

These technological changes in the photograph's nature from film through instant to digital and the permanent to ephemeral nature of digital / networked image use have moved its place in our lives from a stable reminder of a past (Jurgenson, 2019) to a live element of the instant. The image is now, in most cases, a passing, ephemeral expression of the currency of modern life and at the same time has become an element of a global store of our memories in a move to a society that can never forget (Eichhorn, 2019).

Throughout the history of the photograph, arguments and debates about what a photograph is, how it is used, whether it is a neutral recording and presentation of reality, or a new medium of artistic expression have abounded and continue to do so. Lyle Rexer points out how the beginnings of the medium reflected this discussion.

'The names they gave the new medium tended to reflect their different senses of its salient features: heliography, calotypy, photogenic drawing and sun pictures, to name a few. And the shifting standards they applied to finished pictures revealed an even more basic ambiguity. Should they be accurate or expressive? Documentary or artistic? Was photography mechanical or imaginative, science or art? Or both at once?' (Rexer, 2014, p. 1).

The progression of philosophical arguments has covered a wide range of positions from a view of automaticity that divorced the photograph from human creative 'flaws', reinforced again and again, with Andre Bazin's claim of 'a non-living agent without the creative intervention of man.' (Bazin, 1967, vol. 1) comparing the 'mechanical' photograph against agential painting which Scruton rails against (Scruton, 1981). However even in Scruton's scepticism regarding the photograph as art he admits that the use of the 'ideal photograph' is difficult to find as there are logical 'fictions' that create difficulties in defining the photograph as ideal and separating the photograph in practice from the process that he is insistent art retains, that art requires 'complete and manifest expression of thought' (Scruton, 1981).

We see an ongoing discussion from the practical physical device of the camera, the photographic negative and print and the physical nature of both and the philosophical question 'What is a photograph?' A daguerreotype? Is it a form between glass plates that is a single copy of the image (whether a reversed image or a reflected and corrected image) Is that then an image a step further from reality, it being formed from a reflection of that inverse image formed through the optical system or a constructed digital store of light until the moment we process and see it? Or is it how we use it, how it is a part of our art or our media? As Kriebel (2007) says "is it correct to say that it is the object ...we theorise ... or do we theorise their function?" (Kriebel, 2007).

From early views of photography as an extension of nature and the ongoing separation of artistic intent and mechanical process, to Roland Barthes Mythologies and assertion that the photography is modern mythology that transfers the natural state of the photograph as a 'non coded iconic message', to the viewed image in context to an ideological sign (Barthes, 1972), there is a split in how theories of photography view the photograph and whether the photograph can be aesthetic art or art at all. Walden did, however, point out that photographic and art theory has already come to distinguish carefully between artistic and aesthetic interest, allowing photographic art with the use of photographic automaticity in the service of art (Walden, 2019). It is also important to note that other theorists and philosophers, such as Bazin and Cavell, saw the photograph and its study in relation to film but that their conclusions viewpoints would diverge as they examined the relationship between the still image which I discuss under the moving image, later in this section.

An important recent development was made by (Maynard, 1997) where he defines photography as 'a branching family of technologies with different uses whose common stem is simply the physical marking of surfaces through the agency of light and other radiations.' With this model he separated the photograph from the subject by concentrating on the process through the production by light and with this isolates the photograph in its own uniqueness irrespective of the subject. With the shifting to the importance of the role of light in the creation of the image itself Maynard opened the discussion of the photographic image from a new perspective. Diamurd Costello (Costello, 2017) summarised how this moment allowed new thinking and the shift from an established 'sceptical orthodoxy' to the development of a new theory of photography by Professor Dawn Phillips as a move from the following model:

:

1. A pre-filmic event occurs before the camera.
2. The camera takes the photograph.
3. Copies of the photograph are made.
4. The appearance of the photograph allows viewer to learn about pre-filmic event.

(Modified from (Costello, 2017))

To the more recent suggested development in her 'Reply to Scruton':

1. A changing light image generated by light sources and objects forms in real time on the film plane (target)
2. A 'photographic event' occurs when information from that light image is recorded (though no photo exists)
3. The information stored undergoes a process (or processes) to create a visual image (the 'photograph') or multiple copies.
4. The appearance of this photograph allows the viewer to learn about the nature of the photographic event.

(Philips, 2009)

This 'new' theory of photography made it clear that the photographic event (2) is not yet a photograph as it cannot be viewed and will require additional processes (physical or electronic depending on the photographic medium) to create a visual image. For the project, this model and changes to the models highlight, in my view, a key part of the project's importance and that of moving forwards in our assessment of changes in the nature of the photographer and moving image capture professional. The point being that the light image begins the photographic process in both theories and continues to construct the physical change (whether photo chemical or photo electrical) that will result in the potential for the final creation of the view-able photograph.

Phillips in her new model focused on the creation of the photograph at point (3) when it became visible however in practice as professionals undertake consideration of a project the lighting is planned to deliver the concepts of the final image, and this happens from a significant period before the image production to moments before as the scene is assessed and the final image planned before the capture moment occurs.

The new model also raised its own questions about authorship. The 'New' model requires (2) an event and additionally (3) print/display. Therefore, if a photographer did not do (2) then according to the new theory who authored the photograph? Costello discussed whether photographic prints from undeveloped rolls of film left after Garry Winogrand's death and not developed until after this point should be attributed to him or to whoever developed and printed them? The common-sense answer would seem they would still be attributed to Winogrand, but the new model would have the photograph not actually exist until stage (3) has been completed and so should not be. Walden counters this by saying:

'But I doubt that art dealers or collectors would be convinced by such reasoning (I suspect for good reason, as it might well be that there is no answer to the question of whether or not such prints are authored by Winogrand and that, if

the matter is settled at all, it will be on the basis of complex sociological forces, especially market forces).' (Walden, 2019, p. 310).

As the need for stage (3) opened questions about authorship so stage (1) opened questions about the nature of the subject. Paloma Atencia Linares (Atencia-Linares, 2012) argued that even photographs combined to create fictional scenes counted as strictly photographic (with constraints). This is controversial as fictitious entities cannot interact causally with the light sensitive media, however as point (1) of the new theory defines a light scene created by light sources which opens the option that a fictional scene rendered through light onto the image can become photographic. It also opens the possibility of a non-automatic process to capture the 'photograph' which could open the 'photograph' to art such as the works of Gerhard Richter who describes his pieces as 'photo paintings'.

Costello discussed how Richter started with a photograph in some cases such as his Kólner Dom piece, however the final pieces can end up as unrecognisable from the initial light image. He says 'I'm not trying to imitate a photograph; I'm trying to make one. And I disregard the assumption that a photo is a piece of paper exposed to light...' This degree of departure is potentially validated by the new theory however it may also be argued that post-production can create a final image through compositing that the original image or context is no longer recognisable, and this is still a recognisable image. It may not be the same as the original in all respects but the gathering from the light scene through the camera still begins the image creation process. Lopez' discussion regarding Richter or/and the Kólner Dom example is one extreme demanding recognition of the photographic event when scales of modification within the theory's stages may still produce recognisable images.

We can see that the New Theory (Phillips and Lopez) are a way to demarcate WHEN as much as WHAT a photograph is as stages 1 and 2 of the process according to Phillips are formative however the concrete article does not exist until stage 3. What is also significant is that the stages begin with a light image which demonstrates that without the light image the following stages cannot take place. If they cannot take place, then a photograph cannot exist within the new theory. This process dependency places light at the very beginning and if the photographer is in control of the light, then it places the photographer at the very start of the process as well.

That photographers begin the process before the image is created is not a new theory as Edward Weston (Weston, 1943) states 'The finished print must be created in full before the film is exposed 'The two together (New Theory process and pre-event aesthetic/artistic) do however reinforce the photographer in theory as the motivating factor in the image creation assuming the photographer is controlling the light source.

Costello also raises the issue of epistemic privilege of the photograph and how the new theory(A)and sceptical orthodoxy(B)deal with its presence and that of the image's aesthetic quality or validity. We can ask how does (A) account for epistemic privilege widely attributed to photographic images, i.e., orthodoxy's view that 'automatic recording bypasses human fallibility' and thus its use as evidence and how (B) has trouble assessing photography as art as it may say that epistemic privilege of photography entails its aesthetic disadvantage.

This creates a serious question as it distinguishes what is true of photography from what is true of photography serving social institutions (rules guidelines, codes of practice, technical approaches etc. Associated Press guidelines as an example), (Maynard, 1997) and this may impact our sense of 'truth' in image. We can see this happening in our social media world where the lines between the images' aesthetic qualities and epistemic privilege are placed in a world of image makers and online fakes almost impossible to separate from reality (Kramer, 2022).

This has further complexities added through Lopes' focus on belief independent tracking as elements of the qualities of epistemic privilege (Lopes, 2019), as it would then invalidate almost all smartphone images that are now taken with AI processing as the AI algorithms are based on models from models constructed on belief dependent databases using 'ideal' images affected by cultural, social, and individual concepts of the ideal by the database authors.

'An item is a photograph if and only if it is an image. That is a product of a photographic process where a photographic process includes (1) a photographic event as well as (2) processes for the production of images' (Costello, 2017, p. 88).

Irrespective of theories and philosophical arguments photographers and cinematographers create images, we 'paint' with light. This is the beginning of the image, "where is the light where do I want the light to be? What colour is the light, what mood is the light setting? And how do I paint this image to be the image I imagined at the start?

We are captivated by the still moment taken from time and captured in a single frozen representation of that displaced event. For the practitioner the importance of recording medium cannot be underestimated. From size and type of film to size and type of digital sensor the light gathering medium affects multiple aspects of our image creation process from the act of recording the image to the dynamic range and colour rendition (or not in black and white photography) of the image. The choice of medium is an integral part of what we attempt to achieve when creating the image and we often talk about tonality and other creative terms when describing our choice as it is driven by emotional as well as technical decisions.

"There's a spirituality that's connected to it. I go out to take the pictures and at the end of the day I'm by myself, alone with my thoughts, in the dark room. It becomes very meditative." (David Benjamin Sherry, quoted in Genova, 2017, p. 1).

The method of capture to the audience, however, in most cases is immaterial in comparison to the method of presentation and the method of presentation or consumption has changed immeasurably over the last two decades as the image moved from film and the printed image to the fleeting impermanent digital display. Each mode of display holds their own significance to us from the fine art gallery to the factual importance of a photojournalistic moment, the social history of a family album and the representation of 'the now' of a social media image.

And with each medium, each moment of change the argument over ‘what is a photograph’ arises again.

As Ryan Waneka (2015) says,

‘Change is uncomfortable and sometimes we just want to hold on to tradition and what we know. But whether or not you approve, social media has and will continue to change photography.’ (Waneka, 2015, p. 2).

This project is driven by the changes that raise the question again as it is driven by the practitioners who create and capture those photographs and although it may answer many questions it is unlikely to answer, ‘what is a photograph’. As the still image is one side of the hybrid image practitioner’s toolkit its construction and use in practice is as important as its theory and should not be forgotten in this research.

‘The various forms of photographic practice contribute to the production, reproduction, dissemination, of the everyday meanings within the framework of which we act. I believe this fact is fundamental; we should not lose sight of it when we attend to other aspects of photography – the photograph as a picture, or as a token in a system of economic exchange, or whatever. The idea of photography as something used to engender meanings has of course been with us as long as the notion, particularly prevalent during the heyday of the picture-magazine, that photography is a language.’ (Burgin, 1984, p. 34).

How we interpret the photograph and its changing nature in mobile/networked image use and how the move of moving image creation to mobile devices is the latest major shift in transitioning aspects of specialist practice from those specialists to most of the population.

3.2 The moving image

The moving image has been recorded on film for over one hundred years (Malkiewicz, 2015) and for most of that time the ability to produce moving images that were acceptable as professional, suitable for broadcast or for theatrical release has been prohibitively expensive. The last two decades saw the arrival and rapid change in technologies that enabled access to high quality moving images available to most people and saw the delivery of untold moving image stories being produced.

The moving image began being recorded on film emulsion and through the majority of the first fifty years was the most popular way to record the moving image until the advent of television, and film recording still has a place (although to a limited degree) in theatrical releases through an agreement with Kodak and the film production studios to produce a certain number of films every year using film. (Giardina, 2015). Film was really the only way to record

moving images until the arrival of videotape in the 1950's (Ampex, 2019) and, even for a time after the arrival of videotape, was still used for most of the television production as the early videotape systems were too large to be usable in a portable format. Television production, domestic video and then professional broadcast video posed no major threat to film as the medium of choice for theatrical production owing to its low resolution for decades after its introduction. Standard definition video produced images between 400 and 600 lines in vertical resolution and in a 4:3 aspect ratio which was significantly poorer than the resolution of film stock. However, the move to High-Definition video in the late 1990's brought video to a wider aspect ratio of 16:9 and a vertical resolution of 1080 and horizontal resolution of 1920. With theatrical projection systems running at 2K resolutions (2048×1080) at the time, the 1920 x 1080 resolution fell only slightly short of this standard and enabled video to finally be used for theatrical production with the noticeable arrival of the Sony HDWF900 in 2000 (Sony, 2006).

The recent ability of high-resolution video at 4K, 6K and 8K and even 12K has enabled the production of high-resolution stills (8,24-,36- and 80-megapixel equivalent) to be produced from frame grabs effectively allowing video to record still images at the frame rate being recorded which opens many options for image capture:

'I now have the chance of using a tool that shoots at a higher-megapixel setting than the average camera...I can shoot at 60 frames a second, ... but more importantly, it has one killer feature, and that is it has the pre-record function, which means that if you're covering a protest or if you're photographing a child, or anything that has a moment to it, the second that moment happens, even if you're late to push that button by two or three or, in fact, 28 seconds, you have it. It's not a time machine, but it's the closest thing we're ever going to get ...',
Vincent Laforet (2018 quoted in Sawalich, 2018, p. 6).

These changes in the ability to create the moving image allow us to transition to new ways of using the image and new approaches to think about our workflow and intent when we are creating the image. These considerations and developments feed directly into the processes being analysed by the project.

In a similar vein to photographic theory the moving image has been viewed through varied theoretical lenses. From early parallels with the automaticity of photography (Marignier, 1990), new theories added extensions to the image within the context of its part of the film. They also added how the construct of film relies on the image's interaction with its surrounding images, sound and cultural/social understandings (Brawdy, Cohen, 2009). As film theory progressed it moved to encompass and be encompassed within mass media theory (Friedberg, 2009) and subsumed within communication theory, from the signs and signifiers of its own iconography and its use of our wider iconography.

Although theorists as always analyse the moving image and propose a wide range theoretical models for its function for a variety of reasons, I will concentrate on areas of theory that are 'functional' although I will also to some degree discuss Deleuze's film theory or philosophical

discussion regarding film to allow further discussion of links to his wider philosophy, in particular assemblage theory.

Film theory has developed and is seen as progressing from formalism to realism, through Eisenstein and Pudovkin among others to the 1960's and 70's, where the early classical film theory was being challenged by theorists applying new developments in concepts of knowledge including approaches from linguistics through Chomsky and Jakobson (Braudy, 2009). Since this period, film theory has developed models that draw upon these earlier theories with insights from formalism, politics, linguistics and literary comparisons. I will concentrate on a small subset of theory with a formalist and realist examination from soviet Montage theory from Eisenstein and Pudovkin and Mise-en-scene as championed by Bazin as they illustrate areas of physical construction of the medium using the moving image and highlight important differences to the still image.

Constructs of the moving image such as films and television programmes are made from collections of single shots. They may be viewed as frames that contain movement and time. However, film is rarely just a single frame (although we will return to this later). With the exploration and examination of early film, filmmakers began to dissect the medium to see what made it work and examine how shots related to each other. Anton Kuleshov demonstrated the impact of adjacent shots on audience perception of what was happening on screen through an experiment where a shot of a man looking at camera was cut in three versions with a shot of a bowl of soup, a girl in a coffin, and a woman on a divan. Audiences viewing the separate versions commented how his performance was incredible in its portrayal of hunger, grief, or desire in direct relation to the adjacent shot even though the shot of the man was the same shot in all three versions. This effect of attributing meaning to adjacent shots through their relationship formed from the viewer's perspective came to be called the Kuleshov effect. Although as Prince and Hensley discuss, the validity of the relational effect between shots has been assumed and accepted through this 'effect' rather than tested (Prince and Hensley, 1992).

Sergei Eisenstein developed a detailed theory of filmic montage that sought to deliver a method to build a soviet medium through film language. With Kuleshov's building block of shot-to-shot interaction as a starting point Eisenstein proposed a range of shot to shot and macro structural montage. His range of montage includes metric montage where the duration of shots relative to one another, regardless of content, will affect the viewer's perception and reaction to the footage and rhythmic montage where continuity arises from visual pattern within the shots. Continuity based on matching action and screen direction are examples of Rhythmic montage. This type of montage is seen as being effective for representing conflict as opposing forces can be represented by opposing screen direction. (Eisenstein and Leyda, 1949) Eisenstein's montage presented a model for the use of the function of film that took its characteristics of the photographic image, and it is extended from its use of time and movement through space over time.

In addition to metric and rhythmic montage Eisenstein also defined Tonal montage where editing decisions are made to establish the emotional character of a scene, which may change during a scene. His famous Odessa Steps sequence showing the death of a young mother and

the following baby carriage sequence highlight the tragedy of the scene as an example of his use of this montage approach. Finally, he defined overtonal montage as the interplay of Metric, Rhythmic and Tonal montage to induce the required response in the audience. In the Odessa Steps sequence the result should be the outrage of the audience. (Eisenstein and Leyda, 1949).

Montage theory and its use in editing developed filmmakers' control of intent, however critics such as Andre Bazin found it wanting. Bazin stated that there were "those directors who put their faith in the image and those who put their faith in reality" (Bazin *et al.*, 2005). His reality or rather filmic reality was produced through the idealised use of mise-en-scene by the filmmaker. Originally a theatrical term describing the placement of actors and props/set on stage in film it came to broadly describe all elements that are contained in the world of the shot. Bazin felt that an ideal film would have no or little editing and be presented using techniques such as deep focus and lack of manipulation of time or space in the image, to present the world in front of the camera as reality for the audience to shift their focus as they would. As a result, he felt that overuse of editing and soviet style montage was negative to the film and would provide; "the creation of a sense or meaning not proper to the images themselves but derived entirely from their juxtaposition". (Bazin *et al.*, 2005).

Bazin saw film as superior in presenting reality when compared to art or photography as "for the first time, the image of things is likewise the image of their duration, change mummified as it were." (Bazin and Gray, 1960) and although his idealised film would have little or no montage through editing, he admitted that for the moving image to function it often required montage. His desire for filmic mise-en-scene and Eisenstein's montage illustrate distinct areas where the moving image and its use place its function and form as separate from the still image. The outline of early moves from the formalism of montage through Pudovkin and Eisenstein to Bazin's filmic realism highlight areas where the moving image is using structure in a very different way to the still image. It highlights aspects of the relationship of shot to shot through time and of shots to shots in sequences and overtonal montage. Bazin expands on the discussion of functions of the shot through movement in the scene shown through deep focus (a technique where everything in the frame is in focus) and wide shots (a shot showing the whole scene as far as possible where movement happens within the frame over time).

Deleuze in his cinema books 1 and 2 'the movement-image' (Deleuze, 1986) and 'the time image' (Deleuze, 1989) presents a philosophical argument within a post-structural theory position on the nature of film that relates in many ways to his wider philosophy of assemblage theory which presents an ontological position coherent with the project's links across practice, society the individual and technology. Deleuze's approach to the moving image is broken across the two images 1) the 'movement image' which Deleuze breaks into the affection image, the perception image, and the action image and 2) The time image. Deleuze sees cinema of the movement-image has been replaced by cinema of the time-image although he does not assume greater importance of the time-image over the movement-image but just states that the change has happened.

He presents cinema as and representative of the assemblage of sights and sounds and theatre and industry and in image perception through a character's point of view (POV). Elements in movies external to the character POV are technically external to the character (it is an illusion of the film construct). The perception image as one element of the movement image is a sequence POV and view of world which we assemble. The 'consciousness of the camera acquires an 'external vision' which with our brain and its own perception image create objective and subjective shots together to allow us to use the characters subjective POV.

We see links to assemblage theory as Deleuze highlights differences that film has over other media movement including the static frame in the photograph and in film the frame set free, how early films moved scenes together with realist and continuity editing and added 180-degree eyelines to the film language. He describes the beginnings of camera movement and how the use of zoom lenses allowed movement of image in and out of a scene and then sound was added so we can finally see movement from a philosophical view where still objects are just temporarily paused, and parts are shown in relation to the whole by cameras. The moving image camera is 'free indirect discourse' with and of reality.

As with the photograph the history of the moving image has among other areas been characterised by its output. Where the moving image is destined to be consumed has affected what is being done with the moving image and how. Early moving images were of scientific interest and visual (oddity) until the successful development of the projection of moving images by the Lumiere brothers in France and Latham in the USA in 1895 altered the moving image to become an audience focused medium (Sharman, 2019). Cinema increased its audience size and delivered drama, news, documentary and propaganda. The power of the moving image as a way of controlling the message to the masses was realised by both filmmakers and politicians. By the time of Hitler's rise to power its role as a propaganda platform was becoming fully utilised regardless of the ethical position of the filmmaker or the political intent (Boland, 2010).

With the advent of television, the moving image truly entered the mass communication age although the electronic moving image technology of early television limited its production largely to live broadcasts, which in turn delivered drama as theatre productions in front of a camera unless they had been recorded using film beforehand and then transmitted from the edited films. At this point a transition between the role of the cinema as the predominant mass media moving image platform and the television took place with films and televisions taking barbed jabs at each other, although film as the threatened incumbent took more jabs presenting its experience and quality as its defining factors over the broadcast television image and sound (Buonanno, 2009).

For half a century television ruled the mass media audience and the mass media theories. Control and audience expectations and audience impact were factors in the way we viewed the moving image in this era. And then the broadcast moving image gave way to the internet. Here a new dawn took place, enthusiastically broadcast at first by the established media platforms of broadcast television, video rental stores and cable television (Morozov, 2012). With the advent of YouTube and other social media platforms the individual could be heard by anyone and everyone. Control was no longer top down but a democratised moving image by the people

and for the people and this ideal was promoted by the optimistic techno elite. The algorithms that let us see the moving images we were interested in distracted us from the power held by those same algorithms in feeding us a diet of our own beliefs being fed back to us. Technological optimism overthrew caution and allowed voices that would control opinion to realise they could be heard (Marantz, 2019).

The moving image changed its format during this short period of movement to the internet and individual creation with a development of short videos, opinion players, memes and the online expert. In 2019 YouTube had up to 500 hours of video uploaded every minute or over 30000 hours of new content every hour (Tankovska, 2019). By contrast a broadcast television station can only show 168 hours of new content per channel every week if that channel is broadcasting 24 hours per day 7 days per week.

It needs to be clear that comparing hours of content per week is useful in some respects, but broadcast television and online content are often very different things. The moving image production team typically involves many people. Directors, Producers, Camera and lighting teams, Sound teams and post-production teams. Even in the late 1990's when small multi-skilled teams were being created to utilise new technologies the teams still had three or four people in most cases. In news teams where one might expect to possibly have a single journalist there would often be a journalist, camera person and sound engineer. (Skillset, 2000)

With small teams or individuals creating YouTube content some things cannot be given the same level of attention during the production. Although this is not always the case, lots of YouTube content has demonstrated creative ways to deal with the limitations of using small teams to create the moving image. And these creative approaches have broadened how and where content for online mediums is created. One example of this occurred during the covid19 lockdowns in the United States where most television shows closed or moved to filming from home. Much of the content from these large companies looked terrible compared to YouTube creators and in the case of the Seth Meyers show Seth Meyers even thanked a YouTube creator who had given the show help in setting up for shooting at home (Meyers, 2020).

3.3 Camera technology

In order to create the photograph or moving image we need a camera. In this section we will accept that the camera is required and discuss the camera, its development, its use and where it may be going. Linking to elements of AI image creation/manipulation this will examine the development of camera and sensor technology to show how it can enable the still and moving image creation to be delivered within the same productions.

The fundamental design of the camera is a container with a hole (the aperture) for light to come through where it falls onto a light sensitive surface(target)which is either a film or a photosensitive electronic sensor that records the image the light is being reflected or emitted from.

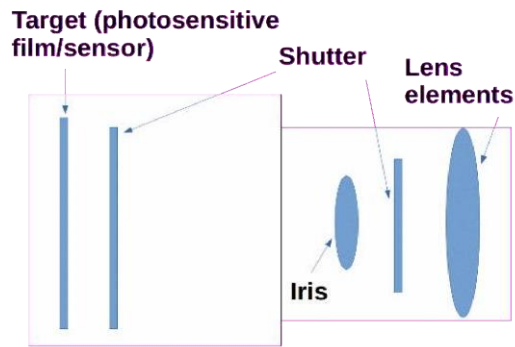


Figure 2: camera design

Note that in the diagram above the shutter is indicated as being in two places. One is in the body of the camera, and one is in the lens. This is not because cameras have two shutters but to indicate that either of these locations can be where the shutter is depending on the specific camera design.

Film

Film emulsion has been the target in camera design for most of the camera's history and only recently became replaced as the primary target in still image cameras. Moving image cameras in television have used electronic targets from the tube camera to the CCD and then the CMOS device alongside film emulsion.

Film Cameras had a significant advantage over early electronic cameras as their target areas (the size of the film emulsion) could be significantly larger than that of electronic sensors and as a result receive a larger amount of light enabling the creation of an image in lower light levels and record an image of much higher resolution. Film emulsion also produced better colour rendition and increased dynamic range compared to early commercial electronic sensors. Film negative sizes ran from sub miniature film dimensions of 10x8mm to large format dimensions of 203x254mm and even larger in some specialist cases where the largest digital sensors are now available as large as 54x40mm:

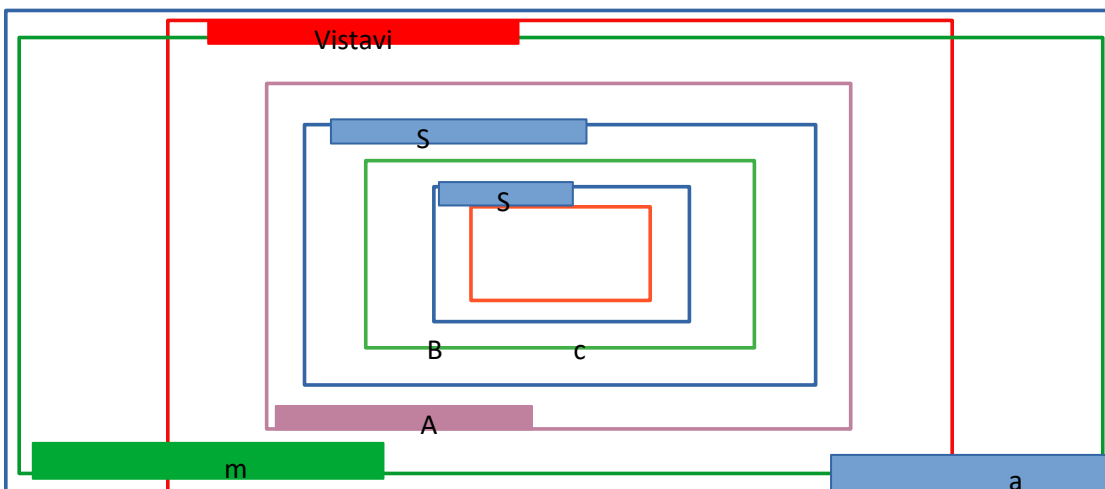


Figure 3: Sensor and film sizes chart

Film emulsions achieved, in the best cases and for a significant period of film history, a dynamic range of seven or more stops where electronic sensors for a very long time could only achieve a dynamic range of approximately five stops or less (ASC, 2001). However, the rapid development of digital sensors over the last decade has produced cameras that compete and even surpass film stock in size (as we can see above) and in dynamic range and colour rendition.

Electronic image sensors

The range of sensors have moved from early analogue electronic sensors in the form of the tube cameras utilising cathode ray technology to scan an image plane with a scanning electron gun and create an electronic representation of the optical image (Cross and Narduzzi, 1978). The use of Tube cameras continued into the 1980's when CCD's (Charged Coupled Devices) became the predominant electronic sensor technology (although in some areas tube cameras remained in use until the 1990's). CCD's had advantages over previous sensors (the scanning electron gun). They did not suffer from image lag in the same fashion as a tube sensor and they were significantly more robust. The CCD is a solid-state device rather than a vacuum tube scanning electron gun device, and as a result was significantly more robust than the scanning electron tube (ASC, 2001).

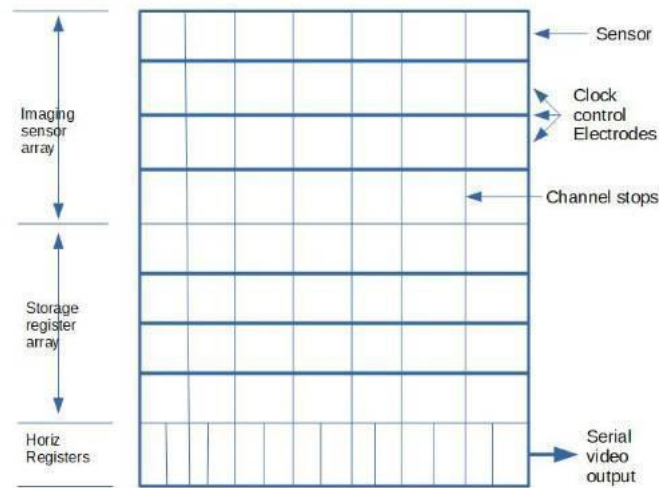


Figure 4: FT CCD

The CCD is a semiconductor device that stores and reads electrical charge produced by photosensitive elements in an analogue device that builds charge in its photosensitive substrate that is read out depending on the specific design of CCD to a linear signal feed that is fed from the CCD to the transmission or storage system which is one of CMOS designs advantages over the CCD. With the demand for CCD's and for image improvement, camera manufacturers improved CCD design to include Frame Transfer, Interline Transfer and Frame Interline Transfer

models and Sony's Hyper HAD CCD design which introduced on chip lensing for photo-sites (ASC,2001), a chip profile that is retained in most modern chip designs.

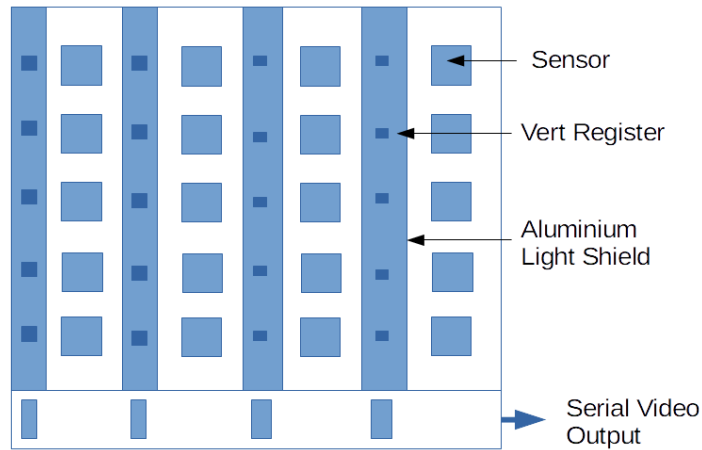


Figure 5: Interline CCD

The CCD became the predominant camera sensor for video cameras until the mass development of CMOS (Complementary metal-oxide-semiconductor) brought advantages that camera makers were quick to utilise including lower power demands, increased data transfer rate from the chip and the ability to include image processing in the CMOS chip rather than an external component. CMOS also has some disadvantages over CCD design however its reductions in cost compared to CCD has driven companies to improve its capabilities and deliver image sensors that exceed the quality of CCD's. The economies of scale led to faster development of features to respond to the gap between CCD and CMOS because of the CMOS manufacturing process being able to take place in the same manufacturing as other semiconductor dies. This combination of factors has led to CMOS designs of various types are now the predominant sensor types for camera sensors whether in standalone sensors or in smartphones which rely on the CMOS architecture's low power draw to deliver a viable imaging component within the mobile device (NASA, 2017).

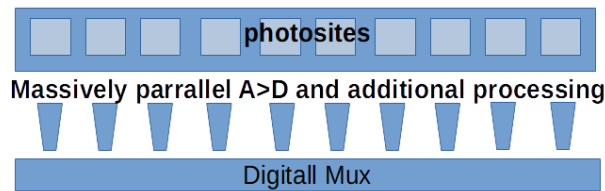


Figure 6: CMOS architecture

In CMOS's development various areas of performance have been improved from moving the wires that connected photosites to each other to the rear of the CMOS and increasing the

photosensitive area in BSI (Back Side Illuminated) designs to increasing the dynamic range of the sensor through Canon's dual gain output sensor (Canon, 2021) and reducing noise at low and high sensitivity through dual ISO approaches taken by Panasonic (Panasonic, 2015). With Sony's development of stacked image sensors (Sony, 2018) the removal of logic and processing circuitry to replace the substrate layer enables larger photosites and improvements in processing speeds allowing the Sony Alpha 1 camera to implement full frame readout with high sensitivity, high resolution, and negligible rolling shutter (Sony, 2021).

CMOS sensors read out line by line, like reading a book, and as a result in recording a moving image can result in a skewed recording of the image as the object moves and is recorded in a slightly different position in each line. This is referred to as rolling shutter and has been the focus of different attempts to address including MOS designs with global shutters. However global shutter designs increase noise and can reduce dynamic range (Panasonic, 2015) and sensor manufacturers are increasing the read speed of CMOS sensors without using global shutters to minimise rolling shutter artefacts in recent cameras such as the Sony A7S III (Sony, 2020). It should be noted however that RED cameras have produced successful global shutter on their Komodo (RED, 2021) so the future for global shutters may be brighter than thought as its successful implementation removes motion artefacts that rolling shutter mechanisms create. Pixel size and function has also developed (AF) with Canon's development of dual pixel autofocus systems utilising two photodiodes per pixel readout allowing PD (Phase detect) autofocus to take place and then combining the two diodes to give a combined larger photosite for each pixel during image capture (Winston, 2017). Most CMOS based autofocus systems were CD (Contrast Detect) systems and in smartphones hybrid systems are becoming more common (Abuolaim *et al.*, 2018):

'Most of the recent smartphone cameras use so-called hybrid AF that utilises both PDAF and CDAF. In particular, the hybrid AF performs PDAF first to move the lens to a position close to the optimal focusing position and then performs CDAF to accurately fine-tune the lens position to reach the optimal focusing position' (Abuolaim *et al.*, 2018, p. 4).

Photosites in CCD and CMOS sensors are monochromatically sensitive (they detect total luminous impact and do not detect wavelength specific information). In order to record colour information camera designs have used two primary systems. One system used three sensors and a prism to split light into its RGB components to target each component of light onto an individual sensor (Sony, 1999). The alternative system used a colour filter array over the photosites and filtered RGB components onto separate pixels. The physical size of the prism arrangement and the need to have separate sensors for each primary colour limits the physical size of the sensors that can then be held in the camera. This factor alone has led to single sensors with colour filter array designs being present in DSLR's, Mirrorless Interchangeable lens cameras, compact cameras and mobile phones. The most common filter array is the Bayer filter array (named after its inventor) and arrays red, green and blue filters in a repeating RGBG array to mirror the sensitivity of the human eye to areas of the colour spectrum (Pei and Tam, 2003) as shown below:

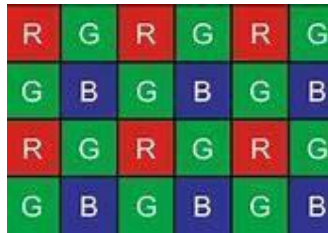


Figure 7: Bayer colour filter array

There have been multiple versions of the CFA including Red, Yellow, Yellow, Blue (RYYB) and QUAD Bayer arrays (Sony, 2018). The colour filter array system requires choices to be made on the demosaicing of the filter information and what filter array to use. The choice of array and demosaicing method can result in visual artefacts including false colour and zipper artefacts which tend to occur along element edges in the images where pixels cannot recreate the smooth edge transition of analogue reality.

Camera ergonomics

Alongside the development of camera technology from film based to electronic sensor-based systems the camera form has also moved through many variations, leading us to a point where the camera is predominantly produced using one of several main types. The current most common camera configurations are the shoulder mount camera, the compact camcorder shape, the modular camera and the SLR configuration, the 'action cam' and the drone. The most common camera shape is the mobile phone and other new camera platforms include drones and action cameras.

The shoulder mount video camera shape is a very functional shape that places the weight of the camera on the operator's shoulder and the viewfinder at their eye with interchangeable lenses or in some cases fixed zoom lenses. This design was, and still is in many cases, the de facto standard for ENG (electronic news gathering) as the form factor makes control of all video functions and lens operations constantly accessible by the camera person (Ikegami, 2017). The downside of this design is a fixed right shoulder position which makes their use awkward by left-handed operators. Earlier camera bodies had a black and white viewfinder as the only display and over time this was modified to deliver a colour viewfinder and add a fixed or swing out LCD for viewing video.

The compact camcorder shape combines a zoom lens in a camera body with focus and aperture controls on the lens and a zoom rocker on the handgrip at the side of the camera. The camcorder shape also integrates a viewfinder at the rear of the camera and a swing out LCD panel for viewing the image during recording and for playback after recording. The VX1000 is a prime example of the compact camcorder shape and the camera that made a huge impact in the 1990's for the introduction of digital video (DV) recording and the ability to deliver quality of video that was acceptable for broadcast at an affordable price (Denning, 2020).

The Modular Cinema Camera design has become very popular as it allows configuration of the camera for different uses such as handheld operation, Steadicam operation and drone use

by attaching the necessary components such as viewfinder, lens control, extended IO and recording options and remote-control systems. Current examples include the RED camera system, the Arri Alexa mini, the Sony fx9 and the Canon C300 III. The shape of the base modular component is largely a cube.

The DSLR (Digital Single Lens Reflex) shape has become the most popular shape in terms of sheer numbers apart from the smartphone. The 'DSLR video revolution' (Reid, 2010) launched DSLR into video operators' hands and placed video features in photographers' hands in ways that had not been possible before and the shape has been retained in mirrorless interchangeable lens cameras such as the Panasonic SH1. For still photography the design is very usable as the grip and viewfinder allows comfortable control of camera features and clear image representation through either optical or electronic viewfinders. For video use the design has some limitations as the grip places strain on the wrist over time which can result in unavoidable movement when re-coding longer durations handheld. This is not such an issue for stills as the wrist tension only needs to be retained at the instant of capture.

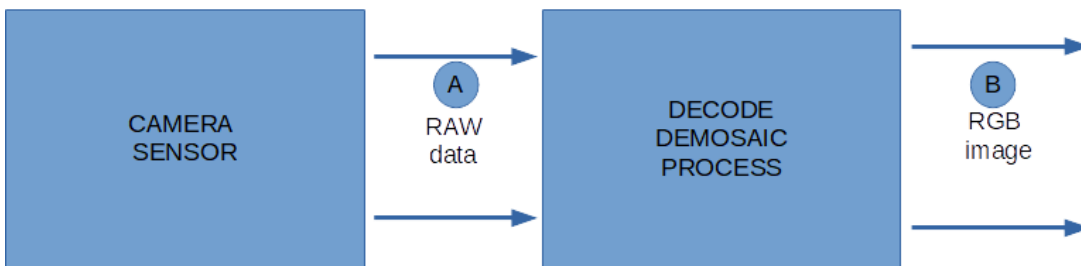


Figure 8: Camera Sensor to RAW

The compact digital camera design was a mainstay of domestic camera design until very recently when the camera features of mobile phones began to match and even exceed the capabilities of compact cameras at which point the market for the compact camera has shown a sharp decline (Zhang, 2017). The main advantage of a compact camera design is still either a larger optical zoom range than mobile phones or was until recently when folded optical designs and periscope zoom implementations have given a range of optical zoom ranges (RED, 2020). If there is a single camera body design that has a short history it is likely to be the compact camera, with only a small number or niche market areas currently being produced.

Smartphones have become the primary camera shape in today's market. From an ergonomic design point of view the slim glass, polycarbonate or metal oblong is can potentially cause physiological problems (Namwongsa *et al.*, 2018). If there was ever an argument for function over form the smartphone, this is it. The multifunctionality of the smartphone is the factor that drives its success with communication at its centre and with the image integrated into social communication the development of camera technologies is being pursued at a previously unequalled rate. With the DSLR/mirrorless body design and modular cinema/video design we

are presented with a degree of 'device uniformity' between still and moving image camera devices that has not existed to this extent before.

The Digital Image and AI image processing

As the digital image has developed so have the image formats required to store and reproduce it. The data from the camera sensor must be processed to enable the data to represent the image recorded in a manner we can recognise. In the majority of sensors, the RAW still image is recorded at point A in the diagram below where all other RGB still images are created through the Decode, Demosaic (or Debayer) and process stages to produce a final image at point B.

To record the electronic data from the camera in a usable form and in a small data size compressed image formats are used and have been used as an alternative to recording the data directly supplied from the sensor. This RAW data allows most flexibility in post-production editing however it requires a large amount of storage (Shipsides, 2012). This is not a problem for still images with current technology as storage media has progressed to a point where it is larger than the frame size of many thousands of RAW images. For the moving image however, this is still a problem as capturing RAW data per frame in uncompressed formats demands storage of much greater capacity and speed with every second generating anywhere upwards of twenty-four still frames and resulting in data storage requirements of tens to hundreds of gigabytes of storage per hour of moving images (Shipsides, 2012).

Moving image compression systems typically use variations of interframe and intraframe compression where either each individual frame has a compressed version stored or only every few frames have total information stored. The frames in between record partial information to allow predictive algorithms to fill in the missing data and complete the frame on playback and editing. In the case of MPEG compression, the addition of predicted frames as well to further enable higher or variable rate compression (Wiegand *et al.*, 2003).

Compression systems can be lossless and lossy enabling the exact version of the original image to be recovered or not. In lossy compression the image will continue to degrade further from the original image as further lossy compression is used as may be the case in editing a lossy image and then saving it. Examples of lossy compression for still images include JPEG, the most popular image format for images on the internet. In lossless compression the image storage size can also be reduced but the full and exact data from the original image can be recovered. Examples of lossless compression in stills include TIFF, GIF and PNG.

RAW data is the information stored directly by the sensor before any processing occurs allowing for the highest degree of flexibility in editing including direct adjustments of colour temperature, ISO and other image control factors.

JPEG is a lossy compression format that utilises discrete cosine transformation (DCT) functions to store the image with less data. The degree of compression is variable and works most effectively with areas of smooth colour and luminance change rather than graphic works where edge transitions tend to be very sharp. HEIF is a recent development of an advanced

lossy compression system, allowing for higher data compression while retaining image quality. Derived from the approaches taken in HEVC, HEIF delivers compression/quality improvement of 40/50% over JPEG.

Video compression occurs in points A and B in figure 9 as well. However, the image stream can be interpreted and compressed using additional techniques that relate to redundancies in data repetition between adjacent frames (Interframe) as well as frame based (Intraframe) compression approaches used in still image compression algorithms (Koenen, 2002).

Intraframe compression relies on algorithms that utilise spatial redundancies among other geographic vectors within individual frames and is used within compression systems that utilise non-interframe systems such as Prores and DNxHD (Goi, 2013), whereas Interframe compression systems utilise motion vectors and motion compensation algorithms to compress data across adjacent video frames such as MPEG and HEVC (Goi, 2013).

Although RAW video data can be recorded for video content, as commented above the data rate and data storage requirements are much more demanding than that of still images. Several approaches have been taken to compress RAW data such as the Discrete Cosine Transform (DCT) and Wavelet compression (RED,2020) is used within REDCODE RAW and Cineform for video (and JPEG 2000 for stills).

Prores RAW takes a different approach and negotiates handover of data from hardware with manufacturers. In theory Prores stores the RAW data immediately from the sensor (Apple,2020) however the functions available within the RAW video during edit vary from camera to camera in ways that make the functionality of Prores RAW variable and dependent on the data handed to the Prores container by the manufacturer's hardware. We can see this when we look at Prores RAW from Fuji and Prores RAW from Nikon where ISO control functions are available or not in each.

With the flexibility of RAW data giving the image creator significant advantages in post-production several compressed RAW systems for moving images have been developed by RED, Blackmagic Design, Apple and ARRI to name a few. These compressed RAW systems make RAW data recording viable for smaller storage sizes and thus reduce in-transit storage demands and accumulative storage at the edit storage location.

For the hybrid image maker, the choice of compression system is an important one, when dealing with still images from moving image frames as moving image compression systems using interframe approaches are prone to image reproduction errors that can reduce the frequency of viable still frames. Codecs such as Prores and DNxHD/DNxHR utilise intraframe compression only and store each frame as individual files (imagine an electronic version of a filmstrip) and do not therefore suffer from the potential for interframe coding 'errors' in reproducing individual frames. With the availability of RAW video becoming available more frequently, allowing individual frames to be adjusted with the same control as RAW still images or the use of HEVC allowing high quality to be achieved at more compressed data rates.

With the availability of a wide range of digital image formats available to the image creator we can select the format that will be most effective for the production chain the image will go through. We can also decide and whether we want image characteristics 'burnt in' to the image

at the beginning of the process or we want the image to retain as much flexibility for editing later in the production chain by using a RAW format.

Artificial Intelligence (AI) and computational imaging

Throughout the image production process digital cameras are examining and modifying multiple aspects of the image that is being produced using a variety of hardware and software approaches with the most significant developments for image processing in camera, and in some editing software, taking place in computational and artificial intelligence (AI) image processing. The use of AI is currently advancing image quality and creative output in images from smartphones and mirrorless hybrid cameras in a wide range of gathering and editing functions (Byford,2019). With its ability to deal with uncertainty through probabilistic deep learning it is extremely suitable for real world problems.

Within computer science AI is used when specifically referring to human machine learning - systems that 'mimic' human thinking and behaviour and may or may not be recognised as human in an interaction with a person. Whereas in most systems involved within image creation the 'narrower' use of deep learning through neural networks (NNs) is utilised more often as it enables systems with the potential for improvement over time and is effective when presented with larger real-world data sets.

Machine learning currently utilises neural networks to enable learning processes to take place. Composed of multitudes of individual processors or 'perceptrons' (the AI parallel of the biological neuron) each neural processor needs activation functions which can allow the introduction of nonlinearity to the neural network increasing from multiple combined perceptrons to dense layer multi output perceptrons and from here the neural network is created where hidden layers of functioning perceptrons allow evaluation against input information to be processed (Kriesel, 2006). In the modern smartphone and dedicated camera, we can have as many hidden layers as our neural processor unit (NPU) allows, increasing the processing and evaluation of the neural network to its given task.

In deep learning networks, multiple hidden neural layers provide, through ideally massively parallelisable architectures, which modern NPUs can deliver, effective processing of the network functions. Deep learning requires lots of data to become effective at learning, as larger data sets provide more data points to evaluate and build ongoing models on, to solve its assigned function and the real world supplies an extreme amount of data which modern NPUs allow neural processing to enable effective deep learning through.

'Deep learning ... is an approach to AI... a technique that allows computer systems to improve with experience and data.' (Courville, 2016, p. 8).

Within the camera technology industry AI is more often (and arguably incorrectly) used to refer to any use of machine learning or deep learning systems and so 'AI' from here on, when used in this paper, AI is used as a generic term referring to machine learning and deep learning

approaches in camera and image processing systems. As commented above the use of machine learning and deep learning is particularly useful in real world systems as Goodfellow et al explain.

'...machine learning is the only viable approach to building AI systems that can operate in complicated, real-world environments. Deep learning is a particular kind of machine learning that achieves great power and flexibility by learning to represent the world as a nested hierarchy of concepts, with each concept defined in relation to simpler concepts, and more abstract representations computed in terms of less abstract ones.' (Courville, 2016, p. 8).

Computational photography is a very broad area covering hardware and software integration to deliver photographic results through combined methods (Raskar, 2006) and often refers to both AI and non-AI computational processing of images at various points in the image chain to improve aspects of image capture and/or process the image (Weiberg, 2018) in a manner that is not achieved by hardware alone. It is an area where agent network theory (Latour,) is examined within many aspects including agency in intelligent hardware and software (Jones,2013).

In-camera AI predominantly utilises Convolution Neural networks (CNNs) which retain and utilise spatial dependencies in imaging data which is important in computer vision (Dettmers, 2015). The 'convolution' is the patching of an input layer 'patch' (subsection of the input image) from a two-dimensional input to a single neuron/perceptron to maintain the valuable spatio-structural data from the image which can be used for feature extraction (Dettmers, 2015). This can be used with traditional heuristic (logical problem-solving programming) guides to the input training data but then the NN is not learning around the heuristic stages as they are fixed logical processes. Self-learning features can be introduced to evaluate the feature extraction (Doermann, 2014) which then allows the NNs to learn in both stages and currently both fixed training data and feature sets and self-learning feature extraction are being developed and/or currently implemented in camera systems.

We can see that CNNs are utilised over other NN types as they retain and utilise the pixel to pixel relationships from the image data within the network rather than processing the data as a longitudinal data stream without the benefits of spatial relationships in the processing. This is why they are predominantly used in machine vision systems, although Mousavi, et al(2016) also showed success in using Lateral Inhibition Pyramidal Neural Networks with CNNs in their work on using deep learning to recognise human faces (Mousavi et al, 2016).

Olympus' use of CNNs in its AI for image analysis and cell recognition in low light samples uses a self-learning approach enabling higher efficiency as the training data does not need to be prepared manually at each stage (Olympus, 2021) and the use of CNNs in object recognition is as (Doermann, 2014) show in their paper the most effective approach to the area of object recognition.

The use of AI in Noise reduction, low light image capture, portrait modification, autofocus, subject and scene recognition and related image profile optimisation through image processing are undergoing the most rapid development, being largely driven by consumer demand for higher quality images in smartphones. Artificial Intelligence in image processing has rapidly made significant changes in multiple aspects of image capture and processing within the camera. AI modelling in camera focus systems allows improvements in focus tracking for moving subjects and detection of specific subjects such as human faces and eyes, birds, cars, pets and trains.

As with any technology AI and NNs are not a universal panacea for all image processing and there are issues we must be aware of in machine learning. These include algorithmic bias, poor training data delivering incorrect network processing of subsequent data, dealing with out of bounds (unknown) data and adversarial examples where false training data is introduced to cause the network to 'fail'. This last point is hopefully not an issue with camera systems but with connected systems such as smartphones could potentially be an issue.

We can also see the limitations of AI using provided training data performing as great function approximators with that training data but with no guarantee of success outside the range of the function. This leads to the 'how do we know when our network does not know?' question as examined in 'Understanding deep neural networks requires rethinking generalisation' (Zhang et al, 2017). There is also the difficulty in providing the correct amount and type of training data to train network for real world application and not just to optimise for training data and not overfitting (too many parameters to model) or underfitting (too few parameters to model) the training data (He et al, 2016). As with all programming systems neural networks are only as good as training data as the often-used programming maxim 'garbage in garbage' explains succinctly.

If we look at NN failure modes, then types of real-world problems that NNs may have can be illustrated. Poor training data (the garbage in - garbage out maxim) can lead to incorrect models being applied to later datasets as Zhang et al demonstrate in their paper on colorisation of monochrome images. The training data of dogs' faces in the colorisation produces a pink area on the fur under nose where the training data likely had many dogs panting with their tongues out and demonstrating how deep learning models build representation from data (Zhang *et al.*, 2016).

In a fatal and well reported issue with the crash of a self-driving car (Ohnsman, 2018) we can illustrate the failure of a NN when dealing with unknown data where the NN for the autonomous driving system had not seen data for images of new construction and the camera and algorithm dealt fatally with out of distribution data (outside of existing dataset). In an image creation system this failure would hopefully not lead to loss of life however it may cause an autofocus system to see one object as another type and track it or not in an ineffective manner.

It also highlights uncertainty in deep learning in areas such as classification problems. Is the system seeing a cat or a dog? What scene type? A person, animal, bird? Car, bus, train? Uncertainty metrics assess noise inherent in the supplied data. If the training data set has only cats AND only dogs and an image, then has a cat and a dog there is uncertainty noise in the

image being assessed (data uncertainty or allegoric uncertainty). When the system is presented with a horse, we have epistemic uncertainty, and all of these areas are important in understanding how NNs report and respond to out of distribution regions.

Another potential problem that may affect network imagers such as smartphones is the introduction of adversarial examples in training data to attack the NN using adversarial examples to cause it to fail in its task. This is a failure driven by an external agent so is unlikely to affect dedicated network isolated cameras, although as cameras develop these become a small share of the marketplace.

Finally, NNs can fail owing to algorithmic bias which is very significant in enabling bias in systems especially if the start of the processing chain utilises logical, fixed model-based systems rather than neural networks with deep learning (Gaonkar, 2020). In these instances, the initial logic can fall foul of programmer bias in assessment of a range of factors from racial stereotyping in facial imagery to colour bias in scene recognition or adjustment owing to sociocultural expectations (Amini et al, 2019).

Where and how RAW data and AI interact depends on the aspects of the image recording and processing pipeline the AI system is dealing with. AI for autofocus tracking happens before any image is recorded to ensure the recorded image is focused successfully on the target sensor. AI processing for relighting in camera is undertaken once the image is recorded and under selection from the image creator allowing flexibility and creative decision making to be made.

AI processing is advancing very quickly, and different aspects are being implemented in different devices such as animal AI systems in Olympus mirrorless cameras (Olympus, 2020) and relighting in Apple's portrait mode on the iPhone (Apple, 2016). It may be the most significant development to continue in image capture and creation soon.

Current examples of computational image capture, recognition and processing, include light models of the human face using AI deep learning for virtual light systems in google phones to relight the human portrait (Tsai and Pandey, 2020). Apple's integration of LIDAR to their phone sensors to improve focus and image texture reproduction using depth data relies on NN processing in portrait and night modes. Using its Deep Fusion system, 'uses advanced machine learning to do pixel-by-pixel processing of photos, optimising for detail, texture, and colour in every part of the photo.' (Apple, 2019).

Scene recognition and colour grading/optimisation per scene using computational, logic based, and machine learning approaches are increasingly available for hundreds to thousands of scene types (Huawei, 2020) and subject recognition for autofocus, exposure and colour processing in newer systems are machine learning based (Olympus, 2019).

In software for post-production, we see NNs being used in noise reduction (Topaz Labs, 2020) and in research for portrait shadow manipulation (Zhang et al, 2020) and shadow removal from a single image using computational non NN based approaches (Chunxia, 2020).

In computational video we see similar progress across a range of areas with spatio-temporal video segmentation using NNs in YouTube stories (Bazarevsky and Tkachenka, 2018) for background replacement and more work being done in this area with the increase in online

communication, such as videoconferencing background removal/replacement by visage technologies (Zezelj, 2020) using NNs and video segmentation. We see this approach also being used to fix elements of 'poor video' such as jerky video and rolling shutter artefacts (the 'jello' effect) with the YouTube enhancement suite autofix includes stabilisation and uses NN and video segmentation (Grundmann *et al.*, 2010).

These systems use approaches that estimate jerky motions in the video and smooth the camera path to synthesise new stable frames, leveraging viewports in the wide-angle content common in smartphone cameras. They analyse and affect the image using translation in x and y axis, skew and perspective over 4 degrees of freedom, with homography to stop warping artefacts and all these elements are combined to smooth out paths for stable video using properties of camera movement in cinematography (Grundmann *et al.*, 2010).

Computational photography and videography combine multiple technologies across sensors providing location, orientation and combine all to the recorded images to deliver a result greater than the sum of its parts and far greater than the sensor alone can provide. As with other areas of technology related developments it is changing rapidly, from discussions of variable shutter exposures on a single exposure to facilitate motion blur removal and reduction through the use of a 'flutter shutter' (Raskar *et al.*, 2006) and the discussion of coded photography providing a richer picture of the whole scene than a photographic image (and possibly confusing Bazin's argument of the moving image as superior to the still image owing to its representation of the scene as 'whole'), (Raskar, 2006) to current use of a wide array of spatial and motion sensors, advanced shutters and AI processing. Its integration of functions creates a new 'more than' photography with the potential for a new 'more than' moving image, from simple combinations of multiple images to integration of sensors and images and computational lighting and intelligent lighting (Skadron, 2007). It is the logical step from separate technologies in areas of camera image gathering including focusing, exposure, dynamic range increase in sensor and increased speed in sensor read out to a coherent integration of these and supporting technologies to deliver the next range of imaging possibilities.

3.4 Light and Lighting

Within the literature review a detailed analysis of light sources and the fixtures they are used in is provided in order to reveal information necessary for objectives 1,3,4 and 5 and the projects overarching aim to 'critically evaluate image capture and lighting technology, together with approaches for gathering still and moving images, and analyse the differences to discover how they are similar and to what level they can be integrated into a single lighting schema'.

As discussed in the context and introduction/background sections the researcher has a wide range of experience in image production and lighting. This allowed direct insights into the use of lighting in those areas. With practitioners including corporate video professionals, journalists and wedding photographers included in the groups affected by hybrid production, the

researcher's experience informed areas of light and lighting that needed information gathered to evaluate technologies and approaches in use now or in the future.

Practitioners have used natural light and artificial light and a wide range of controls of light to deliver the still and moving image and these have developed throughout the history of image gathering and production (Malkiewicz, 2005). From daylight to complete artificially lit environments, productions have continued to create new and imaginative vistas for the final image through the understanding and control of light within the real world in order to 'paint with light' (Alton, 2013) on the image.

In order to adequately inform the research project, the literature review examined the aspects of light - the physics of light and how this knowledge informs lighting technology's use for image gathering. This is then followed by investigating how we measure light to allow knowledge of its nature to be quantified and used in planning and delivering creative and technically acceptable results in our final images.

Technical issues regarding lights and camera technologies interaction are discussed in the section on flicker and other artefacts as these again affect everyday use of lights in practice and require an understanding of the underlying interactions to remedy.

Following this section, the literature's information on light sources in detail is covered including continuous and strobe sources. This section included a detailed breakdown of light sources and is followed by detailed examinations of lighting fixture designs and lighting modifiers. These areas are covered in detail because of their importance for the practitioners' knowledge and application when creatively and technically making choices around lighting setups. These informed choices allow lighting design to effectively meet technical requirements and aesthetic intent in the final image delivery.

Finally, the lighting section covered depth in image creation and the use of lighting approaches and differences in still and moving image practice as integrated parts of controlling the viewers perception of reality in the image.

The physics of light gives us a range of parameters that we deal with when making still and moving images. Understanding those parameters affects our control of light emitted or reflected from a scene to be received and interpreted by a physical target inside our cameras (Samuelson, 2014). We exist in a world illuminated by the sun at the centre of our solar system and even under moonlight we are illuminated by that same light reflected from the moon's surface. This reality is included in our portrayal of light when we create the image. If we use light from multiple sources the viewer will perceive the image as artificial even if they do not actively observe this. Control of light shapes viewers; perception of the image from a 'warm' amber fireplace to a "cold' blue cellar (Rogers, 1998). The literature reviews insight into physics, sources and practice informs all these areas and decisions.

We regularly discuss two characteristics of light that can be broadly defined as quantity and quality. Quantity refers to the amount or brightness of the light emitted by the light. We need a certain amount of light to hit our light sensitive target (photochemical or electronic) to form an image of the brightness we require. The relative quantity of different lights in our scene will

also affect the creative control, combined with the quality of light to meet our other creative requirements.

Quality refers to the colour of the light, its colour temperature, its directionality, its degree of contrast and its hardness/softness. To examine these factors, the literature review looked at the technical nature of light sources and modifiers available for lighting the still and moving image and discussed established practice for using those light sources to achieve our creative goals.

Lighting technology

As lighting technology is fundamental to creating both stills and moving images much has been written about lighting technology within those focuses. In this section I concentrated on outlining the current data and issues around lighting technology from light sources to fixtures and lighting modifiers.

Lighting is a significant element of production for still and moving images and the changes in lighting technology have a direct effect on the ability to deliver both within the same setup. Lighting technology that produces perceptually continual lighting has been mankind's fundamental type of artificial light since controlling fire.

My career as a Photographer, Lighting Director and Director of Photography has given me experience in using possibly the widest range of experience with a very wide range of lighting fixtures and modifiers. It is important to define the elements of lighting technology that are used including hardware, software including lighting fixture software and external software and fixture interconnects (the hardware and software that allows lighting fixtures and control systems to communicate).

Until very recently light sources were composed of a fixture constructed from the light emitting source inside a housing which may or may not have contained a focusing lens or reflector to control the light source and deliver a range of emitting patterns. The only additional electronics required for the source were a ballast in the case of HMI and fluorescent lamps (Millerson, 1999). Control systems were external to the light fixture and were at best capable of dimming lights (Fitt and Thornley, 2002). With the advent of LED sources in recent years the fixture needs to contain hardware and software to control the source and can also contain a range of interconnects allowing control and synchronisation with other lamps using external, and sometimes internal, control systems (ARRI, 2021).

The demand for stills and video on a set at the same time but by separate professionals has long been required but each conflict with the other. One approach that has been developed is Satellite labs Framelight system (Satellite labs, 2018). This was designed to allow larger setups with separate still and moving professionals to use the time and space to gather their images without interfering with the other professionals. This system however relied on a technical approach that captured stills on a second camera between video frames. This used a sync device to strobe and capture without affecting the continuous light for the moving image. Taking images between frames limits strobe duration as it cannot exceed the between frame

blackout periods. This in turn limited the type of photography that can be undertaken using this system.

Light sources

The light source is the light emitting device used in the 'light'. This defines the globe or light emitting substrate that produces the light source for our 'fixture': We are at the point in the use of artificial light sources where there are four predominant sources used in lighting moving images. In addition to these strobes (often referred to as flashes) are often used in still image creation however their brief and discontinuous nature makes them only suitable for still images and not moving images. The four types of continuous lighting are incandescent, fluorescent, HMI and LED sources. Each type of source produces light in a unique fashion and each approach has a direct effect on the use of the light in image capture. Historically there have been other light sources but we will not cover them as they are not in everyday use or not available at all.

Aspects of light

Light as we see it is a segment of the electromagnetic spectrum. The visible wavelengths covering 400 nanometres to 700 nanometres between ultraviolet and infrared are what we perceive as colour. 'White' light is how we perceive the entire spread of visual wavelengths. To use artificial lighting sources effectively we need to understand how each lighting source emits light and which parts of the visible spectrum they emit to understand what colour will be emitted by the light source which will allow us to predict and correct for changes in colour registered by the cameras sensor which we see as its colour accuracy / emission spectrum.

To emit light the source needs power and each type of light source has a separate heat output and electrical efficiency and depending on the combination of emitter source and power a separate luminance output. The physical emitter of the light source also has size, and the size affects the quality of light. I use the quality of light to describe the hardness or softness of the light source. Hard light is created from a small light source and creates clearly defined shadows. Soft light is created by large light sources and creates soft edged shadows. (Fitt and Thornley, 2002). The relationship is illustrated below where we can see that light emitted from a small source will arrive at a subject and either be blocked or pass by it. The light that passes the object passes on to illuminate anything beyond the subject and the lack of light from the blocked section results in our shadow. In the case of a larger source, the light emitting points are spread across the surface of the fixture and result in light arriving in the shadowed areas of other emission points and illuminating them with a graduated number of emission points causing a graduation in the illuminance of the shadowed regions edge creating a 'soft' shadow, as we see on a cloudy day when the entire sky becomes our emitting surface.

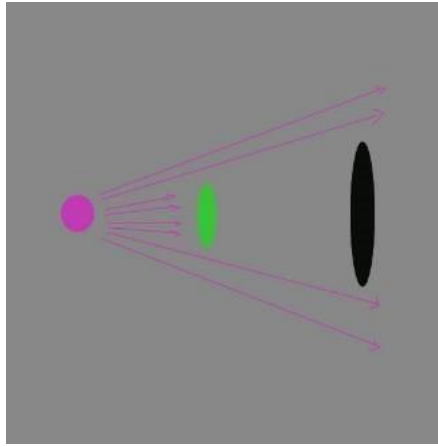


Figure 9: hardlight

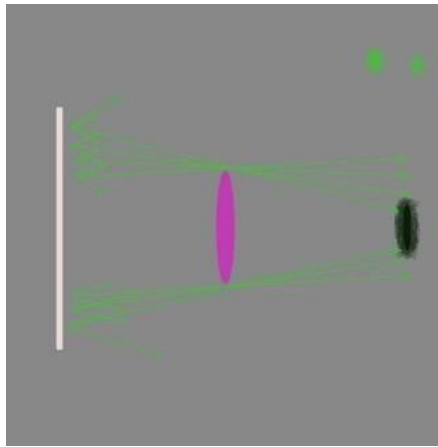


Figure 10: Softlight

Measuring light

To measure light, we have methods and scales of reference for light quality that have developed over time. The four quantitative units of measurement are Luminous flux (Lumens), Luminous intensity (Candelas/Cd), Illuminance (Lux) and Luminance (Cd/m²) (Fitt and Thornley, 2002). For the total quantity of visible light emitted by the source we use Lumens, however of more practical use in using light is Lux, the measurement of lumen per square metre. To represent the spectral distribution of a given source we use spectral emission diagrams (SED) which show how a light source emits the wavelengths of the visual spectrum.

The CIE Chromaticity diagram lets us plot all the colours the human eye can perceive (Abraham, 2016) with the Plankian locus being the set of points that we perceive as 'white light' emitted from a black body. We can overlay visual systems that we use on this system to show how much of the visible system we can display with those systems this is important to understand when shooting and lighting to know what range of colours the systems can display and what colours it might have problems with.

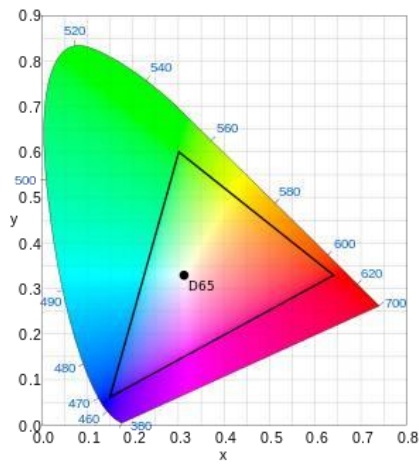


Figure 11: NTSC

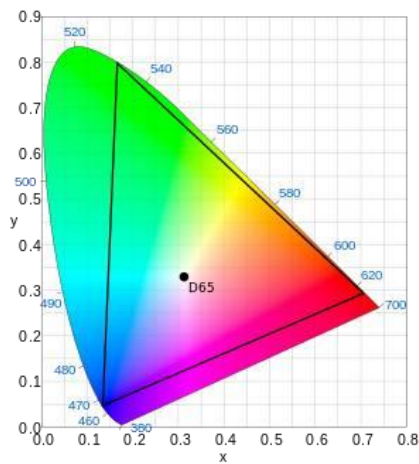


Figure 12: REC2020

Although visual representations of the colour gamut of a system and the spectral distribution of the emitted light from a source are useful, the information regarding the quality of light output from a source are often given as CRI (Colour Rendering Index), TLCI (Television Lighting Consistency Index), TLMF (Television Lighting Matching Factor), TM-30 or SSI values. These Colour metrics give the lighting camera person a quick guide to the colour quality of the light, however they are not without their problems, indeed TM-30 was specifically developed to deal with significant issues in CRI and its reliance on a small colour sample group size and the ability of manufacturers to produce, for example, narrow band fluorescent or LED lamps that would target the sample colours and achieve high CRI values even when the gaps in their wavelength production delivered poor colour fidelity to the naked eye or the camera sensor (Sekonic, 2019). To help give a more detailed and reliable picture of the light output TM-30 includes 3 components; Rf- a fidelity index that is similar to the commonly used CRI, Rg- a gamut index that provides information about saturation and a colour vector graphic to provide a graphical representation of hue and saturation relative to a reference source (Royer, 2015).

SSI was developed to 'address issues with existing indices such as the Colour Rendering Index (CRI) and the Television Lighting Consistency Index (TLCI) that make them inappropriate to describe lighting for digital cinema cameras' (Oscars.org, 2020). It references sources against ideal sources (in a similar fashion to TLMF) such as tungsten incandescent and produces a value based on the separation from the idealised output of a continuous spectrum source. Below we see an example of an LED (white line) compared against an idealised incandescent source (yellow line). The variations away from the even distribution of chroma output will cause colours to be recorded incorrectly and so will reduce the SSI value (Oscars.org, 2020) The range of lighting evaluation scales now available are being used by manufacturers of still and video lights and will help produce reliable indications in the future of light colour rendition for the image creator.

Flicker and other mechanically produced visual artefacts.

In the moving image we try to create an image that is uninterrupted and seems to replay a realistic motion sequence of the real world when viewed. Owing to a range of factors relating to the mechanical recording of the image this is not always successful and can result in several visual artefacts in the recorded image. These artefacts can be classified as either motion or interaction artefacts.

Camera frame rate flicker

One of the first artefacts in the production of the moving image to be 'solved' was that of frame rate flicker. When a frame rate of under 48 fps is played back to the viewer a noticeable flicker is perceived in the moving image. Early filmmakers experimented with frame rates to discover (Malkiewicz, 2005) this. To record and perceive realistic motion only requires a frame rate of approximately 24fps. To save money by using less film, a process of recording at 24fps and playing back each frame twice for viewing allowed both realistic motion and flicker free viewing of the moving image recording. When television systems were developed an approach was used where each complete frame was produced through two interlaced scan lines producing the full resolution image perception with less demand on the system bandwidth. (Burns, 1998) In the case of UK (later PAL in UK colour television) based systems this used a frame rate of 25fps produced through 50 interlaced images and in the USA (later NTSC colour television) a frame rate of 30fps was used combining two interlaced 60i fields to produce a complete vertical resolution image. In both these and other systems such as SECAM the base frame rate was tied to the frequency of the country's mains frequency to simplify engineering and help reduce electrical interference on the recorded and broadcast images. (Burns, 1998).

Camera and light source frequency mismatch flicker

A second type of flicker demonstrates the interaction of camera systems and lighting technologies and in particular camera frame rate and conflicting artificial light frequency flicker. This flicker is created when the frequency of an artificial light source is mismatched with the frame rate of the camera creating uneven exposure between frames. When played back this uneven exposure is perceived as a flickering image (Samuelson, 2014). In the case of incandescent lights, the illumination of the light source dims and rises in concert with the applied mains frequency and flicker here tends to be perceived as a pulsing in the image rather than gaps in the image. With discontinuous light sources such as HMI and fluorescents the flicker can be created through completely black frames when the frame recorded coincides with the off cycle of the light source. This results in a flicker that is perceived as a more abrupt 'flashing' of the image as lit and unlit frames are played back.

As an example of the mechanistic process of recording and a practical application of this knowledge for the professional we can calculate flicker free frame rates discontinuous light sources (Samuelson, 2014) as follows:

(For a 60hz mains supply)

Camera speed = shutter angle /3/light peaks per exposure period

With a shutter angle of 180 we would therefore have a safe camera speed of 30fps for a discontinuous source such as metal halide lighting with a typical 2 peaks per mains cycle. This then allows us to plan for the use of light sources and camera systems in advance of our shooting times.

Playback system and camera frequency mismatch flicker

A third type of flicker is produced when recording electronic video systems including television on monitors when the frequency of the monitor is mismatched with the recording frequency of the camera. This creates a rolling line which moves up or down the screen in the recorded image depending on the degree of frequency offset. To correct for this mismatch, cameras can adjust their recording frequency in minute millisecond degrees until they match the frame rate of the screen being recorded and the artefact no longer occurs (Panasonic, 2020). This can however then create a mismatch with the ambient light source if the screen is in an artificially lit location.

Each of these modes of flicker or visual artefacts illustrate the interaction within the recording process of aspects of the technology used to record the moving image. It illustrates the interaction between the light sources and camera being used and the motion inherent in the real world being recorded. Understanding of these interactions is crucial to the skills and knowledge of the professional and their ability to apply them in the creative pursuit of the moving image as Billy Williams says:

“Thorough knowledge of the equipment and technique of film making, aesthetic understanding of how to control light and use composition, ability to communicate and collaborate ... (are important) “(Williams, quoted in Ettegui, P 1998, p.63).

Light sources in detail

3.5 Continuous Light Sources

Incandescent lighting:

Incandescent light sources produce light by applying voltage to a coiled tungsten element which then reaches a temperature where it can emit light, inside a glass envelope with a mix of gases that can affect the colour spectrum of the emitted light. Most of the incandescent light's light output with a colour temperature of 3200 Kelvin when supplied with their guide voltage. As the coil is heated by mains voltage the light output varies slightly between phases but is relatively consistent over time producing consistent even illumination over the exposure time of the still and moving image capture although not without variation (see flicker section). As colour rendition is important in image capture the change in colour temperature output with voltage drop is important for the image creator to consider (Millerson, 1999). It is important to note that colour temperature from incandescent lights varies with voltage so dimming incandescent lamps will change the colour temperature relative to the increased or decreased supply voltage (Fitt and Thornley,2002) and the colour on camera as it happens. This requires an awareness that lamps dimmed at different voltages in a scene will provide different colours.

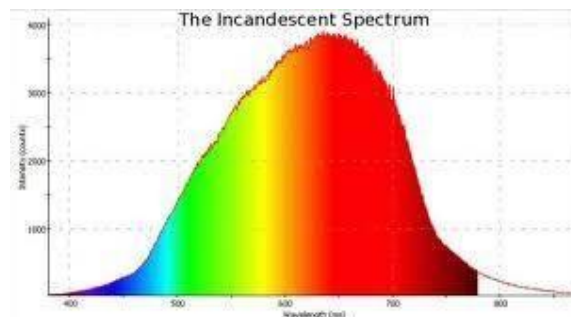


Figure 13: Incandescent SED

Fluorescent lighting

Fluorescent light sources produce light through an entirely separate process. Fluorescent lighting illuminates a glass tube with a fluorescent coating through the excitation of gas particles held within the glass envelope. Unlike incandescent lighting, fluorescent lighting delivers perceptively continual lighting through a rapid series of pulses controlled by a lighting

ballast. A standard ballast operates at mains frequency, typically 50hz or even 60hz. This frequency can cause problems when capturing moving images by unevenly lighting adjacent frames and causing a flickering in the recorded image and even resulting in unlit exposures during still frame captures with shutter speeds of shorter duration. To eliminate or reduce this effect fluorescent lights for still and moving image capture are driven by high frequency ballasts which cause the light pulses to be driven at frequencies typically over 20Khz. This results in any frame being illuminated by a range of pulses to stop the possibility of blank or pulsed images (Samuelson, 2014)

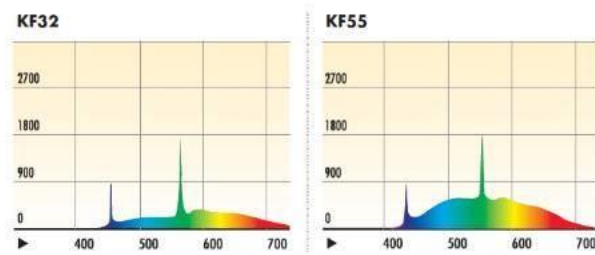


Figure 14: Fluorescent SED (Kino Flo,2019)

Fluorescent technology gained popularity with the advent of Kino Flo light sources that produced tubes that reduced the green spike in fluorescents and flicker on camera (BSC, 2020).

HMI / Arc

HMI (Hydrogarnum, Medium arc length, Iodide) is the third type of light source in use currently. HMI lamps are arc lamps enclosed in a glass bubble. In a similar approach to fluorescent lighting its technology produces a rapid series of flashes which we perceive as continual light but which the camera can record as pulses of inconsistent light quantity and quality. However, HMI utilises a high voltage ballast to produce an arc of electricity between two poles inside of its lamp that produces an exceedingly high light output in the range of 100 lumens/watt. As with Fluorescent lighting the pulses can produce image problems with colour variations and blank frames caused by high shutter speeds mis-timing relative to the intermittent arcs, even with the ballast for the HMI running at high frequencies. This is especially problematic at high frame rates for slow motion footage (Samuelson, 2014).

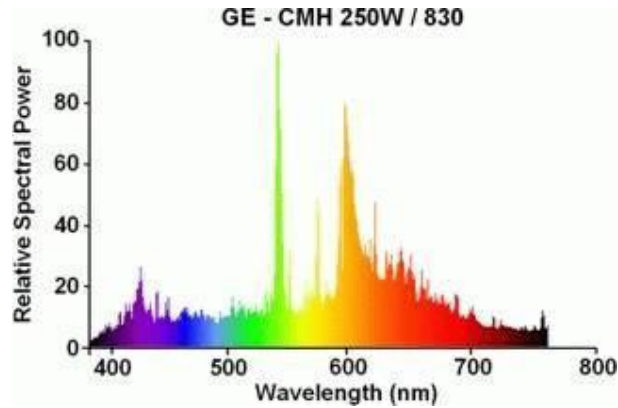


Figure 15: HMI SED (GE,2019)

In use across a wide range of productions owing to its high output HMI's allow shadows to be lit that counter daylight backgrounds in a wide range of cases and are thus popular as daylight fills and as large area light sources.

HMI globes require significant care compared with the other light sources being discussed and the lighting practice and sheer weight of HMI ballast may limit their use by practitioners gathering stills and video. Although the high output may enable a single light source as a daylight fill to make the HMI the most valuable light for that exact reason if the professional is using a single light approach. HMI's also produce the hardest light source as the arc in the globe itself is very small and produces very clean shadows when used in pen face and PAR fixtures.

LED

The most recent viable lighting source is the LED (light emitting diode), a semiconductor-based emitter which uses transmission of light as a result of the movement of electrons across

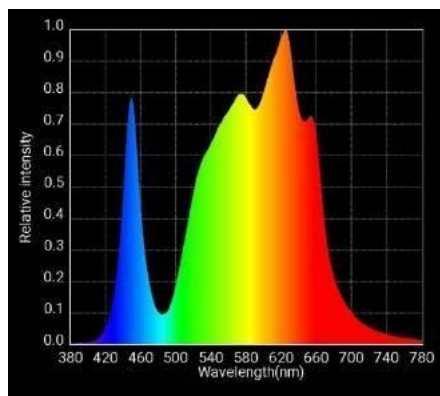


Figure 16: LED SED (GE,2018)

the semiconductor junction. LEDs are a lighting technology that has gone through very recent and very rapid developments. They have moved from the first high output devices in the late 1980's being used in automotive indicators to a wide range of emitters now available that have

a high lumen output per watt and a very long lifespan, making them a very popular form of lighting. LED's can now be produced with a very high colour fidelity that minimises colour shifts in the recorded image, has a high light output for very little power draw and when running at consistent brightness can deliver a continuous light output. When being dimmed however LED's utilise pulse frequency control which can have problems like HMI and Fluorescents, although some designs are eliminating this problem (Litepanels, 2020). The manufacture of LED panels has also moved from discrete LEDs to COB (chip on board) sources and control electronics for arrays.

As we discuss in other areas the process of image capture is controlled by fundamental exposure factors including shutter speed which can vary from minutes or even hours to thousandths of a second when capturing a still image. However, it has a limited slower shutter speed range, generally a ratio of the frame rate being recorded, in most of the moving image's capture, a multiplication of the frame rate in order to maintain motion blur between frames to give the perceived effect of smooth motion. This range of temporal periods of capture relate directly to and are affected by the variation in lighting intensity or rate of light pulses produced by the lighting technology being used (as discussed above). This directly affects how, when, and where different lighting types can be used in still and image capture. Therefore, gaining a deep understanding of lighting technology is an important area for the doctorate to investigate.

Mono colour LEDs emit a single 'white' light. This type of white LED comes in a range of qualities that affect their colour rendition as they change the emitted spectrum. Poorer quality LED's can have a significant colour spike which needs to be corrected for to enable them to be used to produced accurate colours in camera:

Bi colour LEDs are composed of a mix of LED's emitting ideally 3200K and 5600K LED sources to enable the LED fixture to change colour temperature by dimming either set of LEDs.

This allows the fixture to emit either 3200K light or 5600K light or a mix of the two shifting the perceived colour temperature between the two extremes (Litepanels, 2020).



Figure 17: Bi colour LED panel

RGB and RGBW (composed of Red Green Blue and White emitters) LED arrays are one of, if not the, most exciting developments in lighting in recent times. RGBW LED sources have the

capability to deliver any colour that we can imagine. It is an area of rapid development with companies developing software systems that work as integrated aspects of fixtures using the technology such as the Arri Skypanel (Arri, 2019c).

LED's such as Arri's Orbiter fixture have an even larger array of emitting sources to try and address gaps or reduced spectral output that occur across the visible spectrum when using only one or two emitter types or even an RGBW array. The Orbiter uses a six-colour array, including a red, green, blue, amber, cyan, and lime LED's which Arri say; 'translates into a wider colour gamut, more accurate colours, and most importantly, higher colour rendition across the entire CCT range.' (Arri, 2019). In similar fashion the Aputure Nova P300C uses an RGBWW which, 'utilises warm white and cool white LEDs, in addition to the typical RGB chipset used in colour-mixing lights. This chipset increases its output, skin tone accuracy, and tonal variety compared to other RGB or RGBW LED fixtures', (Aputure, 2020).



Figure 18: RGBWW LED

Continuing developments in LED Lighting technologies are integrating many software driven features into fixtures including colour matching and lighting effects such as simulating light from sources such as fire, fireworks and lightning Arri commented in their keynote of 2019 that the integration between hardware and software are key to the future of lighting technology (Arri, 2019d). With functions such as high-speed sync in the Arri Skypanel and developments from LED flash in mobile phones the crossover ability of the LED as a continuous and higher power strobe source is a key area of development in hybrid image creation.

3.6 Strobe/Flash technology

Although still images can be gathered with constant artificial light, for most photographic history strobe lights have been the preferable light source for the still image. From this point on I will refer to strobe and flash units as strobes. This is purely a simplification allowing a single referent to be used. Should there need to be a differentiation I will highlight that by discussing the separation of strobe and flash units.

The electronic strobe has developed from its creation in 1931 (Tolmachev, 2011) through many iterations to become the high power controllable light source that stills photographers rely on today. Today's strobes are technically advanced with camera specific features allowing a wide range of photographic features for lighting including choice of timing sync with focal plane shutters of rear and front curtain sync which affect how motion blur at lower shutter speeds affects the recording still image.

Rear curtain sync synchronises the flash at the end of exposure as the rear curtain begins its move to stop light falling on the camera's light sensitive target. The effect is a flash 'frozen' moment with any exposed movement leading to it as Joe McNally describes.

'... they are blurring through the frame and then BOOM! – Flash hits them, they are sharp (flashed) and all the blur is behind them where it should be. The suggestion of motion is therefore logical.' (McNally, 2008, p. 14).

Although recently there has been a third option introduced with recent flash and camera combinations of Front Curtain with delay. Here you can define a delay for the strobe to trigger after the front curtain and control the degree of flash and burn (Boring, 2020).

In front curtain sync the flash occurs at the start of the exposure and in slow shutter speeds the motion happens after and through the flashed image. In addition to front and rear sync choices modern flash also have HSS (high speed sync) capabilities where reduced flash duration allows for a series of flashes to illuminate evenly across the image at higher shutter speeds. This allows flash to be used as high as 1/8000 sec shutter speeds. 'The flash emits a continuous pulse of light, instead of one quick flash. This enables the entire imaging sensor to be exposed correctly to the Speedlight's light.' (Canon, 2020).

Both rear and front curtain sync are technical solutions to delivering flash with focal plane shutters when several blades reveal and then conceal the sensor image plane and then conceal it to control the exposure time. There are two other shutter options in modern cameras. Electronic shutters, where the read time of the sensor controls the exposure time and leaf shutters which are mechanical shutters in the lens itself. Leaf shutters are available in a comparatively small number of lenses and camera systems compared to focal plane and electronic shutters. Sync with electronic shutters is controlled in similar fashion to focal plane shutters with the rolling shutter artefact of the CMOS readout still potentially producing motion artefacts. Leaf shutter sync is possible and because of the speed of travel of the leaf shutter and its small distance to travel to cover the aperture in lens sync speeds are usually available at all shutter speeds (Terkelson, 2016).

As with continuous lighting we need to measure the output of strobes and additionally their duration. The SI value for Flash intensity is called 'guide number' and is expressed as a single non decimal figure of one or two figures. It expresses a value of the flash to produce a correct exposure of mid grey at an aperture of f1 at ISO 100. From this value, assuming the flash is delivering its full power the stills photographer can calculate exposure at any distance through $f=gn/d$ i.e., at gn28 an f-stop of 2.8 would give an exposure distance of 10m.

Flash duration can affect the duration of movement illuminated during the output. The t.1 duration is the period the flash is above 10% of the peak intensity and the t.5 measurement is the length of time the flash is above 50% of peak intensity. Knowing the t.5 value lets us estimate what time most of the exposure will happen within, however we also need to be aware of the t.1 duration as some flashes have a long duration and t.1 will let us estimate how this extended lighting duration can affect 'flashed' movement in the frame.

Unlike the range of variance in colour temperature from continuous lighting, strobes largely produce a broad-spectrum emission with a colour temperature of approximately 5500K (Jones, 2009). This consistency largely allows photographers to avoid the range of colour corrections that non continuous colour spectrum lights such as fluorescent, HMI and LED require for continuous lighting. It should be noted though that strobes that use flash duration to control light output will retain the colour temperature whereas strobes that utilise power variation to reduce flash output can change the colour temperature produced by the strobe very slightly and will need to be considered to deliver accurate colours. This approach tends to only be available in some studio strobes and not on-camera strobes.

3.7 Fixtures

The unit that contains the light emitting source and that is generally referred to as the 'light' in common parlance is what we will describe as the fixture. The fixture contains a mount for the light emitting source and a power supply. Each fixture may also contain the following elements: a reflector and lens array.

A reflector will direct the light from the light source in one of several fashions. In continuous light sources this is typically a spherical, parabolic, ellipsoidal or combination design. Each design changes the direction and focal point of the emitted light with its own advantages and disadvantages.

This design choice is combined with a choice of mirrored surface with a specular, diffuse, mixed or scattered approach. The specular surface is as close to a mirrored surface as possible and will result in singular reflections from the light source and typically hard emission. Diffuse surfaces are typically created using a smooth but dull surface that reflects the initial source in multiple directions uniformly. A mixed reflective surface can be created using an enamelled white which exhibits characteristics of both specular and diffuse surface and finally a scattered surface is an uneven surface designed to produce random reflections to create as soft a source as possible (Carlson and Carlson, 1991).

Some fixtures consist of just a housing, reflector and source and are described as open face lights. The alternative approach is to enclose the source and reflector and direct the light emitted from the source through a lens. Lens designs in professional fixture are primarily of plano-convex, Fresnel or stepped design and may include one or more lens elements in the lens array to add additional control over the lamp emission and range of adjustment over beam spread from the fixture and in the case of projection lenses the ability to project a pattern from

the lens onto a surface (Fitt and Thornley, 2002). The lens array is combined with movement of the light source itself in some designs to change the beam spread and is typically found in some Fresnel designs (Arri, 2017).

Finally, fixtures will have power controls which can include dimming in the case of incandescent and LED lights. It can be found in HMI and Fluorescent fixtures but not as frequently as the engineering is significantly more complex.

Unlike HMI, incandescent and fluorescent fixtures, most LED fixtures are designed and built with the expectation that the light emitting source will not be replaced during the lifetime of the fixture. One reason for this is the life expectancy of LED sources which can run in excess of 20,000 hours (Litepanels, 2020) meaning that if the lamp is run all day for a typical 10 hour shoot the lamp would last 5.4 years if run every day all year. This contrasts with incandescent sources where life expectancy is measured in 1-2000 hours, and where design for replacement must be part of the fixture in order to make the lifetime of the fixture acceptable for the practising professional or hire company.

For continuous lighting there are distinct designs available to the image creator. These are open face, Fresnel, soft panels, soft lights, broad/flood, spotlight and bare lamp source mounts.

Open face

The open face lamp in today's fixtures includes pars and focusing open faced fixtures. The open face fixture typically uses a spherical or parabolic reflector with a fixed light source position however some open face fixtures allow the spread of the emitted light beam to be altered by either changing the reflector itself or with a simple mechanism that allows movement of the emitting source within the fixture to alter the angle of reflectance in the reflector. In the case of PAR lamps, the open face fixture is largely a simple housing (i.e., a PARcan) as the light source itself implements the light source, reflector and focusing lens (Fitt and Thornley, 2002).



Figure 19: open face fixture

Fresnel

The Fresnel lens is used in most cases in a closed face fixture design with a mechanism allowing the movement of the light source along the longitudinal axis between the reflector and the lens to change the beam angle of the lamp. A characteristic of the Fresnel lens on the beam is a soft edge to the lamp beam which is often used in multiple light setups to allow even coverage of the scene without a noticeable edge to lit regions of individual fixtures. Fresnel designs use HMI, incandescent and LED light sources (Fitt and Thornley, 2002).



Figure 20: Fresnel fixture

Soft Lights

Dedicated soft light fixtures take several approaches to produce a light with a large surface area that emits light with a very soft shadow. Studio soft lights have traditionally used a combination reflector design to emit light from incandescent sources from the large reflective surface and produce a much larger light emitting surface than possible with the incandescent source directly (Fitt and Thornley, 2002). A second approach is to use an open lamp housing inside a collapsible softbox with internal reflective surfaces and a translucent front panel to produce a very large emitting surface (B&H, 2020). The arrival of fluorescent light sources from Kino Flo in the 1980's gave a large soft source that continues to be used today with typically 4-foot length fluorescent tubes in four tube arrays producing an emitting surface of 4 feet by 1.5 feet (KinoFlo, 2020).



Figure 21: Soft Light

Broad / Flood

Broad and flood light fixtures use a wide reflector to throw light in a 'broad' spread and often use a scattered surface to increase the spread of the light. As a result, the broad light is very useful when lighting a large area or providing a general lift in lighting levels in a scene. The design of the broad light works effectively with HMI, incandescent and LED sources.

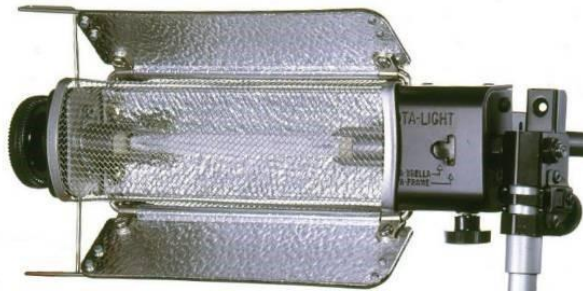


Figure 22: Broad/Flood light



Figure 23: LED video monolight design

Mono light

The mono light fixture design for continuous lights is a very new development with the arrival of high output COB LED sources and the adaptation of the studio strobe mono light design for the new light source. The mono light design is often produced with a standard photographic studio accessory mount which allows the use of standard photographic modifiers for the light source and opens many options for the new continuous fixture from soft boxes to beauty dishes and Fresnel attachments (Aputure, 2020a).

Light Panels

The arrival of LED sources that were viable for image creation produced new sources and with Litepanels delivery of the 1x1 Litepanel, a new type of housing (Litepanels, 2020). The light panel is a flat square or oblong panel with an array of LED sources attached to its surface and this simple design has been implemented by multiple manufacturers since. The beam angle of the panel is dependent on the beam angle of the lenses in the LEDs. The LED Panel design has improved as the capabilities of LED sources and the associated hardware and software control systems have continued to improve adding greater output, colour fidelity and multiple colour selection as discussed in the LED technology section earlier.

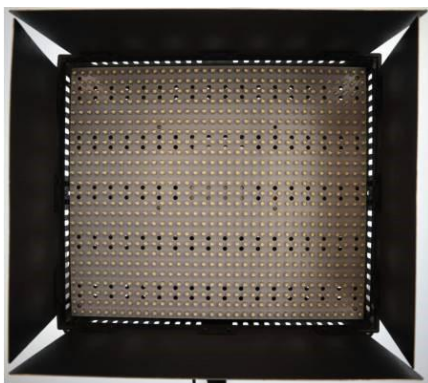


Figure 24: LED panel

The arrangement of LED's is most frequently regular and when close to a subject can produce multiple shadows as the LED separation becomes visible in the transmitted light.

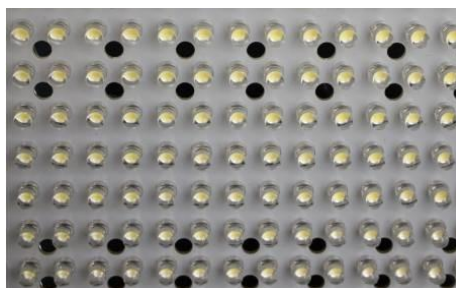


Figure 25: LED emitter separation

In order to minimise this effect other LED panels will have LEDs close together or in the case of rectangular LEDs, in some cases immediately next to each other. With emitter separation causing these multiple shadows a variety of lens arrays and diffusion panels as well as LED's providing indirect diffused light through side illuminated translucent materials have also been attempted.



Figure 26: close LED arrangement

The LED soft panel

The LED source has created new fixtures, and this includes the soft LED panel. This fixture utilises LEDs within a flexible, woven material panel that can be used in a frame to produce a flat panel light or rolled into a smaller shape or fixed to surfaces or under surfaces easily as the flexible panel weighs very little (Westcott, 2020). As with most LED fixtures the flexible panel lights are available with mono-colour bi-colour and RGB/RGBW LED arrays.

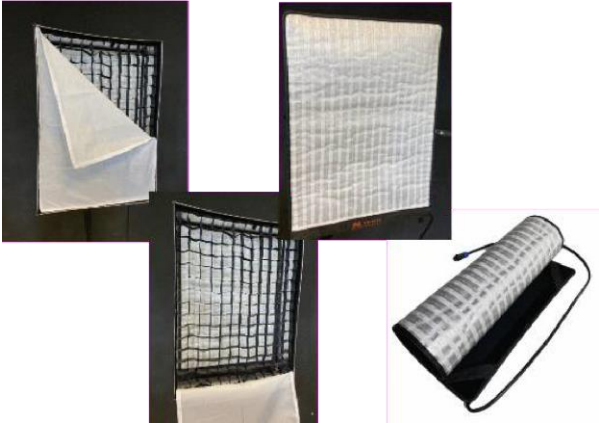


Figure 27: flexible LED panel

Strobe designs:

The modern strobe light comes in many shapes and sizes but predominantly sits within one of three major designs being the studio monolight, the speedlight and in-camera (and in a few rare cases phone) forms.

The studio monolight design typically allows for greater light output and faster recycling time than speedlight and in-camera designs, although with technological developments in these areas the separation in many cases is not as great as it used to be (Mowbray, 2015). The monolight often has a xenon flash tube in arrangement with a small modelling light to provide a low-level illumination to allow the photographer to see where shadows will be placed by the strobe light while positioning the unit. In the case of some recent monolights the modelling light has been implemented using a 30W LED lamp (Godox, 2020) allowing the monolight to be used as a low powered continuous light. This allows lighting position to be fixed for stills and moving images however modifiers and exposure would need to be changed between still and moving capture owing to the significant difference in luminant levels from strobe and LED.



Figure 28: Studio Strobe/monolight design

The 'speedlight' design is the form of external strobe that most people will be familiar with, a design formed as an extension of the camera and often attached to the camera hot shoe. Speedlights come with fixed and moving heads that allow the angle of the strobe relative to the camera viewing angle to be altered. Many designs also implement a reflector and Fresnel movement to alter the beam angle of the strobe to match the angle of view of the lens being used or creatively to alter the flash coverage within the shot (McNally, 2009):



Figure 29: In camera strobe



Figure 30: Speedlight with zoom head and wireless trigger

In-camera flashes are, by design, relatively small and low powered compared with speedlights and monolight strobes as they need to fit within the camera body itself. Two primary approaches are taken with implementing them in camera, that of a concealed unit that is released to provide that flash or of fixed units that are always visible in the camera. Neither design approach affects the output of the unit however the concealed unit approach has the ability to extend the strobe from the lens axis a little more (Fig.29) which can, at some distances help reduce red-eye and add a slight offset angle to shadows produced by the strobe while the fixed design is omnipresent in smartphones (Fig.30).



Figure 31: smartphone strobe

3.8 Modifiers

Modifiers are external controls to the light source. They can be attached directly to the light fixture or used away from the light fixture. They modify the light emitted by the light fixture in a variety of ways and can be crucial to delivering the required quality of light to illuminate our scene or subject. They are a crucial component in lighting in many lighting situations, both in studio and outdoors.

Reflectors

Reflecting light happens everywhere in reality and using a reflective surface to direct light back towards the direction of the source can provide many different lighting functions from controlling lighting contrast ratios to directing light to an area that the originating lighting source position is unable to illuminate, and here the lighting reflector is crucial. The reflector comes in many shapes and sizes, and I will include the folding photographic reflector, bounce

boards and panels such as polyboard (large panels of white polystyrene) and lighting frames with ultrabounce and other reflective materials, in this category. (I am sure Gaffer friends of mine are wincing at this simplification) Reflectors can also come in many surface types from diffuse white to metallic silver and gold coatings and even black to be used a negative fill by absorbing light rather than reflecting it (Carlson and Carlson, 1991).



Figure 32: Reflector

Barn Doors

Barn doors are a modifier that attaches directly to a fixture and can come in two, four or more leaves that can be used to block parts of the light being emitted and shape the resulting light beam. This is often useful in controlling what elements of a shot lights are illuminating and what they are not illuminating and can function effectively on both hard and soft sources, although the degree of control is greater on hard sources; 'In order to enable maximum control while shaping the light, ARRI offers 4-leaf and 8-leaf barndoors ... ARRI also offers 2-leaf Flexdoors—fabric barn doors which provide control over light spill and direction and easily snap onto the front of the SkyPanels.' (Arri, 2019a).



Figure 33: Barn Doors

Scrim/Nets

Scrimms are metal or material grids that are placed in front of a light, typically a hard light such as a Fresnel or open face fixture and typically in the gel/filter slot of the fixture, to reduce the amount of light from the fixture. Scrimms are available in full half and quarter scrim with the metal grid covering all the source, half of the source or one quarter of the source. Scrimms are also available as graduated scrims where the density of the wire mesh is increased in stages across the scrim to produce a graduated reduction in intensity from the fixture allowing a subject with varying reflectance/illuminance to be given more suitable illumination. Nets function in the same way but are more typically made from cloth and placed away from the fixture in holder of open end, open side or closed design (Carlson and Carlson, 1991);



Figure 34: Scrim

Butterflies, Silks/Diffusions Larger scrims are referred to as Butterflies and range from 4'x4' frames to 18'x12' frames. Addition of translucent panels to the frames reduces light and creates a large soft source. This is referred to as a Silk or diffusion frame. They are often used to reduce or diffuse sunlight on a subject and lower the contrast ratio by affecting the ratio of direct hard sun to ambient bounce in the scene on the subject or subject(s). Flags A light will often need to be blocked from illuminating areas of the scene even with an egg carte being used. This is where flags are very useful. A flag is a solid shape, usually made from cloth in a metal frame, which is held in a stand to cast a shadow on a specific part of the light emitted from the fixture. Variations of the flag are described by their shape and size and in film called flag, dot, target, blade and cutter. In contemporary use flag is often used as a generic term for the range of sizes and shapes.

When using a hard-light source casting a specific shadow with the flag is obtained over a wide range of distances between the fixture and the subject. In the case of a soft light source to produce a relatively distinctive shadow edge the flag must be placed near to the subject, or the softness of the light will reduce the effectiveness of the flag.

Gobos

Gobo is an excellent example of the difference between image creating terms. In film lighting it has traditionally referred to any element between the source and the subject and is short for 'go-between' (Carlson and Carlson, 1991). This includes flags, dots, targets, blades and cutters.

In fixture design it refers to a metal insert in a projection lamp for projecting patterns with the fixture. In photography it is used interchangeably between the physical insert, and anything used to cast a shadow between the fixture and the subject. The use of a gobo (whichever definition we are using) can add shadow, texture and colour to a shot.



Figure 35: gobo

Umbrellas

A photographic umbrella is as it sounds, an umbrella structure with the umbrella material adjusted to suit light modification purposes. There are umbrellas with a reflective inner material in silver or gold to produce a directional and large surface area emission source by aiming a source into the surface. There are semi-opaque umbrellas (called 'shoot through') allowing the umbrella to become a soft source by 'shooting' the light 'through' the umbrella or using it as a reflective source with a softer output than a silvered umbrella (and not as efficient as a lot of the light transmitted by the source is lost through the umbrella) (Westcott, 2021).



Figure 36: Photographic shoot-through umbrella

Soft boxes

Strobe lights and small source continuous lights such as incandescent and HMI will produce hard light simply because they are small sources. To generate soft light with a small light source we need to make its light emitting surface area larger. Soft boxes achieve this by placing the source inside a collapsible (using a modified umbrella design), curved, sometimes parabolic reflector with a translucent front panel causing all the light from the source to illuminate the

front panel through direct illumination and reflection. This in turn creates a soft light source of the panel size. Soft box panel dimensions can be from 20 cm to over 2m (Chimera, 2020).



Figure 37: Soft boxes

Egg crates

As soft boxes do create a large soft surface light from the surface radiates in all directions which on many occasions can be a problem as light can then illuminate areas of the shot that are not intended for. The egg crate modifier to a soft box is a grid of cloth strips that subdivide the single source into multiple soft sources and as a result maintain the soft light but narrow the beam spread of the soft source (DOPChoice, 2020). Cinematographer Markus Förderer says that in egg crates 'you get a narrow beam of soft light. It's the best way to really control the beam,' (DOPChoice, 2020).



Figure 38: Softbox with egg crate

Space Lights and Lanterns

Two other modifiers used to create soft light are space lights and lanterns. Unlike A soft box these modifiers send light in all directions and are often used to light areas rather than individuals



Lantern



Spacelight

Figure 39: Spacelight and Lantern modifiers. although they can be used as soft sources for portrait illumination as well.

Beauty dishes

Common in photography the beauty dish is a modifier which is traditionally a reflective dish made of metal with a reflective baffle in front of the strobe position to reflect all the light from the strobe back into the sides of the dish where a matte metallic finish produces a directional but slightly soft light source (Grey, 2009). Being a solid metal dish has hampered the beauty dishes portability, but recently collapsible beauty dishes have been developed using a modified umbrella design which make the use of this modifier on location more likely.

3.9 Lighting approaches

Photographic and cinematographic lighting have developed approaches significantly different over the last century of practical and artistic creation. In many cases the differences can be encapsulated through the differences in the use of strobe lighting technology or continuous lighting sources.

In motion image capture setups can as with photography move from available light setups that cover a single person or large area to planned artificially lit setups that cover a single person to large events and locations where tens or even hundreds of lights are set up. Lighting sources and modifiers allow the control of lighting sources to move from single hard light sources to large soft light sources and to control where the light from those sources falls in the scene.

The locations where still and moving images are created have played a large part in the array of techniques for lighting (Wheeler, 2005). The early film studios used daylight to allow enough lighting for exposure of the film and then moved to rotating stages where that sunlight could be followed for the entire day. In these early days of production light was largely concerned

with providing adequate illumination for exposure and even the advent of mercury vapour tubes in 1903 limited the scope of illumination control with its flat lighting effect. Motion pictures then moved to indoor studios and after the use of mercury vapour lamps to arc lamps and finally incandescent lighting. These developments would soon allow new production and lighting approaches to allow themes from movements such as German expressionism in *The Cabinet of Doctor Caligari* in 1920 and *Nerves* in 1919 to be illustrated in film (Guerin, 2005). This mix of lighting sources stayed consistent until the addition of viable colour corrected fluorescent lighting during the 1990's and then the rapid addition and development of LED sources during the last two decades.

Each addition of lighting source came with developments in lighting modifiers and control and in the range of approaches being used by cinematographers. By the 1950's this wide range of techniques had placed limits within production on its uses through accepted styles for genres (Alton, 2013). Comedy had to be lit brightly and with a very small contrast ratio, horror needed to have dark shadows and contrasting lighting with often under lighting used on characters to support the 'evil' characters.

As lighting sources influenced lighting approaches so too did film movements, camera developments and the changes in production roles in film and television. More recently the availability of the internet and the ability to broadcast your own content, old techniques have been rediscovered by new hybrid filmmakers and photographers.

At the same time as moving image lighting techniques developed, so did still image lighting approaches, with technology moving from magnesium wire to flash powder to single use flashbulbs after 1927 and then the addition of the electronic flash in the 1930's (Lumley, 1960). The use of flash bulbs and electronic flash made the largest difference to lighting approaches as it allowed flash to be used safely indoors.

Light is fundamental to the still and moving image and the creative use of light is one of the most powerful elements of the image creator's toolkit as Douglas Slocombe says:

'I'd say learn the rules before you break them... (and)...find the most salient point of any story and make sure it gets over...I would know exactly what the camera should focus on as well as the mood required to tell the story. Light played the key part in all of this.' (Slocombe, quoted in Ettegui, 1999).

As we move forwards it is also important to consider the practical layers of lighting that are available to the professional likely to be gathering stills and moving images at the same time, on the same shoot or within a project. Such a multi-skilled professional is often working on their own or with possibly one other person. This limits the lighting in a very practical sense that limited lighting can be moved and set up in a reasonable amount of time and allows the professionals to achieve the day's production gathering and creation of images.

Lighting has always delivered a creative range of exposure control and allowed the control and differentiation between shadow areas and lit areas of the image and to control contrast between elements through shadow light and colour. When working in black and white

photographers used shadow, light and variation in greyscale to define and exaggerate shape and three dimensionalities in the image. With still images the availability of portable strobe units allowed images to be created in the field by the single photographer with short exposures.

It is important to understand that we are lighting for the camera when we light and not for the human eye. We are trying to fit a worldview that we have and present it to the camera within the restrictions of the camera's technology to record the world so that the final image seen by the viewer represents our intention for the shot.

Depth

The still and moving image are both focussed on transferring three-dimensional perspective to a two-dimensional representation. (Millerson, 1999) The desire to represent reality in a two-dimensional image requires a range of approaches to illustrate depth in a scene and depth on objects in that scene.

‘We lack stereoscopic clues, instead we rely on secondary clues and interpret size, depth, and distance ... lighter toned areas seem more distant than darker ones... Lighting techniques can take advantage of such illusions to manipulate space and distance’ (Millerson, 1996, p. 21).

The mechanism of the camera initially translates an optical projection of received light onto a two-dimensional light sensitive target. Prior to this, the practitioner makes choices over a range of factors to control the effective representation of the scene in a two-dimensional image. These factors include shot composition, lighting the scene, colour choice, knowledge of the target's light sensitive qualities and planned post processing elements. (Muller, 1998)

Elements of shot composition that can create or control the perception of depth include relative size of similar objects, object overlap, linear perspective, vertical position, horizontal position and foreshortening (Brown, 2016). Beyond these compositional techniques a range of lighting techniques can be applied to the depth of an image. They begin with an entirely natural phenomenon of atmospheric perspective, where very distant objects have less detail and contrast as a result of atmospheric particles between the viewer and distant objects (Brown, 2016).

The first moving still and moving images were monochromatic and responded to light intensity to produce a range of greys from black to white. This response to the recorded light was also dependent on the wavelength of the light and associated colours in the scene. Certain colours would cause a greater response depending on the emulsion being used and then register as lighter or darker than other equally bright colours (Alton, 2013). This allowed still and moving image creators to adjust the set design and character outfits and makeup to control which elements would read as brighter and darker in the final image. It allowed areas of scenes and set design to create depth through the scene design and colour choices so layers of the set

at different distances could have their recorded intensity exaggerated to seem nearer or further away. (Alton, 2013)

With the development of colour film and later video technology and digital camera sensors with CFAs the image could be controlled using monochromatic and chromatic recordings. Practitioners then developed approaches to further create depth with light through the combination of control over lighting intensity and colour in scenes and on subjects in the images (Aguilar, 2012).

In the case of creating depth with lighting intensity and saturation the practitioner can adjust ranges of intensity in layers in the scene to simulate our expectations that objects further away are less saturated. We can also have distant objects lit more blue than red to simulate atmospheric perspective. This artificial simulation that exaggerates the atmospheric perspective on a much shorter scale can nevertheless be effective in helping present depth in the shot (Brown, 2016).

We are also able to create depth with layers of lighting colour at varying distances, a theatrical style of lighting based on using stage flats in theatre for depth and scenery (Reid,1987). This can also use a more staged approach and use distinct contrasting saturated colours simply to make the layers at distances more pronounced relative to each other. Whether this continuing simulation of further objects becoming blue is significant we can see the popular lighting schema where foreground objects are lit amber and background areas are lit blue continuing to increase (Cima, 2015).

With the moving image we have additional elements that can be utilised to increase perception of depth in the image as the camera's movement into and parallel to the real-world scene is recorded in the moving image. This movement of the camera in a moving image reveals relative position and depth in the originating scene through parallax movement of elements in the recorded image (Millerson, 2009).

Portraying depth in an image's scene has access to a range of techniques as we have discussed to represent three dimensionality in the recorded two-dimensional image. In subject lighting we are also trying to control perception of depth to reveal a subject's volume, shape and texture. Subject lighting techniques can control the contrast ratio across an image's surfaces to reveal graduation around an object in three-dimensional space and its surface curvature (Alton, 2013). An additional element of lighting that adds the perception of an object's position relative to the scene behind them is the use of backlights for object separation from the background. The rim of edge light on a subject created by a backlight (Cronenweth, 2012)

The presentation of depth is an assemblage of elements, lens choices and lighting that interact to present the final image. The control over the illusion of depth in a still or moving image is crucial to representing three-dimensional realism in an image. Importantly, it can also be used creatively to play with perception of depth. In narrative and documentary footage we can represent or distort depth perception through lighting and lens use. We can compress a scene with a telephoto lens or with similar colours at the 'wrong' distances. The still and moving

image practitioners can utilise all of these techniques to deliver the image that is required for the task at hand.

Moving Image Approaches

Area lighting

The moving image records movement in a space and we can decide to light that space and let movement then be lit as it travels through the illuminated space. Gerald Millerson describes this approach as 'methodical illumination'(Millerson, 1999). The problems and limitations of area lighting are a lack of control on individual subjects as the entire area is lit and can often result in flat or inconsistent lighting and shadows as action occurs within the area. Therefore, area lighting approaches are often used with some additional subject lighting/lighting modification. Area lighting can also be used intentionally to provide a 'base light' which brings shadows up from complete black in the image and helps to give additional control over contrast ratio in the shots. It should be noted that the total control of the base light shadow level is only possible when the location being filmed in is under the complete control of the cinematographer and the base illumination can be zero, i.e., total darkness. This works well in studios and internal locations.

Subject lighting

Within the scene the focus of the moving image in most shots will be a subject within the scene. There are many approaches to lighting the subject and we will discuss three-point lighting as one model of subject lighting.

Three-point lighting

A well-known and utilised approach to subject lighting, especially in television production, three-point lighting utilises, as it sounds, three light sources to illuminate the subject. These sources are given the names key light, fill light and back light (not to be confused with background light).

The key light is the main light source and is typically recommended to be in front of the subject (on the side of the subject towards the camera) and raised above 20 degrees but below 80 degrees. This produces shadows that feel 'natural' (Letourneau and Gloman, 2005). The shadows and contrast ratio across the subject is then modified by the Fill light which 'fills in' the shadows created by the Key light. To do this the fill light is placed on the opposing side of the subject in a typical lighting setup although it can be set on the same side but further around the subject and pointed into the shadows. The effect of this is to limit the possibility of creating contrasting shadows on both sides of the subject (Holshevnikof, 2016). The final light in three-point lighting is the back light, named because it illuminates the back of the subject. It is often assumed that it illuminates the background, and this is not the case. The purpose of the back

light is to add edge definition to the subject and help to separate the subject from the scene behind it, to add depth to the subject and the scene (Letourneau and Gloman, 2005). Subject movement within the three-point lighting setup will allow the subject's three-dimensional form to be illuminated and shadowed to a degree chosen by the image professional by their choice of position, relative intensity and degree of hardness/softness of each of the Key Fill and back lights.

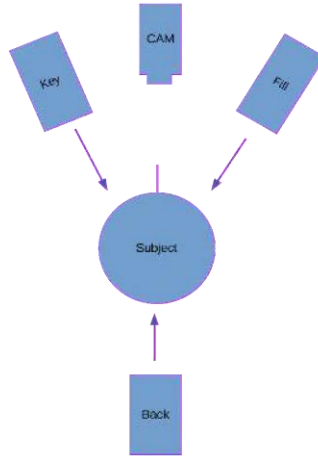


Figure 40: Three-point lighting

Three-point lighting is often praised and damned in the moving image profession by those who use it effectively and those who see it as a stylistic limitation. In truth it is just one of many approaches that an image creation professional can use when lighting. It does offer control over contrast ratio, angle of light source and illumination and around the entire surface of the subject. However, it does require, ideally, three lights per subject. For a hybrid image creator often working on their own and within limited time, this may be an issue. Using, experimenting and understanding three-point lighting can also give the image creator the ability to know when and where any of the three lighting sources and positions might be reduced or eliminated altogether to achieve a desired look on the subject.



Figure 41: 3-point lighting, 1:1 contrast ratio key: fill

Photographic Approaches

Where subject based lighting models like 3-point lighting for the moving image tend to discuss the lights in relationship to the subject and how they can control the contrast ratio, mood or emulate artistic approaches Photographic lighting is often described in photographic texts with certain 'looks' achievable with the subject in relation to the camera and the lights in a relatively fixed position. This is not surprising as, for portraiture as a major example of photographic work, the instant of the image capture will be at a specific angle between the subject camera and light where in the moving image usually the relative position of camera subject and light is changing as the scene progresses or as the subject is filmed simultaneously from separate camera angles.

Broad and Short lighting

The first approaches that I will discuss in photographing a subject, and in particular portrait lighting, are Broad and Short lighting. The difference between the two is the orientation of the subject to the light and to the camera. In Short lighting the light is illuminating from the side of the face orientated away from the camera. This provides a dramatic light across the face with shadows on the side of the face orientated towards the camera and has the effect of narrowing the face in portraiture (Hurter, 2009).



Figure 42: Short Lighting

In broad lighting the light illuminates from the side of the face orientated towards camera and as a result will provide and more even lighting across the majority of the face with shadows and modelling occurring on the side of the face away from the camera and the edges of the face as it curves away from camera providing a smooth and gently modelling to the three-dimensional curve of the face away from camera (Grey, 2009). In portraiture the effect is to 'widen' the face and so can be used when lighting narrow faces if the intent is to produce a rounder face in the final image (Hurter, 2009).



Figure 43: Broad Lighting

Rembrandt lighting

Rembrandt lighting is named after the artist Rembrandt and refers to his use of light in paintings to illustrate a face being lit from one side and at approximately a 40-degree vertical angle to cast a shadow with the nose and facial bone structure that illuminates a triangle of the face under the eye on the shadowed side of the face. The exact positioning of the light proving the primary light source will need to be adjusted depending on the shadow if the subjects face (Perkins, 2006). Rembrandt lighting can be produced with soft and hard sources, however too soft a source will eliminate the edges of the shadowed area to a degree where the dynamism of the approach is lost.



Figure 44: Rembrandt, Loop

Loop Lighting, Butterfly Lighting and Split Lighting

Loop Lighting (Morrisey, 2007), Butterfly Lighting and Split Lighting are three commonly referenced lighting positions for portraiture. As with broad and short lighting these other approaches we will discuss are concerned with the effect of the primary light source and its creation of shadows on a subject. In Loop Lighting the key light is placed and produces a 'loop' of light under the nose in portraiture, hence its name (Morrisey,2007). where Butterfly lighting produces a butterfly shaped shadow and Split lighting is positioned to cast half of the face in shadow with the dividing line between lit and shadowed regions vertically in the middle of the face (Morrisey, 2007).



Figure 45: Butterfly lighting - soft light

It should be noted that lighting approaches are starting points and a repertoire that professionals build on as the production day often succumbs to the unpredictability of lighting as Joe McNally explains:

‘Some folks might view lighting something or somebody as a page out of an NFL playbook complete with X’s, O’s arrows, blockers and tacklers – an intensely complicated diagram with many parts. And of course, just like any play in football, no matter how carefully mapped, once set in motion the whole deal has a tendency to careen out of control.’ (McNally, 2009, p. 32).

3.10 Photography and Cinematography/Moving image creation.

The process of image creation is an area of change that is affected directly and indirectly by the technical and cultural/social trends and the area that has direct effect on the image creators time in terms of a professional change. It is affected by the image gathering/distribution and processing discussions as they all directly impact the photography/cinematography process.

The physicality of image capture, ‘when do I breathe?’, is a good question. When taking a still image handheld, the experienced photographer will often gently press the shutter when breathing out (Mansurov, 2020). This does not work for the moving image as you need to maintain a more constant ‘rest state’ in your physicality when recording handheld - you have to keep breathing! (Hooper, 2020). And this is one aspect of the image creation process. It is physical in nature whether handheld or using a tripod, whether taking street photography or climbing a mountain and whether using a video camera, a DSLR or a mobile phone we make choices about how we take the image from holding it low or high to holding it steady or panning slowly to reveal a scene or capture a panoramic vista.

Creation of the still image is, in the majority of cases, concerned with taking a single moment from a moving reality and capturing it, to gather ‘the decisive moment’:

“Photography is the simultaneous recognition, in a fraction of a second, of the significance of an event as well as of a precise organisation of forms which give that event its proper expression.” (Cartier-Bresson, 1952, p. 16).

Filming the moving image is, in contrast, predominantly focused on capturing motion in a way that appears to the viewer to be free of artefacts against the perceived motion. The process of the moving image captures a sequence of images that when replayed will reproduce an appearance of motion (Samuelson, 2014).

These are fundamental differences in process for still and moving images, but the process is still gathering an image and the compositional choices are similar and, in some cases, the same. What is the focus of the image? Where is the subject? How am I using negative space? Basic compositional processes are the same and we move around the subject in the same fashion, but the still image only captures at certain points where the moving image must capture the motion of the camera and the subject and will often need to capture relationships between elements in the scene that would be unnecessary or obtrusive in a still image.

One example being the OSS or over the shoulder shot (Arijon, 1991) which is common in moving image production as it allows relationships between people to be shown effectively, however it produces a still frame that feels unnecessary and as such is not often found in still image production.

As a result, the comparison between framing/composition for still and moving images lends itself to the further discussion of the differentiation between delivery and process in the mind of the still and moving image producer and needs to be examined in primary data gathering. Lighting the image is a key part of the image capture process. I often describe ‘capturing’ the image and ‘creating’ the image when I control the lighting. We are creating an image as Lance Accord says:

‘I think in lighting there are times when you need to be bold and accept that in reality it wouldn’t be this way, but if we are going to film it needs to be lit and this is what it is going to look like.’ (Accord, quoted in Billinger, 2004, p. 11).

Lighting itself is complex and will need to be analysed in detail through the data gathering as it is a key aspect of the image creation process. Still and moving approaches have until recently been largely defined using strobe and continuous light, as the literature review highlighted when examining lighting texts, and the associated forms and modifiers of those light sources. With developments in lighting technology and camera sensor improvements combined with software algorithms in many cases it is possible to use continuous lighting for a wide range of still image capture instances (Arri, 2019) as well as moving images which is a key enabling factor in producing still and moving images in the same instance. We are now therefore at the point where we can examine lighting approaches including three-point subject lighting, area lighting and motivational lighting (Brown, 2016) from moving image lighting practice and split lighting,

loop lighting and paramount lighting from photography studio techniques (Grey, 2009), among others, to evaluate their viability in producing still and moving images in the same situation.

There are creative elements throughout the still and moving image creation process and they are all becoming affected by technical and industrial/cultural changes as lighting technologies and camera technologies allow us to approach image creation in ways, we have not been able to before with devices that we did not have access to until recently and this will change how we create the image. The roles of photographer and moving image creator (including cinematographers, DOP's, lighting camera people, camera operators and journalists) as the intersection of change and the separation of these roles, will play directly into the assumptions and developed practice that is happening in research.

Image creators are producing both still and moving images as an integral part of their regular workflow, from journalists to event photographers/videographers and corporate media production teams/professionals (Nizam, 2021). In this project I use the term hybrid image creator to describe the practitioner who shoots both stills and videos. This crossover is not new. Photographers have often experimented with the moving image and moving image professionals have taken stills however the technology that delivered both has until recently been in separate devices (Prodger, 2015).

Filmmakers and television professionals have often used still images during pre-production for location scouting and reference images to illustrate style and planning for the moving image later in the process. In film production this was effective as the professional could shoot using the same film emulsion as the stock that would be used in the final film and then gain an accurate representation of how the image could look later in the process. For television this only gave an indication of the final shot as the film emulsion would not match the image characteristics of the video image that would be recorded later (ASC, 2001).

Vincent Laforet, a significant figure in demonstrating the ability of the DSLR to deliver film-like video as well as stills, discussed the reverse as being viable now with video cameras capable of shooting RAW video allowing single frames to be captured at the frame rate of the video when using the RED Weapon camera which has an 8K sensor which allows 36-megapixel images to be grabbed from video frames:

‘But it is a mistake to think of the RED WEAPON solely as a video camera, because what it is doing is, it is actually shooting stills. The format, the codec—it is an extremely high-speed, high-quality still camera that is effectively mirrorless, that has one of the best sensors in the world. And, if you think about it that way, you’re missing the point if you’re saying this is a video camera that lets me get high-res stills. It’s a camera, period. And you can use it either way or in combination’ (Laforet, quoted in Sawalich, 2018, p. 2)

He also discussed the challenges of hybridity and the difficulties in shooting video to allow still frames to be grabbed from the video and used effectively as photographs. He was concerned that the considerations for how the technology enables the capacity to deliver both

still and moving images needs to clearly be based in an understanding of the way the technology works and the relationship of video motion and still image clarity:

‘This idea of shooting video and simultaneously being able to pull stills out of it. I think the reality of it is, that will work in certain cases. If you’re shooting at 24 frames per second with an effective 180-degree shutter, which gives you a 1/48th of a second shutter speed, if you’re shooting someone walking or even a talking head or a vista, that works just perfectly, actually. And one would have to ask oneself, if you’re shooting an incredible landscape, there’s nothing I can think of— unless you’re going to 50 or 100 megapixels, and a very small percentage of people are—why you wouldn’t use the RED’ Laforet (Sawalich, 2018, p. 3).

For the hybrid image maker, understanding when and where you can or are more likely to gather effective stills from video frames and how that beyond a simple static frame with movement inside it, movement and duration is different and effects multiple aspects of motion blur at different distances from the camera to different degrees and in separate spatial/temporal directions.

In addition to understanding the relationship of the moving image and the moving frame to the still image and still frame the hybrid image maker needs to acquire two separate skill sets to deliver still and moving images. Those skillsets begin with lighting as lighting for the moving image can often mean lighting for the moving subject or moving through a lit space. In both instances lighting needs to often be continuous and consistent over the range of movement or the space in vision. With stills lighting we are often lighting for a single position or a single range of movement to ensure focus and exposure are correct for the still image capture.

Separations in practice continue through shooting and post-production where a typical still image production process might be Plan, Place shot elements, Light, Shoot, Edit, Deliver and a typical moving image production process might be: Preproduction: planning, recce, Production: set, light, shoot Post – production: edit, colour grade, deliver (Brown, 2016).

Even if we isolate the moving image from sound, post-production is still different as elements of the frame change during its duration requiring the tools needed to have different functions. In more typical production shots are not treated in isolation but are parts of a larger video construction. An interview, as an example, can last an hour and if the light changes during that period, then images from separate parts of the interview cannot be used or intercut with each other as we will see the changes in light from shot to shot.

When we examine literature on lighting technology, techniques and approaches, what we see over a long period of time is the consistency of lighting literature including technique to technology with a lack of recent updates in formal practice and academic literature. This consistency also leads to a lack of discussion in literature regarding the impact of LED to practise and the huge impact in practice. We do however see a large degree of descriptive online information regarding LEDs from practitioners and manufacturers. With the immediacy of online content, recent developments and new technologies can have information supplied to

practitioners for their immediate use unlike traditional print and publishing with process times from submission to issue of days to even years (for textbooks). For the working practitioner this immediacy of information is

3.11 Assemblage Theory

Why Assemblage theory? How does a specific ontological framework help with a workplace valid doctorate? I would say that it helps immensely. As I have asked questions about lighting for stills and video it becomes clear that why we light, whether we light, how we light and what is changing with lighting is inextricably linked to how we shoot what we shoot, who we shoot and what the expectations are of the images we produce. We, the image makers, whether photographers, cinematographers or hybrid image creators are inextricably linked to our hardware and that image of us, and our hardware is inextricably linked to society's expectations of us. We are an assemblage of person, device, expertise, and cultural and social expectations. We also see later in this section how assemblage is being used as part of a range of conceptual frameworks to analyse complex interactions in diverse disciplines.

Deleuze and Guattari conversed about assemblage theory in 'A Thousand Plateaus' where they drew multiple examples of how social structures and the instance of an assemblage was a flexible structure created through territorialisation and deterritorialisation of elements within the assemblage structure (Deleuze and Guattari, 1987). Each change in the structure could create a new structure as elements changed. We build a social image of a thing as it combines other elements, as DeLanda summarises, all parts of an organism define one another and the whole by relationship. We move from a Hegelian non-decomposable whole view of the universe to a particulate, component view of the whole where each individual element is a composition of other elements that can be seen as individual assemblages themselves (DeLanda, 2016). DeLanda uses the example of the human body and how it was considered as a single unit until developments in medicine showed how elements could be seen as individual components and then later that those components could be shown to be replicable. Batna summarises a key part of the argument for an assemblage.

'In Deleuze's concept of assemblage, each part stands in active relation to others, whereby the emergent properties of the whole cannot be reduced to its parts: a horse, warrior and weapon is an example of assemblage – "each part amplifies the other parts" Therefore, for Deleuze, the key to assemblage is that the warrior is a skilled user or connector in relation to horse and weapon (and we should assume that the horse and weapon are functional, and so forth), alternatively, it would be a mere collection of things rather than an assemblage' (Batna, 2017, p. 2).

And how can this be of use in modelling where we are now and where we might go as image makers and creative lighting individuals? The key aspect of the mounted warrior is the expertise that allows the assemblage to become an assemblage and not a mere collection. In the same way the photographer, the cinematographer and the hybrid image maker are each unique assemblage of expertise and technology, an expertise and technology that is constantly changing, with the potentiality for the new that arises from the interactions of each change and each new addition to the assemblage.

In 'The Selfie assemblage' Aaron Hess applies assemblage to the virtual, social, technological construct of the selfie and considers that in this 'object' the interactions of the dependent components illustrate a new assemblage and that, 'The relationship of self, device, space, and network can best be understood as a Deleuzian assemblage. '(Hess, 2015).

When we consider DeLanda's example of the human body in Hegelian philosophy as a totality that is not decomposable from a modern perspective, we now know that parts of the body can be separated. We can see that the body is decomposable. The body is an assemblage and not a totality. We exist in a universe of contingent aspects of the whole where each aspect and each element is its own assemblage, and the assemblage becomes the viable alternative position to totality. DeLanda explains that the parts of an assemblage relate through relationships of interiority where parts become a new whole, they create a new assemblage and relationships of exteriority where parts of the assemblage interact with each other but retain their identity and can retain the identity of the greater assemblage or become components of relationships of interiority themselves and help to create a new assemblage (DeLanda, 2016). The interaction of elements of an assemblage creates the assemblages' new emergent properties and this potentiality for emergent properties relies on the interaction of the assemblages components:

If (A) stops (B) does not happen. This interaction reinforces the concept of an ontological framework of assemblage and not seamless totality.

DeLanda summarises the elements of assemblage and defines four characteristics where assemblages have fully contingent historical identity which defines each assemblage as an individual entity, whether that be a person, community, or organisation. This is a result of all

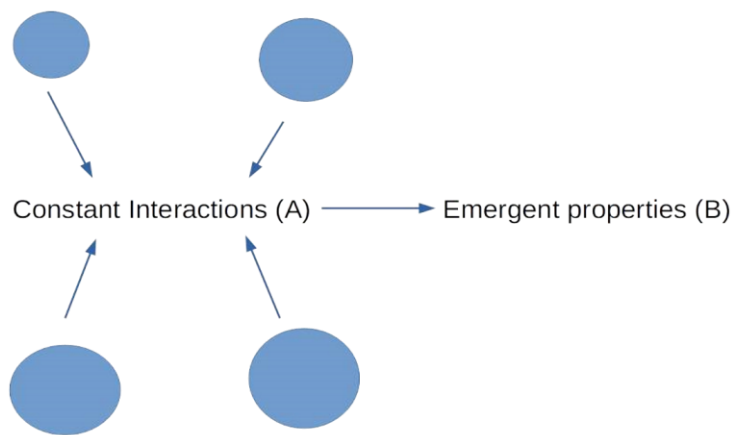


Figure 46: interaction and emergent properties in assemblage

assemblages' ontological status being the same, each operating at a different scale and each capable of interacting with each other from the individual to macro social assemblages. Each assemblage is made of heterogeneous components, from social assemblages' components that may include communities and organisations and utilities such as water and electricity to the mounted warrior assemblage including the horse, the weapon and the skilled rider/warrior (Delanda,2016/Deleuze and Guatarri, 1987). Assemblages can become part of other assemblages and can contain other assemblages as he exemplifies using scales and types of social structures '. Compared to the communities that they compose; people are micro while communities are macro. But the latter are micro relative to the larger social justice movements that they can form.' (Delanda, 2016) And finally, that assemblages result from interactions between their parts but once an assemblage is created its parts become limited by the interactions within the assemblage, although the potentialities of the assemblage are greater:

'The upward causality is necessary to make emergent properties immanent: an assemblage's properties may be irreducible to its parts but that does not make them transcendent, since they would cease to exist if the parts stopped interacting with one another.' (Delanda, 2016).

DeLanda conceptualises the component parts as segments of the assemblage, as expressive components that provide from material and expressive interaction new potentiality for the assemblage and new degrees of coding and decoding of those expressive components in forming the identity of the whole. The properties of parts and the interaction of those properties leads to new capacities which are defined by the interactions (Delanda, 2016). The interactions that structure and create the assemblage are territorialisation and deterritorialisation and coding and decoding. Territorialisation is the determination of the spatial boundaries of a whole and the degree to which an assemblage's components come from homogeneous components or how far an assemblage will homogenise its own parts. In a social assemblage such as an army the degree of homogeneous generation within the assemblage is high and the spatial boundary of the territorialisation is a subset of the populace depending on factors from other assemblages of that society. Coding defines how expressive components fix the identity of the assemblage which DeLanda explains using language of an institution:

'In institutional organisations, for example, the legitimacy of an authority structure is in most cases related to linguistically coded rituals and regulations While all organisations are coded in this way, a state apparatus performs coding operations that affect an entire territory and all the communities and organisations that inhabit' (Delanda, 2016).

These interlinking of elements appeals to my own world view and experience. I see the world as changing, interlinked factors. As we grow, as I have experienced growth, the world changes and new elements are created from the old and then torn apart and made again. The

technology we use as image makers is conceptually simple yet technically changing all the time and at no point in time as much as it is at this point. We can see the smartphone assemblage and stills/video as emerging capacities of the new technological assemblage. As Deleuze and Guattari highlight, 'the tool' is not to be considered in isolation and as such the assemblage of 'camera' is a result of its relationship to its greater position within our own assemblages.

'Even technology makes the mistake of considering tools in isolation: tools exist only in relation to the interminglings they make possible or that make them possible. The stirrup entails a new man-horse symbiosis that at the same time entails new weapons and new instruments. Tools are inseparable from symbiosis or amalgamations defining a Nature-Society machinic assemblage.' (Deleuze and Guattari, 1987, p. 90)

And we as image makers are changing as a result. The 'Photographer' assemblage, the 'cinematographer' assemblage and the 'hybrid image maker' assemblage are each complete social entities with their own spatial and temporal limitations, which DeLanda would see as an example of the assemblage. Each assemblage creates its own identity from a range of separate components and component interactions. In his 2011 lectures DeLanda sees assemblage as a way of thinking about social entities as complete social entities and uses a broad overview of societal links and their reliance on authority and creation of authority as examples where institutions have bosses and people who follow order and an implemented social structure but whose authority needs legitimacy to make it work effectively.

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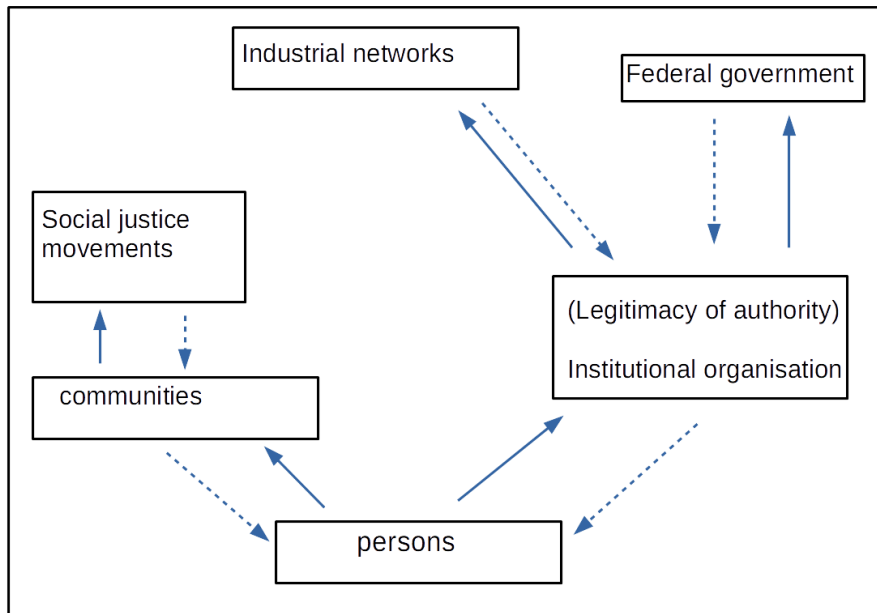


Figure 47: assemblage; example of social structures

(DeLanda, 2011) This diagram illustrates a simple visualisation of some of the links that can form the assemblage but has severe limitations as an object is defined by more than its properties and a detailed diagram of the assemblage would also need to include its potentialities. The ontological positioning of the project places interaction between changing elements central to the observations of changes to the lighting and image making professional. Assemblage theory gives us a position where we may model these changes and interactions. We as professionals are changing as the technology and world around us changes. We are the assemblage and that is worth examining:

‘In this ontology all that exists in the actual world is singular individual entities (individual atoms, cells, organisms, persons, organisations, cities, and so one) whose main difference from each other is spatio-temporal scale. There are no totalities, such as “society as a whole”, but a nested set of singular (unique, historically contingent) beings nested within one another like a Russian Doll... the relationship is one of parts to whole... This link is machine-like: lower scale entities form the working parts of a larger scale whole, a whole which emerges (and needs to be continuously maintained) by the interactions between the parts. Thus, interacting persons yield institutional organisations, interacting organisations yield cities; interacting cities organise the space in which nation states emerge and so on. This changes the very way in which the problem of agency and structure is posed, since the term “structure” illegitimately conflates several scales and deprives organisations and cities of causal agency.’ (DeLanda *et al.*, 2005, p. 68).

DeLanda's attempt at clarification of assemblage from its original Deleuzian complexity and its position as a materialist ontology places it in an opportune position to adapt and reconfigure its concepts to a range of conceptual frameworks. Here its interconnectivity and modal structures allow it to deal with innate complexity ties of real-world research (DeLanda, 2006). Antczak and Beaudry (2019) examined this as a conceptual framework of practice in archaeology, Hoffman and Novak (2017) as a framework examining the Consumer Internet of Things and Ureta (2012) in policy. Each examination demonstrates the value of assemblage as a conceptual framework and as we examine them the value for practitioner research seems clear.

Antczak and Beaudry (2019) proposed a conceptual framework of the ‘assemblage of practice’ for archaeological research. They believed it could work as an effective middle range heuristic tool that bridges deep theory and the complex data sets available to archaeologists.

Their work makes use of assemblage’s generation of new capacities from active interaction as it concentrates vibrant things as opposed to static objects, and sympathetically articulates assemblage theory with concepts of entanglement and correspondence. They present an assemblage of practice as ‘a dynamic gathering of corresponding things entangled through situated daily and eventful human practice’ (Antczak and Beaudry, 2019).

An important part of their approach is the reassembling of the 'assemblage of practice' through a comprehensive and critical marshalling of all the evidentiary processes available to archaeologists. They see the 'assemblage of practice' as a powerful analytical tool to illuminate changes, and the continuities and transformations in human–thing entanglements. This allows the conceptual framework of the 'assemblage of practice' to examine the repercussions of practice across a wide spatiotemporal scale.

Their work illustrates the analytical power of a conceptual framework integrating the active and scalable interactions of assemblage theory in human-thing relations.

Sebastian Ureta's work in policy studies proposes an alternative conceptual framework to study public action using a policy assemblage. He argues his alternative conceptual framework using assemblage theory can 'better capture the complexity and multifaceted character of contemporary policy processes.'(Ureta, 2013). His proposal sees policies as assemblages formed by an ample array of heterogeneous elements, almost directly from Deleuzian assemblage but placing it in a framework that more closely resembles DeLanda's work with its integration of insights from technical standards to everyday practices.

His conceptual framework examines three major configurations of policy assemblages including problematization, infrastructure and regime. Ureta Proposes that a conceptual framework using assemblage theory can deal with the inherent complexity in policy studies as 'Policies are increasingly seen as distributed and non-localizable entities; much closer to an assemblage than to well-defined instruments and/or processes' and 'assemblages 'are never fully stable and well-bounded entities, they don't have an essence, but exist in a state of continual transformation and emergence' which allows them to deal with the shifting complexity and interaction in policies.

He then explores the framework's viability to policy in one instance. His case study of wheelchair ramp installation in Santiago, Chile shows how policies are multifaceted processes in and as an almost perfect example of assemblage as conceptual framework demonstrates direct parallels between territorialization and deterritorialization as 'a multitude of entities, all of them carrying different agencies, intervene and are continually re-enacted, changing the policy's outcome in accordance with the presence/absence of certain articulations and practices'(Ureta, 2013)

In Hoffman and Novak's examination of 'The consumer Internet of Things' (IoT) they present a new conceptual framework based on assemblage theory to answer questions regarding the IoT and its potential to change the consumer experience. Assemblage theories potential to see interactions beyond the hum/object are valuable in their research 'because consumer and object experiences are also shaped by broader societal influences' (Hoffman and Novak, 2017).

Their examination of consumer interaction with the IoT argues that a conceptual framework based on assemblage theory and object-oriented ontology as object characteristics to some degree mirror assemblages viewed as connections of exteriority (Deleuze, Guattari, 1987). Here the inside of the interacting assemblage elements do not need to see what is inside the other objects but simply have a point of interaction allowing continued development of new

capacities in the same way objects interact without seeing the internal functions of other objects (Hoffman, Novak, 2017).

This conceptual framework can detail how the consumer experience and object experience emerge in the IoT. It is this conceptualization, anchored in the context of consumer object assemblages that defines the consumer experience by its emergent properties, capacities with agentic and communal roles expressed in interaction.

‘Thus, there is sufficient complexity in the interactions of simple consumer-object assemblages to justify initially focusing on this relatively micro level, and consideration at this level is sufficient to define consumer and object experience from an assemblage theory perspective. However, assemblage theory allows, and in fact demands, that we also provide a framework that allows interactions of IoT experience assemblages to be considered in a broader context.’ (Hoffman and Novak, 2017, p. 1180)

Each of these conceptual frameworks illustrates the expanding use of assemblage theory across a range of disciplines. Each demonstrates the viability of its central concepts of interaction, territorialisation deterritorialisation, active generation of new capacities between heterogeneous components to conceptualising the real world and building a picture relevant research area.

4 Methodology

Introduction to methodology

The project's methodology is presented in two main sections. The first section titled 'Methodological considerations and design' provides a detailed discussion of the project's requirements and the decisions made to finalise the methodological design. It begins with the ethical considerations considered during design.

A clear discussion of the chosen methodology and data gathering methods is then included to explain the choice of a mixed methods methodology using a survey composed of online questionnaires and interviews with a case study.

The second section titled 'Methodological data gathering' describes the implementation of the chosen methodological design. This includes a timescale overview and discussion of the changes during implementation including design changes during the pandemic and social change in Hong Kong.

4.1 Methodological considerations and design

4.1a Ethical Considerations

In the design and process of the research process care was taken to ensure adequate consideration of ethical issues. Ethical assessment over the design and implementation of processes examined whether the project needed specific care to ensure that effective action was taken to safeguard the participants, researcher and stakeholders involved. As well as the ethical principles driven by academic and professional standards, the project's methodological design, intent and output was inevitably influenced by my own ethical standpoint and was an aspect that I needed to be aware of throughout the project.

I undertook every effort to ensure that the project was ethically sound through all stages of recruitment to investigation and communication as Bell and Waters (2018) discuss the principles of research ethics and quote Blaxter *et al.*, summarising them as:

“...research ethics is about being clear about the nature of the agreement you have entered into with your research subjects or contacts.... Ethical research involves getting the informed consent of those you are going to interview, question, observe or take materials from.” (Blaxter *et al.*, 2010, p. 164).

My intent throughout the project was to ensure clarity and consent at all stages. The completed design of a data gathering instrument and invitation is included in sections 4 and 8 of the appendices.

Consent

The project was undertaken with approval and informed consent from all stakeholders (May,2004) to ensure that the conditions of the programme and broader ethical concerns were met and to meet and uphold my own moral and ethical position. Ensuring consent was informed was undertaken through clear statements in invitations to participate for the online questionnaires, online interviews, and case study, to ensure that all subjects were made aware of the issues being discussed and the conditions of participation. I always obtained direct consent from participants either through face-to-face invitation or online invitation.

In the case of the online questionnaires the agreement to participate included an 'agree' status after the agreement that the participant needs to click to enable the questionnaire to be completed. All interviewees were asked to confirm that they are willing to participate before the interviews take place.

Ensuring no harm will come to participants.

All efforts were taken to make sure that no harm, directly or indirectly, could come from information retrieved during the research project (Gregory, 2003). To ensure this, confidentiality was ensured through anonymous submission of the questionnaires to conceal participants identities. Only invited parties were able to complete the online questionnaires; there was no danger of irrelevant data sources being introduced even though the submission was anonymous.

The online system stored no participant information including IP addresses used at the time of form completion. I took care to ensure that the extent of confidentiality also considered accidental revelation of any participants identity. The questionnaire ensured participant privacy by not giving the option for personal information to be given away. The released information will not name participants and the data is presented to avoid inadvertently revealing subject's identities through knowledge of participants involvement at points in the researched time period i.e., knowledge of a particular employment role at a particular time.

No person was prejudiced in any way for not taking part and anyone could withdraw at any point without risk of any negative response. All the questions related to professionalism and relevant theoretical issues relating to the research area and in no way held offensive or inappropriate content. There was no need for deception in the process and there was no need for covert data gathering in any way. It was a completely open research process and the research data gathered during the project will be clear in its intent and planned outputs.

Publishing

The data gathered was only be used in this report (however it will be available for future use and all participants were informed of this as part of the invitation to participate letter) and any previous data from other reports was reinterpreted to assist in answering the aims and objectives of this research projects, ensuring that there was no possibility of dual publication of data and no partial publication to represent purposely or accidentally more than one study from the results of one.

All authorship was clearly stated, and any contributors were acknowledged accordingly. This ensured that there was no issue with ownership and to additionally ensure that I.P. is not an ethical issue as the project is for the university and undergoing university research approval processes which include clearance of I.P.

Social implications

As with any project in a workplace there is always the possibility that there will be competing aims between colleagues and academia is no exception. One of the possible implications was that the conclusions will potentially negatively affect relationships with participants, however in the project I presented conclusions and recommendations that are constructive in their nature rather than highlighting negative aspects and allow a more positive set of actions to be suggested. I was also aware of the other stakeholders in the project and the potential for power issues as they included my employers and their organisations. I did not wish to affect the project negatively through misinterpretation of their interests in the project and its potential results personal implications as I have a personal stake in the report and needed to ensure that I did not bias the data analysis or the conclusions.

There will be a bias and I am of the viewpoint that all research, however objective it presents itself as, is inherently subjective. Throughout the project I undertook to be aware of the potential for bias and present any such potential clearly in the report to minimise this. I also needed to be aware of any potential conflicts of interest between my personal goals and those of the stakeholders. However, as the stakeholders involved are aware of the change being investigated, I saw only a positive implication in the data from the final report.

4.1b Rationale for the chosen methodological approach

Introduction

The methodological approach was designed to supply rich and relevant data sources that would meet the project's objectives. I initially considered a survey methodology as it would gain individual examples of practitioners' response to the gathering of still and moving images through questionnaire and online interviews. Its lack of naturalism and potential to restrain the responses of the surveyed population (Schon, 2017) were major factors in my decision to not

use it as a single methodology but to integrate survey data gathering methods as elements of a mixed methods methodology.

With the research's focus on professional practice and experience with its intention to feed back into advice for the ongoing development of this practice, I had decided against using a case study methodology with their difficulty in applying results in a more generalisable manner (McLeod, 2015). A deeper analysis of the benefits of case study led to integrating a small case study as a sequential component of the mixed methods methodology. This allowed the project to access the advantages of a case study, including depth of data for analysis, while its use as a component of the mixed methods approach helps to integrate the findings into a more applicable dataset.

After further consideration I chose to use a mixed methods approach within a qualitative framework to gain insights through mixed data sets. A literature review would act as its first component to provide secondary data across the research areas. This would be followed by a survey including data gathering beginning with a questionnaire aimed at a targeted audience of professionals who are producing still images, moving images and sometimes both. A small case study would then combine its analytical data with data from this questionnaire into the design of the final questions for a semi-formal interview process of a small group of experts in the field (Lalor *et al.*, 2013).

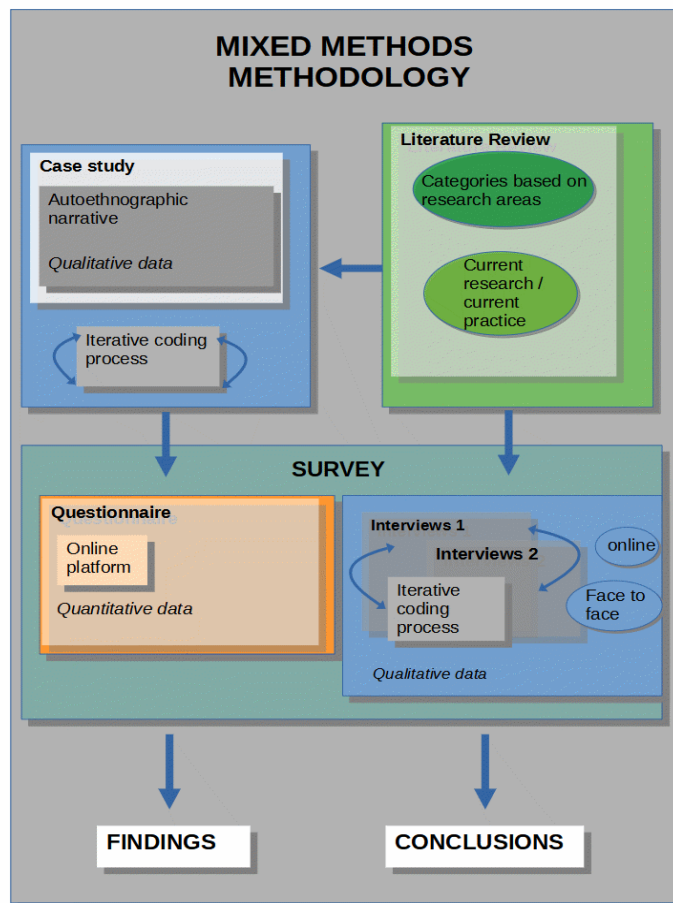


Figure 48: Methodology overview

This combination would allow the triangulation of the data through comparison of the secondary data from the literature review, quantitative results of questionnaires and qualitative data from the small case study to the qualitative data from the interviews with their smaller sample of practitioners and clients (Lalor *et al.*, 2013). I wished to use a variety of primary and secondary data sources to ensure a valid data pool for triangulation and analysis. The use of a small case study and combination of staged questionnaires and interviews allowed the research to be carried out effectively alongside and integral to practical issues within the workplace.

For the questionnaire and interview sampling size the project aimed to sample a large and relevant group of the practitioner population for data gathering. Here the advantage of working within an industry that is entirely based around communication helped as there were multiple ways to contact them and request their help on the research. I was able to sample a wide and diverse subset of the practitioner and client body to gain meaningful results. Survey sample size for the questionnaire was forty invited participants with a successful take up of 32. For the interviews the sample size was 10 participants.

The project would use a mix of deductive and inductive research design as I as a practitioner researcher and insider researcher had initial theories about what was happening in the industry but wished to gain additional insight from the collected data. This would include insights that might conflict with my initial expectations and biases and the potential for new.

This would provide design criteria for data gathering and analysis from case study, interview and questionnaire design to the choice of coding in NVIVO. The design would value professional positionality and insight when analysing case study and interview data but to take care to avoid researcher bias when sequencing manual coding and emergent codes.

The methodology and methods were designed to gather effective data to answer the project research questions including documentary review (articles, reports and professional sources from literature searches and relevant annotated reports). In addition to these I would use the small case study, interviews and questionnaires aimed at creative professionals, clients/employers and camera and lighting equipment manufacturers. The use of these valuable sources aimed to provide results that would allow the delivery of effective insights and proposals for the future image creation professional.

4.1c Chosen Methodology overview

Introduction:

This section details the decisions taken in the chosen methodical approach for the project's review of lighting techniques, technology and approaches to filming moving images and shooting stills in Hong Kong in order to meet the project's objectives. It describes the reasons for using a mixed methods research methodology, consisting of a quantitative/qualitative small

survey combined with a focused group of qualitative interviews and supporting sequential small case study. It also examines the reasoning for the sample groups demographics and how the areas of research focus were investigated using the chosen methodologies.

Through my industry career over the last twenty years, I have gained a wealth of experience in conducting data gathering with specific expertise in interviews and paper research which helped in the design and undertaking of this data gathering. This expertise in the area of research and in undertaking practice-based research in production environments enabled me to implement primary data gathering effectively. Combined with secondary research sources from literature including academic articles, programme handbooks, policy documents, professional trade papers and online resources, the research focussed on delivering the main aims of the project:

1. To critically evaluate lighting and image capture approaches for still and moving images and analyse the differences in approach and equipment to discover how they are similar and to what level they can be integrated into a single lighting schema.
2. To investigate productions in Hong Kong that require delivery of still and moving images at the same time and analyse how this affects lighting and filming the final images to meet local cultural expectations and assumptions around image and content.

The development and changes within the still and moving production industry during the last decade have introduced new demands and approaches that affect production design decisions from individual project content to cross-project collaboration (Murphy, 2015). The project aimed to investigate how these new approaches within projects have increased demand for still and moving image delivery and are becoming integrated into media project design and expectation. The literature review aimed to examine established and changing practices and improve an understanding of them to meet the project objective to 'examine changes in image gathering technology and practice and its effect on the role and perception of the 'creative image creation professional'.

This also aimed to enable the project to inform image creation professionals to successfully engage with developments of shooting and lighting change in a multiplatform, simultaneous gathering, networked world. This would provide insight into the project objective 'To examine the technological difficulties of shooting both still and moving images simultaneously and to evaluate the effectiveness of this approach in delivering viable stills and moving images for professional use.'

The literature search and review formed the first part of the projects research methodology and the project then gathered data using the staged questionnaires of a suitable sample group (Robson and McCartan,2016) and undertook a small case study of an instance of production using the approaches being investigated, before further qualitative interviews with professionals and employers. The questionnaire, interviews and case study would all contribute effectively to meeting objective 4 to 'identify the changing lighting equipment and relevant technique requirements of professionals involved in image creation using photographic and moving images'.

Changes in demand, expectations and practice have affected photographers and videographers probably more than any others (Dufour, 2015) with journalists having also seen the increased demand for gathering both still and video at the same time (Rosensteil, 2015). These professional groups will therefore compose the key data gathering groups to provide relevant practitioner data. This demographic choice would allow valuable data to meet objective 2 'to examine production of still and moving images within a Hong Kong context to establish cultural and social factors and expectations of the image, including the impact of network culture'.

Technological developments have enabled still and moving image capture on a single device and social media has enabled its clickable distribution, shifting public perception to assume that such image creation must be easy. A consequence of this perception has been gradually increased demand over a wide range of client groups including corporate clients and news organisations, who have increased their demand more significantly than other sectors (Bowman, 2017). This increase made these client groups significant and necessary for data gathering to answer the project aims and specific research questions with specific focus on Objective 3 to examine changes in image gathering technology and practice and its effect on the role and perception of the 'creative image creation professional' required data from literature, interviews and the questionnaire.

The case study, practitioner and client groups have all been affected by the unique, shifting cultural and social melting pot that is Hong Kong. The city has a vibrant and large-scale image production industry, with still images covering everything from family portraits to international marketing campaigns. The subject of moving image creation is equally wide and covers projects from corporate communication videos to internationally acclaimed feature film productions with Hong Kong alone having taken 13% of the mainland Chinese audience share in 2017 (HKTDC, 2019).

With this creative output within a small city the expectations and cultural demands of clients and professionals affects all aspects of production and professional practice. A key factor in assessing my project's research needed to therefore be the impact of current social and cultural norms in Hong Kong image creation practice and how they have affected the changes that are happening in the image creation industry.

These areas framed questions in the interviews and questionnaires to provide data that would provide insight into objective 2 to examine production of still and moving images within a Hong Kong context to establish cultural and social factors and expectations of the image, including the impact of network culture. It would also provide data for objective 3 to examine changes in image gathering technology and practice and its effect on the role and perception of the 'creative image creation professional' .

These objectives would also be given insight through the case studies observations on client practitioner interaction during a production event with additional insights to objective 5 to identify and analyse specific lighting approaches that can deliver professional results when

simultaneously delivering still and moving images. The interaction during analysis of the case study data and other data can provide data across objectives as Lalor explains:

‘a significant advantage to using a case study approach within a sequential explanatory design is that it allowed the research team to quantify, across the range of data sources, the level of evidence generated within the study to support particular claims. ‘, (Lalor et al, 2013)

Using a mixed methods approach combining literature, survey, case study and interviews enabled the research to gather an effective data set on the change in filming and lighting approaches that have occurred in the industry over the period of the last five to ten years. These changes can be assessed to examine how they have directly and indirectly affected the study’s group of practitioners and practices. The combination of theoretical insights from academic sources and professional journals from the literature review stage also informed the structure of the data gathering and analysis process.

The project’s schedule delivered the project through 2019 to 2021, including data gathering, literature review and report production, which is explained in detail at the end of the research methodology section. Following the initial literature search and review I planned to gather data using a questionnaire of a suitable sample group (Robson and McCartan, 2016) and undertake a small case study of an instance of production using the approaches being investigated, before qualitative interviews with professionals and employers. The array of qualitative data from the case study, including images, video content and field notes would be analysed to help inform and formulate modifications to the subsequent data gathering in questionnaire and interviews (Yin, 2009). This would be followed by quantitative analysis of the survey data and thematic analysis of the interview data (Braun and Clarke, 2006). After this analysis I redesigned the interview questions for a second round of data gathering to gain further data for final analysis.

The data gathering was undertaken in stages over 1 year, following on from the first questionnaire, to allow for changes in practice and for each stage of gathering and analysis to inform the research. This allowed the survey to feed into interview design and the small case study to gather techniques and approaches to lighting that could help inform the questionnaires and interviews. The triangulation of these multiple data sources aimed to provide data for the project objective to identify the changing lighting equipment and relevant technique requirements of professionals involved in image creation using photographic and moving images.

It would also allow the gathering and creation of still and moving images using the techniques observed and discussed in the first data gathering sections (See Appendix). These can then be used in subsequent interviews and questionnaire design with input from the small case study.

The project used online questionnaires as this enabled ease of participation and allowed initial analysis to be performed using the survey system. In the case of the interview and questionnaire the design considered the need to enable the participants access to the online

system and tailored the online questionnaire to be as accessible as possible. In the case of the questionnaire, the design addressed elements which could encourage participation including reducing the burden of length, reducing complexity, using visual design to make the questionnaire easy to complete and making it convenient to respond, (Dillman *et al.*, 2014).

The aim of the data, and insights from the project was to help in supplying effective advice or guidelines for new approaches to production and lighting for simultaneous gathering of still and moving images. This allowed me to present the findings and complete the final report after data analysis. As discussed earlier the data analysis for the project combined qualitative and quantitative data allowing for insights to be gained and data to be triangulated in order to support findings and recommendations from the data.

The project used NVIVO software to organise the source data from the interviews and case study and facilitate the coding analysis of qualitative data from the interviews and case studies rich data sources (Leech and Onwuegbuzie, 2011). Combined with statistical analysis of my survey and interview data using Google Forms I was able to triangulate the results for deeper analysis. The array of qualitative data from the case study, including images, video content and field notes was analysed to help inform and formulate modifications to the subsequent data gathering in questionnaire and interviews (Yin, 2009). This would better provide insights and valuable data for objective 5 to identify and analyse specific lighting approaches that can deliver professional results when simultaneously delivering still and moving images.

This would be followed by quantitative analysis of the survey data and thematic analysis of the interview data (Braun and Clarke, 2006). After this analysis I would redesign the questionnaire and interview questions for a second round of data gathering to gain further data for final analysis.

In the case of the interview and questionnaire the project addressed the need to enable the participants access to the online system and tailor the online questionnaire to be as accessible as possible. In the case of the questionnaire, it addressed elements which could encourage participation including reducing the burden of length, reducing complexity, using visual design to make the questionnaire easy to complete and making it convenient to respond, (Dillman, 2014).

4.2 Chosen methodology and methods in more detail.

Mixed methods approach using a small case study, questionnaires and interviews.

Mixed methods methodology is as Creswell (RIA, 2016) describes 'a common-sense approach' to research. It is how we naturally try to find the truth. We ask questions, we observe, we test and then we combine all that information to find the 'truth'. In television production,

video production or journalism where I have worked for a very long time, we present a story to tell facts and data from surveys supported by experts and interviews to corroborate each other and provide a more accurate presentation of what is. Thus, a mixed methods approach feels like a common-sense approach to me. This makes it a relevant research methodology as it is an approach familiar and often utilised within the industry that the project is researching within. Indeed, Creswell uses the television interview as an example of real-world mixed methods gathering in practice (RIA, 2016).

Mixed methods methodology combines quantitative and qualitative data sets to add additional insight into data analysis around the research questions for the research being undertaken. How we gather qualitative and quantitative data can be approached in many ways and how we prioritise one type of data over another, affects how we can analyse and interpret the data and then how we can form insights and conclusions from that data and its findings. (Creswell, 2006):

'Mixed methods research is a methodology for conducting research that involves collecting, analysing, and integrating quantitative and qualitative research in a single study or a longitudinal program of inquiry.' (Creswell, 2009, p. 9)

The project used a mixed methods approach that combined quantitative data with qualitative data, as the project's world view is of a complex system of social reality that cannot have its data presented as simply one or the other. It was valuable as the context of protests and subsequent legislation and social gathering restrictions during the pandemic made face to face data gathering difficult in many instances. The ability to mix data and utilise data gathering methods that could be used online was crucial to the project's completion.

The data gathering and analysis allowed detailed, insightful, and valid conclusions and recommendations to be gained from the data. Sequencing of both gathering and analysis to provide insightful findings was important (Robson and McCartain, 2016) and is presented in more detail in the Methodology 2 section where implementation including participant demographics are discussed. Equally the choice of mixing manual and algorithmic coding mechanisms (Bryman and Burgess, 2004) when using NVIVO for qualitative data analysis was important and is expanded on in the data analysis section. Sequencing is covered in terms of data collection as the project used a mix of qualitative and quantitative data collection using interviews, a small case study and surveys through questionnaires. This allowed the project to gather an effective group of data for analysis of the factors affecting the practice and the elements integral to examination such as practitioner feedback on the effectiveness of lighting approaches for stills and moving images.

The project's mixed methods research methodology consisted of a questionnaire, secondary data from a literature review with a focused group of qualitative interviews and supporting sequential small case study. These gathered an effective set of qualitative and quantitative data on the changes in filming and lighting approaches that have occurred in the industry over the

period of the last five to ten years. Assessment of these changes examined how they have directly and indirectly affected the study's group of practitioners and practices during that period and allow recommendations for future practice to be made.

This mixed methods approach allowed me to gather a statistical indication of the factors I wished to investigate from the questionnaire with further, richer, more detailed, more 'human' evidence from the case study and qualitative interviews, that helped to qualify these areas further. The wealth of data and insights from mixed sources allowed an effective methodology to provide insights into the project's aims and objectives.

Case Study

The use of case study as a data gathering method has the potential to reveal in depth data on a single case as Hyatt summarises when discussing Stake. 'Case study research is an investigation and analysis of a single or collective case, intended to capture the complexity of the object of study'. (Hyatt *et al.*, 2014, p. 2).

It is also noted that sources of evidence for the case study are likely to need to come in different forms and from different sources owing to the depth and focus of the case study:

'No one kind or source of evidence is likely to be sufficient (or sufficiently valid) on its own. This use of multiple sources of evidence, each with its strengths and weaknesses, is a key characteristic of case study research' (Gillham, 2000. p. 2).

These elements of case study made it valuable in providing data across the project's objectives from technical insights in camera and lighting technology to practitioner approach and professional culture expectations. The breadth and depth of data that can be gathered is very valuable however it is tempered by a key limitation in its lack of generalisability (Hyett *et al.*, 2014) in specific from an expert viewpoint. The autoethnographic case study has additional difficulties of its own 'truth' in writing itself, as Wall points out when discussing her own narrative.

'However, in practice I do still have trouble sorting through the "truth" in my story and deciding how best to tell it. It might be that it is indeed impossible for anyone to ever finalise a perfectly accurate story.' (Wall, 2008, p. 3).

The case study was eventually delivered as a narrative case study with detailed narrative inquiry as the situation changed the data gathering landscape during protests and Covid 19. It was carried out retrospectively and utilised all available data source to reconstruct the case study of a project that took place before the lockdown but that contained the requisite elements for the project.

The narrative case study allows a valuable and pertinent data source to provide valuable insight through analysis and reflection as McLeod found when looking at narrative case study in therapy.

‘a narrative/theory-building case study—and the case of Mr. R—a narrative/pragmatic case study— serve a valuable function for the therapy research community as a whole, as exemplars of quality, by showing what can be achieved through this form of inquiry’ (McLeod, 2015, p. 241).

The case study narrative was written in first person to place the researcher's experience actively within the narrative to provide a potential for deeper insight through experience when analysing the narrative (Atkinson, Coffey, and Delamont, 2003).

The small case study was chosen to be a media production where stills and moving images were being produced within the same setting. This allowed data to be representative of the subject being investigated by the project and allowed the gathering of relevant data and/or examples that could then feed into the interview design. With its deep examination of practitioner practice and practitioner/client interaction it provided data from objective 5 to identify and analyse specific lighting approaches that can deliver professional results when simultaneously delivering still and moving images, to objective 4s focus on lighting technology and technique and objective 2s focus on image creation in Hong Kong.

The single illustrative case study within the larger research project allowed the research to take advantage of case study benefits and minimise its restrictions. By using the small case study as a sequential component of the mixed methods research methodology it functioned as an exploratory element feeding questions and defining areas of inquiry for the following questionnaire and interviews. It could then function effectively this way as one advantage of case studies is their ability to provide detailed insight.

“...the detailed qualitative accounts often produced in case studies not only help to explore or describe the data in real-life environments, but also help to explain the complexities of real-life situations which may not be captured through experimental or survey research.” (Zainal, 2007, p. 4).

The case study also allowed real world observation and notes to be taken from an instance of the subject area being undertaken and generate qualitative data around this instance, including the contained work and use of technology, changed technology and client expectations. This would directly provide insight to objective 3 to examine changes in image gathering technology and practice and its effect on the role and perception of the ‘creative image creation professional’.

Interviews

Interviews as a data gathering method allow a rich qualitative data set to be gathered and to allow investigation to change and reveal information as the interviewer and interviewee engage and develop the data gathering through the process (Fox, 2006). With practitioner interviews it was aimed to provide data for objective 1, to examine the technological difficulties of shooting both still and moving images simultaneously and to evaluate the effectiveness of this approach in delivering viable stills and moving images for professional use.

Interviews have significant advantages over other data gathering methods and these advantages include extended data collection from participants, enabling researchers to probe aspects of what a participant says to get a fuller picture of an experience in ways that a more structured approach such as a survey might not. Interviews can explore the experiences of different participants, who can be selected to reflect a range of experiences relevant to the research area. In the research project for example, photographers and cinematographers may have different expectations of the use of lights. Interviews also allow people to speak for themselves which when combined with other sources can help increase the validity of the data (Creswell, 2013). This breadth of insight from analysis of the interview recordings and notes from the interviews would provide valuable material for objective 3, to examine changes in image gathering technology and practice and its effect on the role and perception of the 'creative image creation professional'.

Disadvantages of interviews can include the time-consuming nature to participants and the researcher at the time of data gathering and for the researcher during data analysis. Accepting that they are often limited in number as a result of their time-consuming nature the project design relied on the value of depth of data for the research themes and potential illumination of new themes.

The process of data gathering during the interview can also be inefficient, as the participants may not limit themselves to the area in which the researcher is interested, requiring the interviewer to ensure that they take care to add relevant subsequent questions during the interview process (Fox, 2006). To help steer conversations back to the subject area if needed the implementation of interviews took a semi structured approach with optional questions, however the process remained open to broader comments providing valuable insights themselves.

There are three types of interviews; unstructured, semi-structured and structured and a choice needed to be made over the most suitable type of interview used and then applied equally across subjects to ensure an equivalency in the data gathered. Unstructured interviews allow a very rich data source to be gathered but require much more focus during data gathering to ensure that relevant data areas are being discussed and the interview does not drift to an invalid position of discussion.

Semi structured interviews allow a rich data source to be gathered with several fixed starting points allowing themes of discussion to be more easily pulled from the data and structured interviews form the most rigid frameworks for interviews and are the easiest to administer

however are less likely to produce deep or newly insightful data sets when compared to semi structured and unstructured interviews (Robson and McCartan, 2016).

In the research projects case, it was decided to use semi structured interviews to gather a depth of data but with a more manageable and consistent framework for data gathering and analysis. It would also allow starting points to be made targeting project objectives while being open to areas outside of the project's objectives providing valuable, unexpected data.

Questionnaire

With five key objectives to meet the project required both deep and broad data sets. The method that would supply a broad range of data from the largest participant group would be the online questionnaire. This would enable data to be gathered across a wide range of quantitative questions and a smaller number of qualitative options.

The value of a questionnaire is its ability to gather a large data set (Robson, 2006) and supply clear standardised data responses. Online access enables participants to undertake the questionnaire at a time and location suitable for them which increases participant take-up (Crandall, 2007). With the integrated analysis engine of the Google Forms platform allows statistical analysis to be carried out to a degree and allows separate downloading of the complete data set.

The project used online questionnaires to gather data using a secure server utilising Google Forms to help ensure any participants anonymity. I also conducted interviews online through Skype and other real-time chat systems. This had the advantage of allowing a more relaxed environment to gather data and can:

” ...give respondents ample time to consider topics and answer. While in-person questioning often catches respondents cold, online communication provides a private, relaxed environment in which participants usually feel comfortable enough to share their innermost feelings and thoughts.” (Crandall, 2007, p. 2).

In the case of the sampling size, the method intended to sample as large a group of the practitioner population as possible. Here the advantage of working within an industry that is entirely based around communication helped as there were multiple ways to contact them and request their help on the research. This became even more important as social restrictions occurred during the pandemic and legislation following the 2019 protests in Hong Kong. I hoped to sample a wide and diverse enough subset of the practitioner and client body to gain meaningful results through the effective use of purposive sampling.

‘Purposive sampling (also known as judgement, selective or subjective sampling) is a sampling technique in which a researcher relies on his or her own judgement when choosing members of the population to participate in the study.

Purposive sampling is a non-probability sampling method, and it occurs when “elements selected for the sample are chosen by the judgement of the researcher.” (Dudovskiy, 2013, p. 1).

Data analysis

The questionnaire data and analysis

The questionnaire's quantitative data was analysed using statistical software. At the project start the projected software was SPSS (software for advanced statistical analysis that includes machine-learning algorithms and text analysis) however the relatively small dataset enabled Google's own analysis within Google Forms with further analysis in Excel. The project's aim was to gather a large enough sample group to be a representative sample (Bryman and Cramer, 2005) to allow for more generalisable conclusions to be drawn. However, as the sample group needed to be chosen to guarantee a level of knowledge and experience it became difficult to allow for the statistical analysis to produce inferential results at the same time as I could not gather a random sample group at the same time (Liero and Zwanzig, 2012).

Interview Data and analysis

After gathering data using semi structured interviews based around questions relating to the research questions the interview aimed to be open to follow up questions as possible to draw relevant knowledge from the discussion in an investigative and co-operative questioning approach. Of the interviewees, all the professionals were able to attend their interviews. The round 1 interviews involving creative professionals were recorded and listened to several times to allow notes to be made around any inferential content that could be drawn from tone, non-verbal components and short or single work answers to questions that in the flow of conversation are understood to say more than the single words presented as a grammatical value would suggest (May, 2001).

A detailed transcription was made including side notes to retain the whole communicated meaning of the answers within the construct of the interview. The transcriptions were then examined using open thematic analysis (Braun and Clarke, 2006) to identify key themes across the interviews and analyse how the interviewees saw the research areas. The analysis looked for relationships based on the responses within the interviews. I remained open to new codes emerging through the analysis in addition to identifying areas drawn directly from the research questions and aims. From this analysis it enabled the research to have data it could use to triangulate with the data gained from the questionnaire and literature review.

The process was repeated several times using NVivo software starting with close analysis and rereading of the texts after relistening to make additional note of any inferred commentary from laughing, nonverbal indications of disagreement and agreement (May, 2001) extended from responses to questions and nonverbal prompts to extend an answer from the participants.

Initial coding Initial coding was made on the interview texts within NVivo using the coding tools and accompanied by additional notes using the memo function to relate notes against

content. This produced 147 initial codes (made note of as nodes in NVivo) which were then put forward to help identify possible themes during the rest of the iterative review process.

Case study analysis

The case study was analysed in a similar fashion to the interview data. A combination of manual and automated coding processes was undertaken as the case study also supplied qualitative data that could be placed inside NVIVO software to help perform qualitative analysis. I used thematic analysis to provide insights from the raw data provided during the interview process and the case study narrative process.

Once the data was imported to NVIVO, NVIVO's query tools were used to provide initial search results from word frequency analysis to provide a starting point for analysis and to help facilitate manual reading of the data.

From these initial query responses and readings, a wide range of codes were generated. Re-reading of the case study narrative would help manually code the large number of generated codes with insight from practitioner expertise and from reading across code data to see where separate codes were in fact part of more complex codes in the data. (Zamawe, 2015)

The sequencing of the automatic query coding and the manual coding in multiple iterations was designed to allow a mix of inductive and deductive reasoning to provide the most effective and valuable analysis of the qualitative data.

Triangulating data

Using the queries available within NVivo, specific word searches and word frequency queries were run during the rereading and note taking to help identify where words were appearing in relation to other words and which words were more frequent (and potentially more significant). During the rereading this analysis helped me to see some patterns and relationships that I might have otherwise missed. Once I coded the text the queries were run again on coded material and using the additional coding and matrix coding queries, I was able to increase my detailed examination of the codes arising to (Leech and Onwuegbuzie, 2011) group codes together and arrive at major themes that were present across and within the interviews.

To analyse my data effectively quantitative data from the questionnaires was statistically analysed and its data combined with the qualitative analysis of the case study and interview data. I then used NVIVO to organise source data and start a coding analysis of qualitative data from the case study (including journal notes, images, and videos), questionnaires and interviews and perform thematic analysis of the qualitative data (Leech and Onwuegbuzie, 2011). This allowed further coding which I was then able to qualify through triangulation with quantitative data from the complete range of data sources. NVIVO also communicates with a range of data sources and file formats which I used to analyse the project's quantitative data.

Throughout the project, reading and re-reading of secondary and primary data sources examined links between the interwoven information. This provided insights to refine the data gathering process from the redefining of interview questions before and during interviews to the examination of themes from the qualitative case study and interview data. This would allow

the chosen mixed methods methodology with its methods to be implemented effectively as is discussed in the next section.

5 Methodology 2 - Implementing Data Gathering

Introduction

With a mixed method design chosen to allow the project to combine the benefits of insight from the chosen range of data gathering systems (Creswell, 2009) the plan for undertaking that process needed to be delivered. This section discusses participant recruitment approaches the data gathering timetable and demographics of the participant groups. These are covered in qualitative data from questionnaires, interviews and case study combined with quantitative data from the survey to analyse the project's area of focus.

The methodology would combine data from 2 rounds of questionnaires, interviews from relevant professionals and industry experts with informed insight using a case study as a sequential data component to add insight into the information from the first questionnaire and survey and interviews and to analyse it in detail as an example of the situation arising in aspects of producing images, both still and moving, at the same time or in the same situation and project.

Choosing the sequence of data gathering and analysis affects interpretation (Robson, McCartain, 2016), and the planned design of survey and interview components is designed to inform analysis through the project's timetable and allow the potential for change and new information during the extended data gathering and analysis period.

Once the data gathering had taken place then qualitative and quantitative data elements could be compared, combined and discussed. This could then provide deep insight into aspects of the project's investigation into the changing world of image capture and lighting for dual still and image processes.

DATA GATHERING SEQUENCING:

	Literature Review	Interview 1	Interview 2	Questionnaire	Case Study
2019					
2019					
2020					
2020					
2020					
2020					

5.1 Recruitment

The project focused on a mix of professionals potentially affected by the area of change in the industry that the project is investigating to gather relevant insight from the interviews and questionnaire samples.

As stated in the ethics section all data gathering and participant involvement was undertaken within university and European ethical and data protection guidelines. To ensure data was gathered as appropriately as possible the interviewee candidates were chosen from professionals, I know in Hong Kong who work in areas that may be affected by the situations the project is investigating and who work with many other professionals on a daily basis in media production, both still and moving image based.

All interviewees were invited face to face or by email and all sent the information sheet for informed consent to ensure they knew that all data was to be held securely and no personal data would be collected during the data gathering process. This included any data that might allow their identity to be inferred from examining the presented project data. The conditions of data gathering, storage and analysis/presentation ensured that security and anonymity were maintained through the project process following the Middlesex University guidelines (Middlesex University, 2019).

The invitation also informed them of their rights to leave the project at any point and that in the case of them leaving all associated data from them would be deleted.

In order to gather relevant data, the sampling of the participants was designed with purposive sampling (Dodovski, 2013) in mind to provide sample characteristics that would increase the possibility of useful and insightful qualitative and quantitative data. These characteristics vary across the first and second round interviews as the research questions focused on vary in these interview rounds.

Research questions:

Each area of data gathering captured elements of data across the range of research questions to allow detailed insight when triangulating data during analysis. Only the second round of interviews provided less data relevant to research questions 1 and 2 as their participant group had more insight and expertise in areas covered through research questions 3,4 and 5:

Research questions and data gathering outline.

	Literature review	Questionnaire	Interviews 1	Interviews 2	Case Study
rq1					
rq2					
rq3					
rq4					
rq5					

5.2 Questionnaire

The questionnaire sample size was aimed at forty and supplied 32 samples. The questionnaire was designed to be delivered online to allow access at the participants convenience. Several platforms were examined to decide on relevant security and anonymity characteristics that would meet university guidelines. After consideration it was decided that Google Forms would be used as the platform does not collect any submission data including IP address of the submission and thus allows anonymous submission. The link to the questionnaire was only given directly to known professionals to minimise the possibility of data being entered by participants outside of the project's planned sample characteristics.

The online questionnaire started with an invitation page explaining the purpose of the project, the anonymous nature of the data collection, storage and use and the ability for the participant to remove themselves from the process at any point. The forms invitation page explains how to do this and the thank you page at the end provides the participant with a unique identifier for their submission allowing the record to be found and removed later if necessary. Over the two survey periods a total of thirty-two Hong Kong creative professionals were surveyed.

The questionnaires were designed with questions grouped around gaining relevant answers to the project's research questions and to give a base response to analyse the subsequent interview data and to inform questioning during the interviews and design of the second round of survey. They were delivered to creative professionals including photographers, moving image camera people, journalists, and multi-skilled professionals.

5.3 Questionnaire Demographics

The indicative first sample group looked at research questions and consisted of creative professionals who either produce still or moving images as their primary role or whose role contains still and/or moving images such as journalists and shooting producers/directors. Round 2's questionnaire sample group was chosen from relevant participant samples over a broader and potentially less directly operational role. The sample group consists of creative professionals whose roles include still moving and both types of image production.

5.4 Case study

The case study analysis examined a production where still and moving images were produced in the same location and at parts of the process at the same time. This included examination or process technology and client expectations from gaining stills from moving images, gaining stills in the lighting setup designed primarily for moving images and gaining stills with a short use of

flash during setup periods for the moving image shoot sections. As the researcher is providing an insight into the process and interactions through the day and events of production they also served as an example of the freelancer/SME in Hong Kong as Creswell (2013) says:

“The case study method explores a real life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information ... and reports a case description and case themes” (Creswell, 2013).

The case study used was a single case analysis of a corporate production in Hong Kong where still and moving images were gathered at the same time in the same location and in the same location but at separate times by both a single professional and two professionals in the same space. This relates directly to the project’s investigation of the demands, challenges, and the impact of shooting both still and moving images within a single location. The case examined involved a professional photographer and shooting producer/director.

The close analysis of this case study was undertaken with access to production planning notes and sketches for the production day as well as conversation and reflection with the photographer and shooting producer/director. In addition, stills and moving image clips from the shoot were assessed to evaluate differences between the types of capture.

Robert Yin (2009) describes a case study as “an empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2009) and in the case of this project examination of contemporary phenomenon in a real-life makes it particularly suitable to investigate the active change in image capture practice.

To assist in writing a valuable and reliable narrative case study I referred to all materials still available for the case study. This included examining pre-production emails and notes on pre-production meetings, production planning notes and sketches including lighting plots and equipment planning sketches, shoot schedules and equipment lists.

The material produced during the recce before undertaking the shoot was referred to which included some reference still images and notes regarding the location and interviewees. Finally, the rushes and raw images were examined along with the project files for the edited still and moving images and the final produced images, both still and moving.

These information sources helped to build as reliable a narrative (McLeod, 2015) of the production day and production process as possible. This covered shooting, lighting, the role of the still, moving and hybrid image creator and the interaction between the people within the case and the organisations in creating the scenario where the image creation happens. The Narrative delivery of the case study gives a richness to the data from the impact and insight of life stories applicable to the narrative and is given insight through the analysis of the Narrative, communications, images, moving images, notebooks with Narrative analysis for codes and themes from the case.

5.5 Interviews

The interviews were undertaken in an open-ended semi structured format (Robson, 2016) that allowed the participants to speak freely for the length of time they felt comfortable with and with follow up questions that tried to expand on the participants answers based on the ongoing discussion. The sample for the interviews was five initial interviews with creative professionals based in Hong Kong and with a range of professional working experience in areas of image production where demand for stills and moving images in the same project are likely and with a period of employment from 5 to over thirty years. This was then followed by an additional five interviews with professionals from client-side roles to equipment manufacturers.

Interview demographics

Round 1 Interviews

The first group of interviewees was chosen from professionals with image production experience including ENG style video cameras, camcorders, Digital Cine cameras, DSLRs and mirrorless cameras to have discussions that covered the technological and practice changes that have occurred and are still occurring in camera use. The group needed to contain professionals whose traditional expertise has been video and others whose traditional expertise has been still images and professionals who undertook both still and moving images. The group also needed to include professionals who used mobile phones in their work to assess this significant component of change in still and moving image capture.

Round 2 Interviews

The second round of interviewees were five professionals from client-side roles to equipment manufacturers who could inform on demand and technical changes that affect the production of still and moving images in separate and single devices and the processing software that is such a significant part of almost every image capture device now being produced. The small sample size for interviews follows qualitative design principles of deep exploratory data sets being gathered from highly relevant small sample numbers (Dawson, 2009).

1st round interviews:

Round 1 interview participants were:

- Director of Photography, based in Hong Kong for 10 years.
- TV Producer who has been working on news and light news for Hong Kong's largest television broadcaster for the last three years

- News camera person who has Worked for an international news organisation in Hong Kong for the last three decades.
- Photographer - commercial photographer working in Hong Kong for the last three decades shooting product, food, corporate and modelling images.
- Producer working in Hong Kong and Asia for over thirty years.

Round 2 interview participants were:

- Producer - Working in Hong Kong for 10 years.
- Senior video journalist working in Hong Kong for 12 years.
- Media Director working in Hong Kong for over 30 years.
- Technology Manager managing a major international lighting company centre in Hong Kong for 10 years.
- PR executive working in Hong Kong for 20 years.

All interviewees are based in Hong Kong, and all are Hong Kong permanent residents.

6 Data Analysis Results

In this section I present the analysis of the three primary data sets (interview, survey, and case study). In the thematic analysis of the interviews each discovered theme will be supported by the interviewees' quotes and brief analysis for each case. In the survey the questions are related to the research questions they were designed to target, and the case study is presented as an analysis of the autoethnographic narrative case study presented in full in part 1 of the project's appendix. The findings and conclusions discussion section that follows data analysis presents a more expanded version of this analysis and allows the data to be considered against contextual and literature discussions and in relationship to the other primary data sets. As discussed in the methodological design the data gathered and analysed presented both quantitative and qualitative data:

6.1 Qualitative Analysis

The interviews and observations /notes from the case study produce a wealth of deep and focused qualitative data that was analysed using thematic analysis and brought together to deliver key insights into the production of still and moving images in a rapidly changing industry. This provides a wealth of data that can be combined with the project's quantitative data to produce valuable insights into practice.

6.2 Quantitative Analysis

The survey contained quantitative data from simple yes/no questions to scalar questions that can be analysed using simple statistics to give a numerical insight into areas that inform the research question areas. A selection of graphical analysis and presentation formats are used to clearly illustrate the data in response to the questions.

6.3 Survey Data

The questionnaire was designed to target areas related to the research questions 1-4 to gain insight for further survey data and interviews for the creative professionals.

- RQ 1 How and why are practitioners using lighting techniques and modifiers when aiming to gather stills and video from the same shoot? This research question was addressed in survey questions :19,20,21,22,23,24,25,26,27,28,29
- RQ 2 How do lighting, and camera technologies make the gathering of stills and videos from the same setup achievable for professional practitioners? Survey questions: 6,14,15,16,17,18,19 and 20
- RQ 3 Why and how have practitioners and clients moved to deciding the types of shoots likely to be achieved using a hybrid approach? Survey questions: 9,10,11,12,14

- RQ 4 How does delivering stills and video from the same shoot (hybrid gathering) affect the professional practitioner? Survey questions: 2,3,4,5,6,7,3,8,9,10,11,17,18,24
- RQ 5 How does working in image creation in Hong Kong, an international city, affect shoots that require the production of stills and video and why have recent changes affected the sample groups within Hong Kong. Survey questions: 4 The majority of data for this research question in the interviews and inferentially from all of the questions in the questionnaire as all the professionals are based in Hong Kong.

6.4 Case Study Data

The case study concerned a single production event covered in detail and analysed using detailed coding approaches as described in the data analysis design section. It provided a wealth of data that is presented below.

6.5 Interview Data

Round 1 interviews:

1. Producer 1: Tse
2. Producer 2: Adam
3. DOP: Sam News
4. Camera person / Photographer: Shek
5. Photographer: Woo

Round 2 interviews:

6. Head of media company: Liam
7. PR communications executive: Francis
8. Senior video journalist: Li
9. Head of lighting company: Kim

Introduction to themes from interview analysis After coding was undertaken with close reading of the interview transcriptions and examining the audio files again themes were identified using thematic analysis. In the following section these themes will be supported quotes from the interviewees and a brief analysis for each case. A more detailed discussion of the analysis with links between other data sets takes place in the findings and conclusions sections after the data presentation and analysis section.

The themes identified from the interviews are discussed as they arose from the two stages of interviews. In the first stage interviews the major themes that were identified were:

1. Demand for stills and video from the same professional has increased but photographers and moving image professionals still see themselves as separate from the other.
2. Phone and camera technological advances are enabling a wider range of image capture professionals (and amateurs) to capture both still and moving images for professional use.

3. Smartphones' rapidly developing technology has changed their use in image capture, editing and distribution.
4. Lighting for capturing both stills and video at the same time or in the same location is more frequently achieved using continuous light. The type of light source in most of the cases is daylight or LED.

In the second stage of interviews the themes identified were

5. In a range of still and moving image roles in Hong Kong there is often a total lack of lighting because of technological change and a lack of lighting skill and experience leading to lighting being seen as the exception and not the rule in many cases in Hong Kong.
6. Hong Kong Organisations and Media Clients see Photography and Video gathering still as mostly separate roles with distinct dissimilarities.
7. Demand for Hybrid image gathering in Hong Kong tends to increase as the size of the client organisation decreases:
8. Use of LED light sources has increased throughout the industry despite initial costs and repair costs being higher than other sources to the point where LED is the de facto lighting source of moving image production and is increasingly used in photographic studios.

6.6 Themes arising from group 1 interviews:

1. Demand for stills and video from the same professional has increased but photographers and moving image professionals still see themselves as separate from the other.

What seemed to also appear significant was the professional perception that the still and moving image were the same AND different. A duality of belief and understanding from both photographers and moving image professionals.

The practitioner's self-image is clearly embedded in their experience and social understanding of their industry and reinforced by production structures that separate still image and moving image into separate 'pipelines' from preproduction conversations and expected social interactional differences between the photographer and the client /subject and those of the moving image professional and those same bodies.

The discussion and reflections by the interviewees revealed a conceptual framework concerning the moving and still image that placed the taking of the image as the same and different as that of the moving image from camera operation to lighting and post-production. Shek points out that 'it is the same' and then almost immediately confirms that there are significant differences in the same sentence at several points. When we discussed the technical issues with producing usable footage at low light levels being problematic for video as the usable range of low shutter speeds is much higher than slow shutter speeds you might get away with in certain still images he commented that , 'you can shoot video with the feeling... is

different as an example from a still shot with a slow shutter speed it depends on what you're doing and what you need but I think nowadays technology makes things easier so even with his not good lighting I can increase the ISO.' This understanding that there is a difference between a usable shutter speed range for video and stills is discussed from the viewpoint of a camera person explaining the difference and at the same time explaining the thought process about how controlling the technology enables the image producer to differentiate practice between the two types of image capture depending on the creative demand of the specific image capturing scenario. He then explains that the technical options of using the DSLR/mirrorless type of camera allow him to switch between the two types of practice.

'It's the same I found it but the frame makes the difference if because of the different landscape (background) and I can use a small light and bounce light using Portrait Style I can move around this more flexibly without needing a video light and a big tripod .. I think the way is a little bit different but it's similar. The difference is if I'm shooting a camera, I try to search for two different backgrounds and if I want better quality, I can put it on a tripod. I don't need a bigger flashlight if I'm shooting stills. It's so it makes videos and still very similar now very close in the way we shoot.' (Shek)

Adam and Sam however saw clear differences between the process of shooting stills and videos especially in post-production processes and project timescales where they saw the still image taking significantly less time to produce in its totality as Adam summarised very briefly '...and photography is so easy it's so quick but video, it takes so long to produce the video'. Sam made an observation that further explained the process on a day where video and stills photographers were working on the same project.

'I'm finishing for the day and packing up and I can see photographers still working, editing their photos. They're there after I'm gone but then they're finished but we're (video production team) are just starting,' (Sam)

In large ways the operation of the camera was seen as the same however the difference in lighting although seen as 'the same' was understood to be different in the technicalities of lighting source differences between strobe and continuous lighting.

Adam says, 'I'm thinking about stills cameras and events. You need a zoom lens, otherwise I guess it's more controlled. I could do that because I know lighting, I need to know a little bit more about controlling the Camera.'

And Shek was relaxed about the technical difference in shooting both image types for professional use, 'we can sell my company shooting news video and photography and I do both and it's just different equipment.' In addition to being positive about the ability to deliver across platforms with sufficient understanding of the technology; 'It depends on the quality if you just

want my Snapchat then pictures from video OK if you want good quality then you need flash whatever the theory is the same for Stills and video, but the equipment is different,'

Moving image professionals saw the photographers' role as more client facing and requiring a different set of social skills to accomplish their roles as Adam says 'when you're a photographer you need to be more of a suck up ...' and then continued to compare that to the role of the video camera person : '...but as a video camera person you can go back to being the grumpy one behind the camera as you should be.' He said laughing in recognition of the stereotypical image of the video camera person he was referring to.

The separation between the concept of the still image and moving image creative is reinforced in Hong Kong through the public perception of the roles as Woo, one of the photographers, explains that video is seen as less professional than photography.

'Maybe sometimes HK people think still photography is a very specific and professional, video is more common and general, so they think they have both services provided, as you can see wedding companies are provided both video and photography at the same time, they think wedding photography and videography are not so pro, just a business like.' (Woo)

We see in this theme that perception of the social position and value of the image creator in Hong Kong impacts the professional's identification of themselves and potentially the future identification of new professionals deciding on whether to start a career in image creation. This perception was discussed by everyone as changing and as a result changing the way image production is becoming further reduced as a viable career for many people as it directly affects what professionals are being paid.

'YES, now I think they are changing the photography levels we used to get 4000 an hour. I can ask anyone to do so now for 500 an hour because the technology, because when you shot film, you spend a lot on film and it's very difficult to get the right shot and now it's easy and focus shaking all taken care of therefore I think it's a good thing because even the mobile phone can do everything now.'

(Shek)

2. Phone and camera technological advances are enabling a wider range of image capture professionals (and amateurs) to capture both still and moving images for professional use.

The interviews made it clear that smartphones for many professionals have become an accepted and expected part of the production toolkit including image capture for online and broadcast stills and video. In addition, new features and capabilities of mirrorless cameras are adding capture opportunities for a wide range of image capture professionals and non-professionals at a quality acceptable for professional use. One example mentioned by Sam was the acceptance of the Panasonic SH/1 for Netflix production – the first mirrorless camera made

acceptable for high end 4K productions for the streaming service. The interviews revealed several areas that had enabled phones and new camera technology to become such indispensable and inclusive parts of the production toolkit.

All the interviewees at some point made note of the smartphone's importance in capture thanks to its inconspicuous/non-frightening form factor and convenience. In many situations where everyday people are being interviewed small cameras have always helped put them at their ease and is why small cameras are often favoured by documentary teams. Tse points out that a phone can work where even a small camera is distracting or where filming has to be discreet.

``We do some footage on the phone because when holding a camera even a small one people get worried and so I use the phone and in its phone case and the iPhone is OK for TV and the phone makes it easy to hide and film discreetly.'
(Tse)

On another occasion Tse explained that her team needed to film in a way that would be acceptable for one of the first locations where a case of covid-19 had been found in Hong Kong. Filming with the phone made this possible and her camera team assessed the footage technically after the filming.

``We asked one of the first hotels where there was a case and had to ask people in a way that they were happy to answer, and the phone was good for that. My camera team say the iPhone is very good.'(Tse)

The ability to work anywhere, the convenience of having your camera with you had been accepted by professionals for years now, but the delivery of quality stills and footage that can work almost invisibly with footage and stills from larger digital cameras is a relatively recent development in the smartphone technological armoury. Now we have that capability, the true usefulness is being taken advantage of by professionals as Adam points out. 'I have used iPhone shots arriving in cities from planes In Tokyo on the underground. It's much easier holding your phone about people than a camera and I like there's an extra tool. `` And that convenience and quality has the potential to make everyone a broadcaster as Shek laughs when telling the story of working on the protests' coverage in June of 2019:

'I think the thing that has to change things most because I think that everybody now is used to shooting video and photos ... so what's the big deal, but in the past you can shoot video it was not good... now my phone its good... tell you a joke about filming occupy central, everyone has a selfie stick and come out and then I stand up already maybe two or three feet over the people and now the selfie sticks are coming out everywhere in front of me! I had to call "Are you reporting?!

If not, watch it at home and let me do my job!” You know but that is it everyone’s a reporter.’ (Shek)

This convenience, the ‘best camera is the one you have with you’ concept is not new to image capture, but the changing technology and capabilities of smartphones are developing what has been a device of only convenience into a device that shifts into a regular production tool.

3. Smartphones’ rapidly developing technology has changed their use in image capture, editing and distribution.

These elements of the smartphone's rapidly developing technology have also changed its use in image capture, editing and distribution. The acceptance of the mobile device into the professional workflow has been discussed for the last decade and the interviews demonstrate that the devices are now at times and in certain instances a significant part of that process. That acceptance does not however come without doubts and qualifying comments on using smartphones and how smartphones are affecting the production of still and moving images including the ‘look’ that each smartphone imbues its image capture characteristics with and the approaches to gaining those characteristics and benefits.

“Everyone has different standards for what they’re looking for - I like realistic colours some of my friends like more saturated colours but companies are changing the number of cameras on the phone like Nokia with five cameras and how the cameras combine using processing changes the look.” And Tse goes on to say that the technology only works if the software with it works easily and effectively in the phone ‘... the software needs to be very stable for it to be good. I think it can be out of focus really easily.’ (Tse)

Along with image processing technology the participants highlighted network features as important aspects of the smartphone's use that make them viable tools for production. Shek explained media companies making the decision on supplying phones for production as a financial and record keeping driven decision; ‘...and the phone is cheaper than cameras so companies will give phones and hardware support and give teams iPhone 6 which is good enough for video and for Media industry because we need to keep a record of editing on the iPhone and Airdrop can track which phone the footage has come from.’

This combination of cost effectiveness, ease of use and familiarity lets companies open up and extend the type of creative professionals who are capturing images. Woo discusses this as a negative for the image creation professional who in some cases can now be left out of the process.

‘I think the reason is that the customers will not demand very high-quality photography, they only need the photo putting on the phone or iPad instead, sometimes they can do it by themselves or sometime the intermediary, e.g. a

designer can take up the shooting job before reaching to the photographers, they can get the job by lower price to do both design and photography.’ (Woo)

But whether negative or positive, all the professionals discussed the phones being used in a wide array of image capture options and the ease of use and familiarity makes the mobile platform accessible especially for media that is ideally distributed quickly. Adam relates the mobile phone and its ‘presence (here referring to it being present all the time) as important and enabling for journalists.

‘if you’re a journalist having your iPhone with you is very important then you were doing this having your iPhone with these very my shorts now yeah do live streams they have a phone and then a massive huge mic that’s bigger than the iPhone.’ (Adam)

He goes on to explain a critical feature ‘and like before with small camcorders make you feel confident with it without learning the technicalities of cameras they don’t want to learn.’ The need to use an image capture device without a deep technical knowledge of the device or the capture process is exactly what makes the phone available to such a wide array of image capture roles. This accessibility is then combined with image editing on the device which allows changes to be made before the image/video is delivered. Tse in her role as a producer explains when discussing her own filming with mobile phones for her programme that the ability to shoot and edit can allow her to deliver a shot that before would have required her to take her entire crew to gather; ‘an example in blue in Kwun Tong area there’s some blue fish. The phone was very convenient to get pictures and the editing software helped.’ This aspect of enabling a wider group of professionals can, like convenience and familiarity, have potentially negative effects on the professionals; ‘Technology e.g., app / retouch tool can make it easier. Everyone can take photos and make it better after retouching. no need for the skilful photographer, the client thinks the technology can do what they need after shooting by retouching’ (Woo) But Sam does not have the same concerns; ‘I think the Professionals will not be affected that great. I think only the everyday person will shoot on their phone.’ Although as we have seen from the other interviewees points that does not seem to be the case and Woo offers a summary to the coming age of image creating enlightenment.

‘I think it is the result of the "industrial revolution", an analogue to the digital world, it’s a general change, when the professional technique become more general, everyone can do it easy, everyone can learn video shooting, editing , photography from YouTube, many kind of professional photography will become less professional.’ (Woo)

Where the interviewees discussed mobile phone technology developments in repositioning production roles, they also highlighted several aspects of camera technology that had enabled

converged roles and changed ways of shooting still and moving images. Mirrorless camera developments in several key areas including autofocus and broadcast quality recording for video were raised as important changes as Sam summarises; 'with this stills camera now advertising as a one-man band camera, with the eye Focus tracking, and even animal eye tracking (anyone can shoot).' The interviewees also discussed how the technological advances and the reduction in the size of the camera along with developments in network integration to mirrorless cameras and video cameras alter practice in the field which Shek, working on daily news output is using and seeing in use regularly; 'there's a lot of live streaming with a little text over that, that the cameras have certainly got better for me for. The video cameras do the same things and now the small cameras are much better for your back and much better to work with.' He said laughing at the importance of the practical benefit of the reduced camera size. He went on to raise the benefits of smaller camera bodies with large zoom ranges for travelling for his news gathering work and gathering stills for documentary/nature videos and photography.

'I think before we needed to take a lot of different lenses to shoot everything normally and now small cameras have a 24 to 200 and even 600mm zoom and you can shoot everything in 4k. I used to have a big lens for bird photography that cost 40K. Now I have a camera rx10 for 14 thousand and it's very light. It lets you enjoy shooting and everyone, anyone can do it, young people, old people.' (Sam)

4. Lighting for capturing both stills and video at the same time or in the same location is more frequently achieved using continuous light. The type of light source in most of the cases is daylight or LED.

The interviews, as we have discussed in the previous theme, demonstrated that although there was a perception from the professionals that they did not often shoot both stills and video at the same time very often they all raise multiple examples of cases where they did gather stills and video or stills from video. Further questions revealed an implicit understanding in the group of practices and professional knowledge that allowed them to achieve this result effectively and what their choice of lighting was.

The consensus of practice and opinion was that in situations where both stills and video were to be gathered that the lighting source and design should be the same and continuous. It should also be noted that the explicit consensus was that the frequency of shooting stills and images in the same setup by the same professional was low.

In many practical examples, comparisons with lighting approaches and technologies were integrated with aspects of camera and mobile phone technology alongside production decision making and interviewee preferences and client instructions. An example that Tse describes demonstrates how production guidelines, technical capabilities and the practicalities of the shooting day affect lighting for stills and video.

'so, we do not change the lighting between Stills and video, and we do lighting setups looking at video and take stills in that environment. Under the sunlight is

the best for our photographs - some programs to make you more positive like medical programs. We have a channel guideline to film under the sunlight to make the images load more positive and have as much green in the image, when possible, like trees and grass Gardens. On one day we shoot in a campsite where we paid for the day so we had to shoot everything we could for the whole day with lights in the evening to make it worth it.' (Tse)

The use of daylight for shooting for stills and video was an approach that Shek also felt lent itself to demonstrating how shooting both in the same setup was similar, 'overall the basic concept of certain aspects is the same if you're talking about like you talking about lighting in daylight then shooting video and shooting stills is the same.'(Shek) He then expanded on how much more sensitive cameras are now and explained that his approach to capturing both has changed as a result ; ' I don't need a bigger flashlight if I'm shooting stills it's .. it makes video and still very similar now, very close in the way we should (light them).'(Shek) He then continued to discuss a point made by inference from other comments in other interviews and other descriptions of capturing still images from video that the lighting setup for the capture of stills and moving images was not changed and the approach used for that setup was the same ; 'When I teach how do I tell the light I explain 45,45,45 if photos and videos.' He said outlining a typical three-point lighting approach and gesturing to illustrate the relevant light positions when explaining it.

The types of lights being used for capture of still and moving images produced large amounts of discussion over changes in lighting technology and lighting practice. Adam Sam and Shek all described the move from hot tungsten lights and large fluorescent panels with various tales of disaster when using older hot lights. Shek described his company's decision regarding new lights and an example of problems with older light technology.

'...we've (his news company) changed all the lights to LEDs. In the past tungsten lights would sometimes burn things - my senior cameraman in Singapore once told me a story about someone on-set setting a light and not recognising the heat sensor for the fire alarm and setting off the fire extinguisher and now we don't need to worry.(because the LED lights are cold)' (Shek) He also reflected positively on using large soft KinoFlo lights but explained a practical issue in an age of reduced staffing was 'you need assistant if you were using KinoFlos (to carry them and set them up).' (Shek)

The reasons for the shift to the primary use of LEDs as the light source of choice ranged across several factors including low power draw enabling the units to be battery powered, low heat output, the ability to dim the lights, choice of single colour temperature, bi-colour and RGBW options allowing for flexibility of use and adaptability to the individual project or the area of production the professional predominantly worked in. Adam explained with reference to older lighting technology and client demands.

'I like LEDs, well clients do not like hot lights anymore, they know they can have cold lights. I still have Dedo lights and they're much better, the colour is much better and they're hard light, but I would never have a hot light as a key anymore. I used to like my Rifa lights and had lots of redheads and blondes but now everything has been replaced by LEDs. Clients are sometimes sitting they're saying it's hot because of the lights and it's not the case now.' (Adam)

The advantage of low heat output was a major factor that made lights more desirable by clients but for professionals the ability to dim the light without changing the colour temperature was just as important and the ability with bi-colour and RGBW to match colour temperatures using just the light was incredibly important 'LEDs ... you can match the ambient light more quickly you don't have to use filters' (Sam). As well as the technical qualities of the light the ability of the LED to be manufactured in different form factors was raised in the interviews as another reason for its success; 'the led flexi panel light is nice because they're lightweight.' (Sam) and Sam's comment was echoed by Shek's explanation and nodding affirmation of the ability to move a large flexi panel nearer to the subject thanks to the LED's low heat output and produce a large soft light source that was comfortable for the interviewee and flattering at the same time.

Although there were many features discussed that have made the LED lights invaluable and the de facto light source on productions, a characteristic that all the professionals agreed they had to deal with as a negative was the lack of reliable colour accuracy. Adam was blunt as he explained; 'Well I am sick of these cheap lights and want to get one good key, the cheap ones are OK for me because I can grade the colour shifts out but terrible when I give it to someone. And also doing stuff on white you can really tell.' The issue was raised again by Sam who bemoaned the lack of consistency; 'the problem with the cheap LED's is you have to test everyone. We looked at all of Adam's and with a light meter we had to mark each one separately for colour temperature as the indicated reading and actual output were all different.' And there were different levels of colour filtration required on each LED as Adam confirmed.

'In the old days we just used CTB or CTO on the tungsten sources. It should be much easier with LEDs, but we actually checked and to go 5.6 Kelvin on my LED was actually 4.5 Kelvin and actually that still had a green spike. The more expensive ones are better but the cheap LED spots are horrible. I don't like the colour at all, it's horrible.' (Adam)

Across the interviews we see that the benefits and client demand for cool (temperature not colour) lighting have made LED light sources necessary for most shoots and motivate professionals to implement elements of practice to ensure that this negative characteristic is mitigated for image capture.

6.7 Themes arising from group 2 interviews.

The second round of interviews contained participants able to give a wider view of change in industry practice and demand in Hong Kong, through insights from management of large teams of practitioners, technical and sales insights from lighting developments in the industry and project delivery across a range of areas likely to be affected by hybrid image creation practices. The areas discussed in the interviews were informed through the project's aims and the responses gained in the round 1 interviews.

5. In a range of still and moving image roles in Hong Kong there is often a total lack of lighting because of technological change and a lack of lighting skill and experience leading to lighting being seen as the exception and not the rule in many cases in Hong Kong.

One theme that arose and was quite shocking to the researcher as a practitioner was the complete lack of lighting on projects, in many shooting cases, as a result of a lack of lighting as part of the image maker's skillset and the technological capabilities of the cameras being used. Two of the interviewees discussed how this could be a developing factor as an element of the speed of journalistic coverage and the working range of the camera technology, creating the knowledge that images would be attainable without lighting and as a result placing lighting as an unnecessary additional factor in the image creation process. When the question was asked in response to this suggestion whether lighting was a factor that should be important all of the interviewees agreed that lighting was an important element of better images, however this was countered by the practicalities of the toolset for the hybrid image maker and the range of equipment that the professional would carry as a 'one man band' for an entire day shooting:

'DSLRs and a7s are so forgiving in low light with the larger sensor and image correction and noise reduction and clean image with not a lot of light and it might be flat but its there even if it can't direct the viewer's eyes to a particular place and but it's there and its happening and the poor sod who had to go and do that whole shoot on his own didn't have to carry a whole buggy of pieces and I can understand the kit room and thinking of being on their feet for ten hours and looking at the lighting kit and thinking '.Ummm.' And that has come about from the technology and the dynamics of the video these days, ... and now my videographers go often without a reporter so keeping kit as light as possible is important, but not just from an ergonomic comfort perspective but from my perspective that they can just keep going for longer.' (Liam)

It could be seen within the theme that there is a lack of knowledge around lighting the image among new professionals and that experience is often limited in terms of only having used LED lights and possibly only one light to raise illumination levels rather than create an image with

the use of light. When light is used it seems that its function has often reverted to the days of early film in just providing a brighter light to achieve an image rather than delivering artistic expression.

‘And in many ways with lighting with the DSLRs lighting is becoming the forgotten art and the videographers can get away with not carrying all those lights and tripods and obviously if you do light it you will get better video but the modern generation from university and training don’t really know how to turn on a light and it’s not being well taught or if it is being taught it’s not sinking in.
(Liam)

The single image creation practitioner among the second round interviewees admitted that their own lighting knowledge was small and that on the occasions where she needed lighting she would have to get assistance from a member of the team who knew how to light or to bring the subject of the lit shot to the company’s studio where lighting technicians could arrange an interview lighting setup for them, and often when shooting on location she would not take lights at all.

This practical decision to not take lights has its frequency increased when there is a lack of knowledge which can then have a negative effect on the final image when lighting is not used. The result of not having lighting as part of the professional skill set, and the seemingly default position of not using lights, is a greater potential for negative issues in the final image that is gathered, as Liam explains.

‘But losing the discipline of lighting means that in those scenarios where lighting would be really great it is often something that is not even considered say like a sit-down interview with a politician or a cooking demonstration or a product shot, and they know they can do the job without the light so they don’t even think about it when lights could make all the difference’ (Liam.)

The trend for a skillset in lighting missing in the modern professional, is making an impact for clients as well as many are confronted with still and moving image productions without lights and assume that is the way all images are made. This was illustrated when during one interview, while linking between questions the interviewer described setting up lights for a client and the interviewee commented that they assumed the client was surprised as it has become less likely that a photographer will always bring lights and also raised the potential negative feedback if the lights had not been part of the image makers toolkit on that occasion.

‘...yeah, yeah, and then they’re happy, and they would not have been happy if you’d said, “yeah I’ve got to come back in two hours with my lights.”’ (Francis)

However, the discussion among interviewees also illustrated an implicit understanding in clients and media organisations as well as professionals not skilled in lighting that lighting or at least control of light is important to delivering a good image, an implicit understanding that can create problems if lighting is not used. One clear potential problem with this understanding is that if lighting has not been discussed by clients who seem to have no expectation of lighting and the final images do not meet the client's approval the client would often then comment on the lack of lighting:

'... it's important for every live shoot that we do (and we do a lot of video without doing a shoot at all) i would feel uncomfortable personally as we book the crew and they're in front of the client and the if the client has expectations or if they have no expectations at all and haven't noticed there is no lights and then they see the final product and they're like 'It's rubbish I don't want to pay for that.' (Francis)

The data from the interviews does confirm a change in practice and possible lack of lighting knowledge among clients and professionals, and it shows the explicit understanding among clients and members of teams organising shoots that this change has happened, making them extra cautious when arranging shoots to guarantee that lights will be part of a shooting kit, as they are not now guaranteed to be by default.

'I don't want to be in that position, so it also happened that we've used lighting crews this month and you go you've got lights yeah?' and they say 'yeah!' (Surprised intonation) and I say 'just checking ...yeah, we are checking for this and as we are doing lots of interviews recently and so the brands got to look good, the individual's got to look good as well so it reflects on everything and our professionalism. We do need to do it(lightning) and sometimes we can't just go somewhere really bright because that's sometimes your worst enemy, so yeah, we do value lighting.' (Francis)

Linked to the lack of lighting on image gathering projects by image makers is the reality for some sectors of production that lighting is seen as an optional extra and not a creative necessity. This occurs for a range of reasons from purely practical, with the weight of lighting equipment leading to videographers not carrying it on days where they are moving continuously on foot and need to carry all of their equipment to a lack of knowledge of lighting from entrants in an industry where technical knowledge at a consumer level often ignores or does not include lighting, leading to assumptions that lighting is not needed and lighting not even entering the planning and thinking for image gathering.

In video journalism the practicalities and ability to carry equipment often wins over the ability to add information and meaning with light as Li pointed out when discussing her own

experience as a video journalist and from experience with her team when asked about whether they take lights out most of the time.

'No, because it's twice as heavy to carry and you travel by yourself with a gimbal, go-pro, drone, camera and (if you take lights) you need two lights, stands etc. But in some apartments (in Hong Kong), you need it.' (Li)

And she continued that often for her team lighting is not key to the daily work, although it is interesting that she uses videography and not video journalism in her comment on the importance of lighting. 'I don't think in news videography that lighting is the most important thing.' (Li) And in situations where a lack of knowledge then directly impacts decisions to use lighting tools when they are available, the decision not to use them in the situation when they are needed can occur as well.

'We had a video two people talking and one was a broadcast savvy and we said they'll need a reflector or something and one guy said no and their guy who doesn't need one generally didn't and the guy who had one didn't use it even though he did – even though you're not there you do need it' (Francis)

Even in areas within news gathering such as feature stories it is not always the case that shoots will be lit.

'Now with what we do usually there is some background to the set at their home or business it's a busier image an way but we shoot pretty tight and what we want people to see is up close and personal because we want people to see what is more important and if the background is important then its because there is an interesting part that we show and we do still do interviews from time to time and we do have some great lighting kits but do we use them enough? Probably not.' (Liam)

The combination of a wide dynamic range in recording the image and a very wide range of light levels where acceptable images can be recorded has increased the acceptance of images that can be delivered without additional lighting or without control of lighting. The use of mobile phones by most practitioners and clients to gather video or stills casually and without planning for lighting with the processing that happens in phone to improve the look of the image adds to this perception and lack of expectation for lighting when shooting.

Technology has impacted still and moving image gathering in many ways and we see that an expectation that the gathering devices capability to gather in any light situation has directly impacted the expectation for the necessity to add additional light. In addition, it would appear that the entry skill set for image gathering focuses on the gathering device and its operation at the cost of adding a lighting skillset to the new entrants and even practising professionals who

need to utilise a range of gathering devices and are then compromised in their ability to control lighting aspects of the image when it is needed.

6. Hong Kong Organisations and Media Clients see Photography and Video gathering still as mostly separate roles with distinct dissimilarities.

The interviews in round two revealed that in large areas of production, stills and moving image production continue to function primarily as distinct areas and roles, even while there is explicit and implicit acceptance of an increase in hybrid approaches occurring in Hong Kong. This separation is maintained both in professional practice and experience and in the understanding and management of projects by organisations and clients.

Liam runs one of the largest video departments in Hong Kong within an organisation that also has one of the largest numbers of staff photographer positions in the city and he sees the current situation and the situation in the near future within news gathering in Hong Kong as remaining largely separate for still and moving image capture.

'I think in their prism from where I am things are still separate and although there is crossover in the technology the way the photographer goes about their business is very different for the way videographers go about theirs... Even through there are crossovers in the technology they use the application of what they are getting is so different the way the videographer and photographer go about their business is fundamentally different.' (Liam)

Within his organisation itself there is a clear separation of function in still and moving images and that he sees a difference in the production of the two delivering quality in each area that is then used in mixed media delivery.

'So much so that the videos we make at the ORGANISATION our videographers make their videos but delve into the photographers' catalogues for thumbnails for YouTube etc, 'cos photographers will often have a more stunning still image than a frame grab from the video. So, we still make use of the photographer's skill set.' (Liam)

The interviewees also discussed how this separation of roles affects moving and still capture when professionals do try to cross over and deliver both still and moving images but from existing skill sets and expertise in one image type. This aspect of the theme highlights the difficulty for professionals who have spent a lifetime building experience in still or moving images adapting that skill set to the new image type.

'Some people say they do video, but they don't do video, they don't do sequences, but they have the best frames.' (Li) who also comments that, 'A

videographer is gathering sequences and a photographer looks for a moment.’
(Li)

The Separation of roles is seen in the wider media’s established concept of the photographer and the videographer within organisational structures however it is also seen to be a constrict within the mindset of many professionals as Li added.

‘One photographer said, “if I’m photographing, I can’t concentrate on it I can’t do it in the limited amount of time both photography and video I have to think differently”’ (Li)

It should also be noted that although the theme of continued role separation was clear there was an underlying acceptance of the shift to hybridity and to professionals developing dual skill sets that open opportunities for them to work within both still and moving image production. Where this is happening, Li stated that in her experience working with other professionals, freelancers and organisations in Hong Kong, that the crossover to hybrid image creation was higher moving from the still image to hybrid than from the moving image to hybrid:

‘Earlier this year I was on the jury of the digital storytelling contest it shows where things are coming together and lots of videographers were photographers but not lots of people enter that who also enter film contests.’ (Li)

The trend of dual skill sets and professionals being able to shift from one to the other was further illustrated by Kim who discussed how this was now possible when relatively recently it was not something that would happen at all.

‘And it is merging as we speak and that for us is very new, we are talking to a DP from a still photo background who is shooting a show for amazon and I was thinking twenty years ago that is absolutely not possible, but now all that is merging very fast.’ (Kim).

Hong Kong media has established practices and is also a city where new technology and practice is engaged rapidly and the roles of still, moving and hybrid image creators are a clear example of this transition happening over the last five to ten years, however much more slowly than one might have predicted.

The interviewees revealed through the discussions that the demand for stills and video across productions was increasing as a whole and that this was also driven by a rapid increase in demand for video from clients in response to the developments of social media output expected in corporate communications in our current society. Where companies in the past may have been able to limit communications, both internally and externally to still images, they

are now needing to produce still and moving images and although this demand for both is currently being met largely using separate professional roles this is changing in some cases.

7. Demand for Hybrid image gathering in Hong Kong tends to increase as the size of the client organisation decreases:

It was clear across the interviews that a theme arising from discussion of lighting and hybrid shooting that the demand for the approach increased among lower budget productions and when the client is a smaller organisation. This transition has been happening during the last decade and is gradually becoming a recognisable subset of production approaches when necessary. Li related how in her experience it began with requests from NGO projects, but that even now larger organisations do not use the hybrid approach:

‘NGOs would ask for photos and video we want to work, and they want 10 pics and video for 2 mins and that’s when it became a bigger role, and I could point to who could do both and then when you work with smaller media, they do both but bigger like Bloomberg don’t do both they ask for one or the other’ (Li)

The interviews in several areas discussed the increase in video as a key impact in the increase for shoots with stills and video and for the use of hybrid approaches both in location projects and in photographic studio projects where previously they would have been only still images. Liam discussed how the change in social media and availability of video on the internet has acted as a driving factor for this change in client demand and expectation that is highlighted in theme 1 as well.

‘And of course, there’s more demand for video because in the past here was nowhere to put video – look at our dept we have gone from 4 to 20 in the SCMP in a few years and the New York Times went photo desk to tiny and the video desk finally took over the photo desk and that hurt, and photography continues but the other demand has exploded’ (Li)

The decision to use hybrid approaches is seen by the interviewees to arise because of situations where there is no other option and the hybrid approach itself as practice that will compromise either the still image or the moving image that is gathered. The hybrid approach tends, therefore, to be used on projects where budget is limited or the locations and/or subject matter require a small crew or a combination of both.

‘And our videographers are not encouraged to do both even though the Sony a7 could do both ... but it is a different headspace ... (and) in the times we try both it is always budgetary and not for editorial or stylistic decisions’ (Liam)

Budget and necessity do not always, however, promote the possibility for hybrid approaches as the interviewees raised the point that the ability to deliver both video and stills for a project is sometimes given as a production option by professionals themselves, and this acts as the starting point for the assessment and possible use of the approach on a project.

‘Except for the NGOs I think it’s the photographers and videographers themselves who prompt both cos you diverse your possibilities “I can do commercial, and news and you can offer more”’, (Li).

But Li reasserts that in large organisations in Hong Kong, such as hers, the use of hybrid approaches will remain, for the near future at least, to be a relatively minor approach to gathering still and moving images. ‘Like here for sure it’s quite separate and most photo desks don’t work with video’, (Li).

This theme was not unexpected from my viewpoint as in media as in every other industry, cost drives the process. When technology in the late 1990’s enabled small teams, it was lower budget delivery companies supplying smaller satellite channels that implemented multi-skilled approaches more quickly. With hybrid image making now, it is to be expected that companies needing to meet the demands of a connected industry, will have to assess how to gather stills and video within the scope of their own finances. Larger companies will still be able to resource separate still and video gathering teams or professionals where hybrid image makers will be attractive to smaller companies. In Hong Kong, with many media companies being small teams, the ability to offer both stills and video may be a competitive function of the industry moving forwards that cannot be ignored.

8. Use of LED light sources has increased throughout the industry despite initial costs and repair costs being higher than other sources to the point where LED is the de facto lighting source of moving image production and is increasingly used in photographic studios.

The increased demand and use of LED technology in production was another theme that arose in the analysis of the round 2 interviews, with insight into the technical demands of LED use and production from Kim, the head of an international lighting technology company in Hong Kong. The use of LED has become the primary and/or only light source in many cases and in conversation, when discussing lighting, this is clear as the term LED is often used when one might just expect ‘light’ to be used. It was also clear that the transition happened very quickly, and Kim described his company’s surprise at the speed of change and increase in demand for their own LED fixtures over their other established light sources.

Kim discussed the rapid increase in use and demand and illustrated it using the similarity of demand in wedding studios in Hong Kong and other Asian countries.

'But where we are big is in lighting because continuous lighting and less heat with LED and in Korea, we sell lots of LED lights to wedding photographers (not fashion shows), the traditional photographer.' (Kim)

Where hybrid shooting is seemingly happening as a budgetary and situational necessity, the impact of continuous lighting in increasing stills studios producing images is occurring because of the technological improvements in LED technology. This use of continuous lighting and in particular LED use has enabled more efficient shooting in the studio for the stills photographer and

'The still photographer who contacts us is really the studio who want continuous lighting and I can shoot very fast AI can shoot more less heat less bulb costs and so in Korea most have moved to continuous lighting' (Kim)

The side effect of the shift to continuous light has been to encourage hybrid filmmaking or at least an increase in dual still and moving image production as Kim comments.

'And now the still photographer is also part of them as they are capturing digital imaging for still and most of them also do moving image and they extract a frame from their moving imaging and so the way they compose their picture has also changed a lot and more and more still photographers – today has lost the way – as you say – do they think the same way I think before they were not the same there were technical constraints I think now the way they approach their subject is the same they don't call it the same but in reality it is very similar and we have still photographers who use Arri cameras and extract still images' (Kim)

The increase in the use of continuous lights in studio settings for the flexibility in lighting control has increased the opportunity for stills and video to be filmed in the photographic studios as well. This has been driven by the lighting flexibility of LED fixtures and the speed improvement of lighting for different colour temperatures and colour effects with bicolour and RGBW LEDs eliminating the need to rig colour filters to a fixture. This presence of continuous lights in studios has opened opportunities for recording moving images in the same space and setup and even at the same time.

The flexibility of the LED light source in its various form factors and availability to match colour temperature and in multi colour arrays produce light of almost any colour, has enabled its use in a wide variety of situations and to give new creative options for use of the light source for the moving image as well as the still studio as discussed above. Having a high output source that was robust and could be battery powered for significant periods of time has made LED sources very popular with moving image makers from news gathering to corporate production and even feature film production. The additional features of LED fixtures such as accurate colour control, remote control of the light source using DMX or wireless control systems, and

low power were key to making the transition to their use in the Hong Kong and Asian feature film industry as Kim explained.

‘The crew started to be very happy, and it could do things we could not do in the past and the crew and client are happy and then I’m happy because people rent my equipment. And we can’t plan, we hope but it’s true LED and (our LED light) we have allowed film to step into LED and also a lot of moving light.’ (Kim)

Although the presence of LED is prevalent when discussing lighting it can also have a negative effect as its initial costs can be higher and the decision to have lights or to use them can end up being a financial one rather than a creative one.

‘Cameras have come down in price and LED were supposed to being lighting costs down ... lighting is very expensive, but they are still high-end bits of kit, the decent ones anyway and I can see why some agencies and freelancers would look at the cost and their income and think they can do without it’ (Liam)

An unexpected effect of the rapid take up of LED use is a lack of knowledge and experience of other sources as LED has surpassed that of other light sources in day-to-day use, creating a limitation in the skillset of the image makers who are using lights.

‘If you don’t have experience to tungsten or HMI then you will not use it as it is a risk and it might not work so the LED transition was extremely fast and now everyone was very fast and it has impacted creativity and it has impacted the full range and young guys are stuck with less possibility because they are scared of putting a filter on a gel and how will it affect the light they don’t relate to it’ (Kim)

LED lights initially were expensive and relatively low output compared to other sources however with the advent of cheap LED sources, the flexibility of a controllable source with low heat output, followed by colour temperature control and then saturated colour control, made them very popular very quickly. The flexibility of form factor from a flat source to a flexible thin source and a single point hard light source depending on the choice of LED emitter and array in the fixture, enabled LED use in a wide range of situations where other sources were difficult to use.

This is not to say they are without their problems. The robustness of the LED source and LED fixtures is a key reason for their use however as Kim points out they are fragile under certain circumstances, not the source itself but the associated electronics, and are particularly susceptible to water damage. When they are damaged the repair is also more difficult and time consuming than other light sources. Where a lamp can be replaced in a fluorescent, incandescent or HMI fixture and the fixture itself is robust, in an LED fixture if there is a fault the entire unit needs to be sent for repair as the LED is mounted as a fixed part of the fixture.

There may also be detrimental to the lighting knowledge and experience in new entrants as if they do not use other sources and cannot assess their viability in certain situations. This lack of experience can result in longer setup times and choices being made regarding light sources and so will not use them at all.

6.8 Questionnaire:

The aim of the question design was to provide evidence that would give additional insight when triangulated with the data gained from the interviews and allow specific data sets to be

photographers	Cinematographers, videographers, camera person	Moving image professionals i.e., shooting directors
9	10	11
Total	30	

Table 3: S1 roles

answered in a more appropriate data gathering tool. In order to analyse the questionnaire data initial statistical breakdown was undertaken using the Google apps. The tabulated data was then imported into NVivo, and further breakdown undertaken for comparison with the interview data.

Response rates, sample frame and academic/professional access to sample population: The design of the project assumed that there was an available sample group of 40 professionals who work in production roles that are affected by the ability to shoot still and moving images. Of the invited professionals the response rate for the questionnaire was just under 70%, high enough to be a representative sample of the target group. However as highlighted in the project design considerations the target group itself is from image capture professionals as a whole and a small subset can be argued to not be applied generically to the larger community of image creation professionals. This potentially limits generalisations that can be inferred from the project.

One significant advantage the project data gathering had is because of its work-based approach. There is often a difficulty in academic research in gaining access to the sample group that is suitable for investigating professional practice for a wide range of reasons. This problem is alleviated in this project's research owing to the author's own professional insight and contacts with the relevant production personnel.

The results: Of the professionals sampled, 30 completed the survey with most of the professionals shooting moving images primarily and just over half as many shooting stills primarily. The number of professionals shooting still and moving images equally is a significantly smaller group however it is large enough to indicate how the ability to deliver both as a professional has now become a viable option. The mix of professionals allows the data to be examined with a global response as all the respondents are image creating professionals and with further comparative analysis between groups of professionals to see where separation or consistency in their responses occurs.

As can be seen from the data summary in table S1 (above) one third of the participants were photographers, and two thirds were moving image professionals, although only half of those were professionals whose job is focused solely on the image such as videographers and cinematographers. The other half of video professionals were multi skilled roles such as video

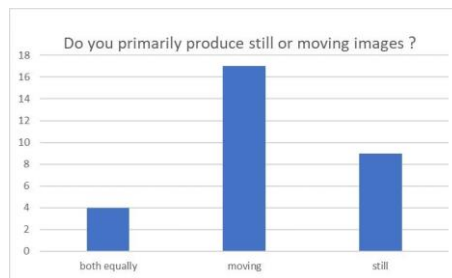


Figure 49: Chart S1 image production frequency

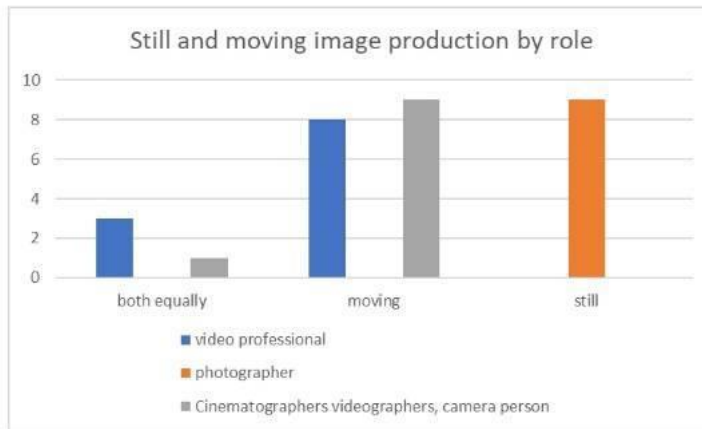


Figure 50: Chart S2 still and moving image by role

producers, journalists and shooting directors. Chart S1 still or moving image global response We can see from Chart S1 that the production of stills and video images is largely broken down into primarily producing either still or moving images with only four participants producing both stills and videos as their primary output. With the additional breakdown in chart S2 we can see that the production of stills AND video was primarily by professionals with multi skilled roles and one moving image specialist with no photographers producing both as their primary output. Chart S2 still or moving image by professional.

When looking at the areas relating to research question 1, “What common lighting techniques and modifiers do practitioners use when aiming to gather stills and video from the same shoot? ”The study used the questionnaire questions 19,20,21,22,23,24,25,26,27,28,29 in questionnaire 1 and focused on expanding deeper context and thematic insight to the research question in the interviews. In the following tables and charts we can see the summarised results of the questionnaires that give an insight into the current approaches among Hong Kong based professionals.

We can see that all image creators are using natural light as is to be expected and that LED lights are common across two groups of professionals with tungsten, fluorescent and HMI

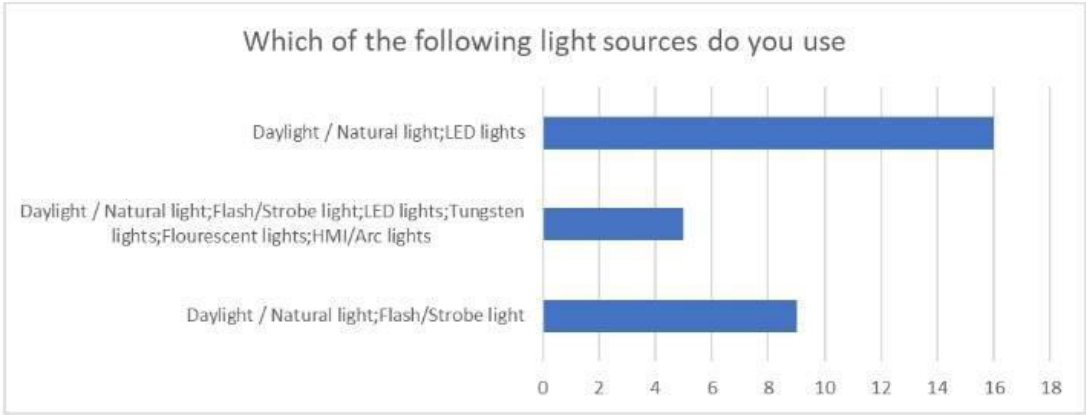


Figure 51: Chart S3 Light sources in use

predominantly used by moving image professionals. LED lights are clearly the significant change here as they are present among all but the still image professionals and even there, they are present for some professionals. As is to be expected moving image professionals are not using strobe lights owing to its non-continuous nature. When we look at the crossover between professional roles in chart S4, we can see that photographers are largely using strobe as their primary light source with natural light and among continuous sources they are using LED lights as their primary source, however to a much less degree than strobe lights and natural light. One photographer is using fluorescent which I assume is a studio-based setup that has been in place for a while and does not need replacing.

For moving image professionals in the survey LED is by far the most popular with natural light, with both moving image specialists and multi skilled roles both using it. We can see that tungsten light is still being used by moving image specialists despite its heat and power draw and to a lesser degree fluorescent and HMI/Arc sources are still being used. Among multi skilled roles LED is used by a much higher number of professionals than the other continuous sources.

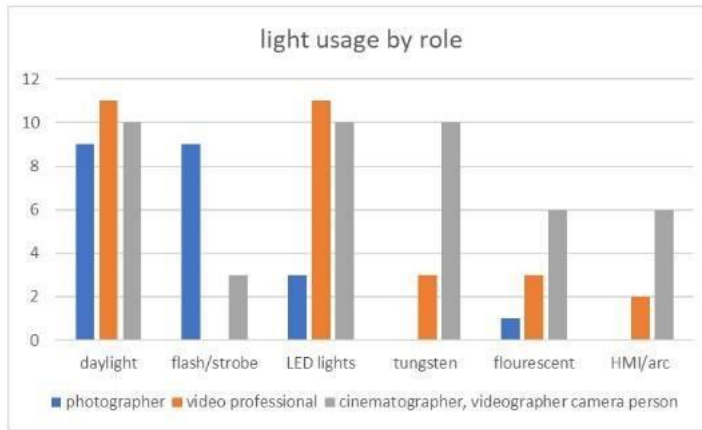


Figure 52: Chart S4 light by roles

Moving from light source the survey also asked about lighting setups and if the same setup would be used in circumstances where stills AND video. We can see in chart S5 that in the majority of cases where the setup was used the same lighting setup would be used for both although as their options for a separate setup and sometimes switching to strobe for stills together were almost as high it seems that there is an almost even break between using the same setup and approaching lighting stills and video separately among the professionals. It should also be noted that almost one third of the professionals said that the dual setup was not applicable to them, an indication that the delivery of stills and video for many professionals is still not a priority.

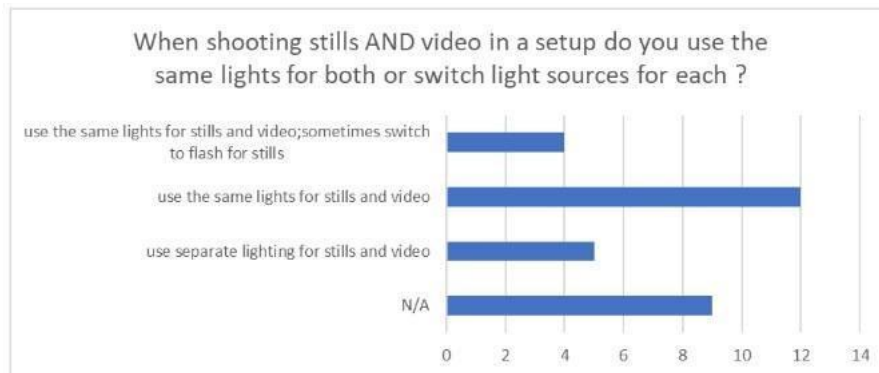


Figure 53: Chart S5 Lights for stills AND videos.

Chart S5 shows that there is a difference of approach when using light sources for stills and moving images which is further clarified in Chart S6 which shows that there is almost a 50/50 split in whether professionals would even use the same lighting design for the two types of images.

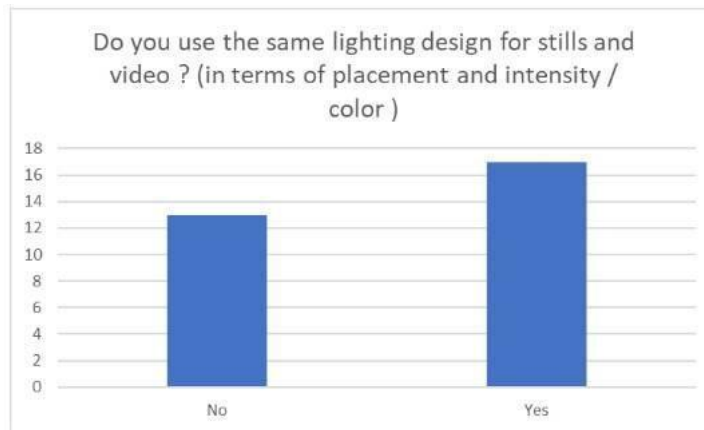


Figure 54: Chart S6 lighting design

With this separation made clear between professionals the survey did however show that aspects of lighting were equally important to large numbers of the professionals. Chart S7 shows that the control of light is seen as very important by most professionals with less than one quarter seeing it as less important.

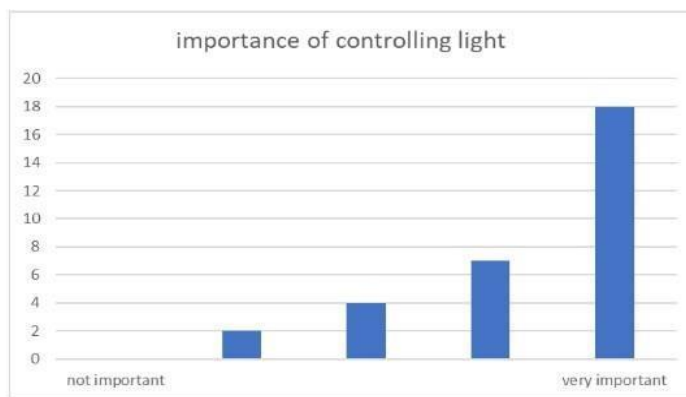


Figure 55: Chart S7 importance of controlling light.

Charts S8 and S9 allow us to look at the use of modifiers by the professionals to see which types are being used most frequently among setups. The options given for the professionals were softbox, reflector panel (i.e., collapsible 5in1), flag(s), beauty dishes, diffusion panel/butterfly panels, umbrellas, barn doors, colour filters, diffusion filters, metal reflector for flash/led projection lenses. I was quite surprised that only three options were chosen with the lighting softbox being the most common modifier and diffusion filter just over half as popular with the reflector panel being almost as popular. The soft box and diffusion filter are serving a very similar function in enlarging the light source to produce a softer light which is often considered more

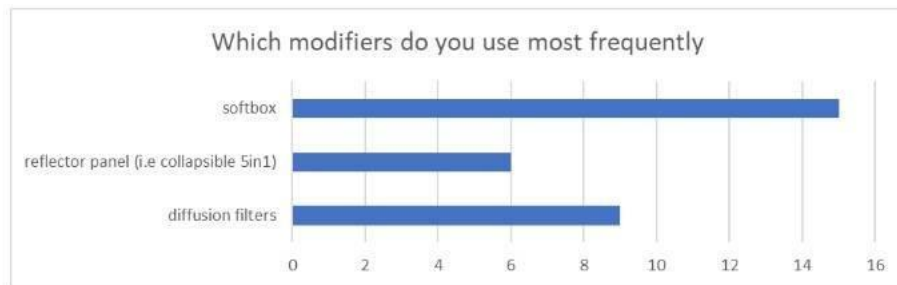


Figure 56: Chart S8 modifier frequency

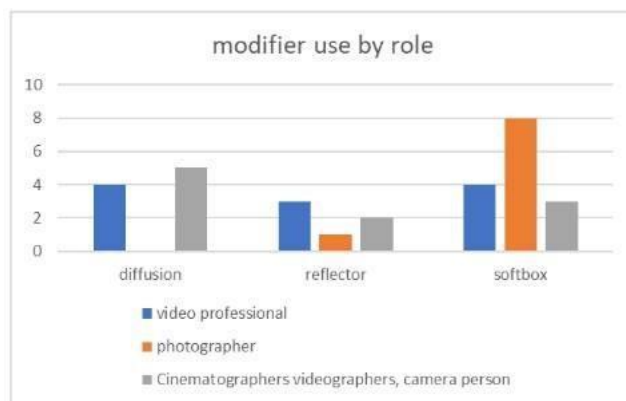


Figure 57: Chart S9 modifiers by role

flattering and once attached to the light source are moved with it as one unit. The reflector panel is an easily positioned modifier which can serve a range of functions from reflecting light, softening light, blocking light, and reducing light, making it a very flexible modifier, and one that is very easy to travel with.

The results in S8 and S9 are further illuminated through chart S10 where we can see that most professionals are using modifiers on or with their light sources the majority of the time. We also see in table S2 that professionals by over two thirds say they use hard and soft sources equally. This illustrates that although professionals modify sources to make them softer, they are still using hard light sources as frequently.

In addition to knowing the type of light being used it was also important to examine what aspects the professionals were looking for when assessing which lights to use in the field. Table S3 shows that the range of features are largely important for most professionals with colour

both	18
soft light	8
whatever available	4

Table 4: S2 types of light usage

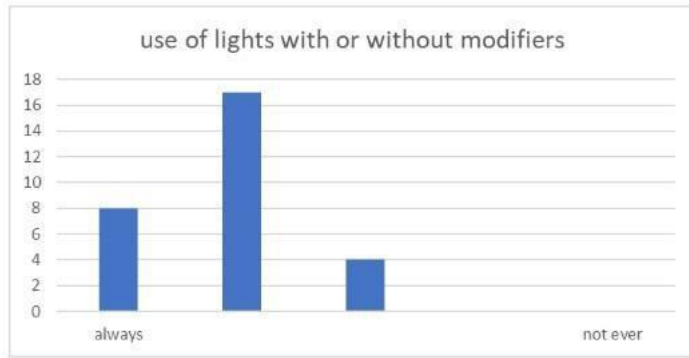


Figure 58: Lighting Modifiers

accuracy being a key feature for all professionals. It is good to see that professionals are still valuing the colour produced by their light sources and understanding that light sources will not adversely affect the recorded colour of the subject is very important to image creation professionals. Light output is an important factor as it defines what area or over what distance your light is a viable source, and it seems that many professionals are using lights on location as battery power is important for as many professionals as light output. (Table S3 - Key features of light source)

Colour Accuracy	30
Light output	26
Battery power	25
choice of modifiers	9
dimmable	21
flicker free	21
cold light source (heat output, not colour temperature)	11

Table 5: S3 light features importance

With all the information in these survey areas highlighting the value and importance of lighting and lighting control across the majority of still and image making professionals the survey also asked if the knowledge of the differences between lighting for stills and moving images was important to the professionals. We can see from chart S11 that it seems that for most professionals to have this knowledge is neither very important nor not important at all.

Whether this is cause for concern is an area I will discuss in more detail in my findings and conclusion.

Chart S 11– importance of knowledge of differences between lighting stills and video Within the interview one main question aimed to investigate research question 2 as it was a semi structured interview the follow up questions changed between interviews to follow the relevant narrative being drawn out of the interviewee through the interview process. Within

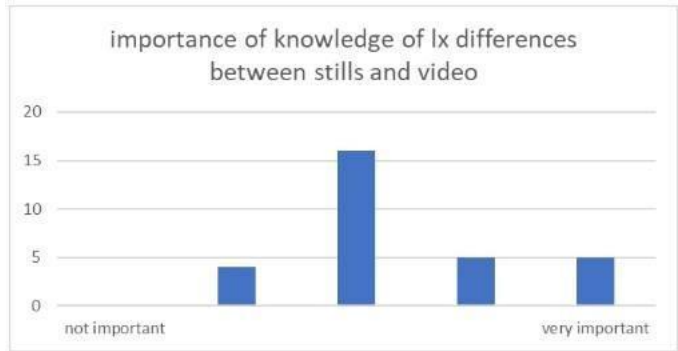


Figure 59: lighting knowledge S11

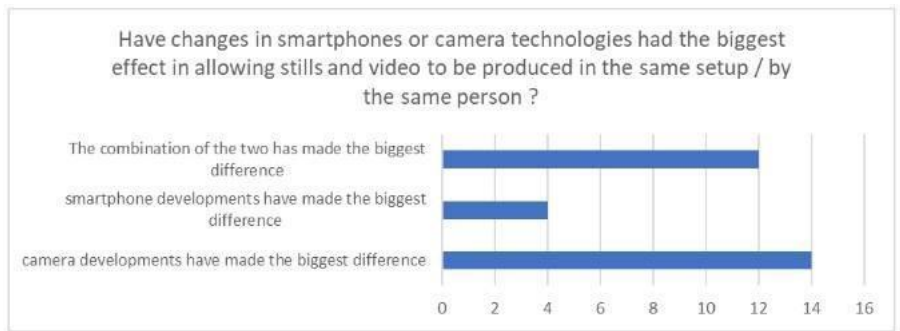


Figure 60: Chart S12 technology change

the questionnaire, questions 6,14,15,16,17,18,19 and 20 were focused on relevant items to look at areas of that same research question: “What lighting and camera technologies make the gathering of stills and videos from the same setup achievable for professional practitioners?”

Chart S12 shows that professionals are split almost evenly between the combination of smartphone developments and camera developments or the developments in camera technology alone have had the largest effect in allowing stills and moving images to be created in the same setup and by the same person. Smartphone developments alone are only seen as the most significant factor by a small number of professionals. This illustrates that camera technology developments have made the largest difference for the working professionals with smartphone developments being attributed by just over half as many professionals as being an important factor. Chart S13 clarifies this viewpoint in application as only three of the surveyed professionals considered smartphone developments to have not made an impact on their work.

Combined with S12 we can see that the impact of the smartphone development is outside of direct practice but just as, if not more significant in how stills AND video are becoming a factor for the professional.

With the use of smartphones assumed to be increasing in professional practice it was important to see what devices image creators are using to record images with. Chart S14 Shows that Mirrorless and DSLR camera models are used by most professionals and

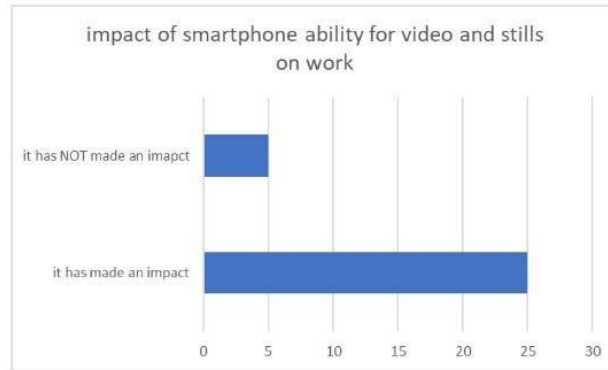


Figure 61: Chart S13 Smartphone still and video recording capability impact

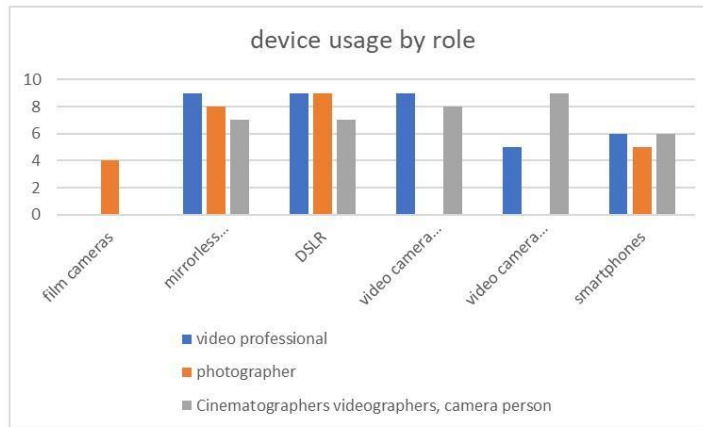


Figure 62: Chart S14 Device usage by role

smartphones are also being used by all groups. Video cameras, whether with interchangeable lenses or with fixed lenses, are only used by moving image professionals and only half of the surveyed photographers are using film cameras. Of the moving image specialist roles, although a large number are using DSLR and mirrorless cameras there are still several not using either and still only using dedicated video cameras or possibly smartphones. Chart S14 device type by role

With smartphones being the third largest common device across all three professional practitioner roles table S4 shows that the convenience of always having the device with you is the main feature that makes it viable for professionals with social media integration important to two thirds of the participants. Linked to social media integration, the ability to share images immediately is important to just under one third of the professionals with its ability to put

people at ease when filming. Interestingly image recording quality is only rated by one third of the participants with the ability to shoot still and moving images rated as important by less

Convenience (always with you)	26
Social media integration	19
Image quality	8
Ability to share images/stills immediately	8
puts people at ease (less frightening than a camera)	7
Ability to shoot and edit on the same device	4
AI features (portrait mode, night-time mode etc)	4

Table 6: S4 Mobile features that make it viable for you

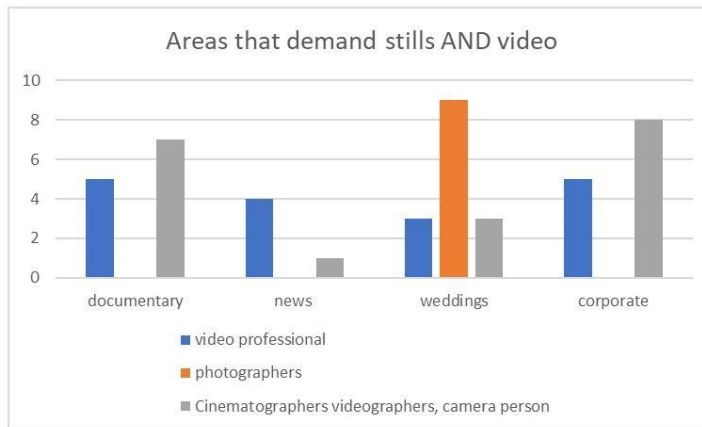


Figure 63: Chart S15 Areas of demand for stills AND video

than one sixth of the participants along with AI features.

Research question 3, “Why and how have practitioners and clients moved to deciding the types of shoots that are likely to be achieved using a hybrid approach?”, the project focused on the broad areas that would like to be affected at the moment or in the near future by the demand for shooting both still and moving images.

The survey gave a range of options to include areas that were likely and some that were less likely to be affected by the need to shoot still and moving images to ensure there was no. or as little as possible presentation bias in the gathering. The areas given as options were weddings,

corporate, commercial, portraits, news, documentary, entertainment, and drama (Chart S15. Areas of still AND video demand).

We can see that weddings and corporate are the most likely areas to have a demand for stills and video. However, it should also be noted that corporate productions were expected to have high demand as well. Photographers chose only weddings as areas of demand for both stills and video and moving image specialists saw corporate and documentary as the areas where the demand would be the most likely. Possibly as the professionals dealing with multiple areas of projects the multi skilled professionals were the group who saw demand across all four areas. It should also be noted that the areas of commercial, entertainment, drama and portraits were not chosen as areas of dual demand by any of the professionals.

This is from the group of invited professionals who came from varied backgrounds and working experience. The survey showed that the group's experience covered drama, documentary, entertainment, portrait, news, corporate, commercial and weddings.

To gather additional data to investigate research question 4, "How does delivering stills and video from the same shoot (hybrid gathering) affect the professional practitioner?", the survey data examined the importance for the new skill set, the demand on the practitioner to deliver both still and moving images and the areas of difference that the practitioners saw in gathering still and moving images. A second group of questions asked whether the effect of shooting both types of images had a negative effect and if the practitioner had added the ability to gather still or moving images to their skill set.



Figure 64: Chart S16 Demand for stills and video in the same setup

We can see from the data visualised in chart S16 that only four professionals felt that the ability to shoot stills and video was very important, however there are also a significant number who gave a midway response indicating that in some situations that the ability to shoot stills and video can be important on some jobs. Most respondents however clearly do not see the ability to shoot both as very important including nine who saw it as not important at all.

What the survey does show however is that the knowledge is being required and that professionals are preparing themselves as can be seen in chart S17 which shows that over two

thirds of the professionals surveyed have already gathered one or the other skill sets in image creation.

We can also see that professionals are already using mobile technology in their image creation from table S18. Although it shows that just under half the professionals are not using smartphones to gather images of any type, it equally shows that just over half are already gathering still and moving images with the devices. The professional's skill set is having to embrace the new technology and as such is forcing change on them.



Figure 65: Chart S17 new skills added.

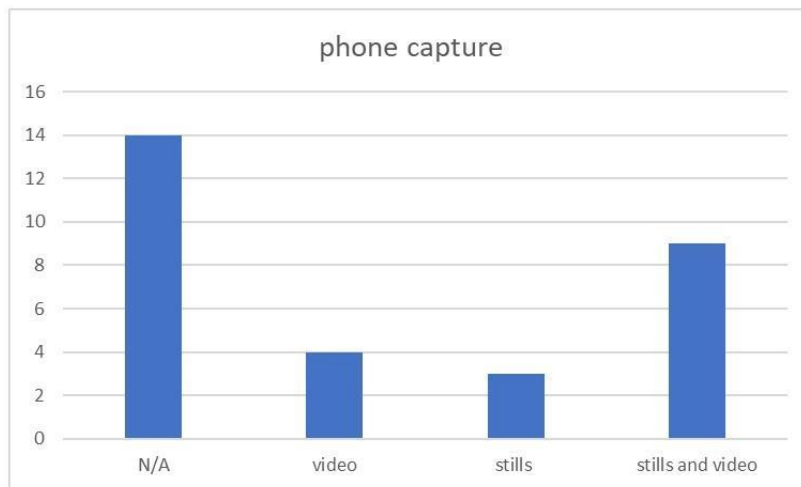


Figure 66: Chart S18 phone capture of stills and video

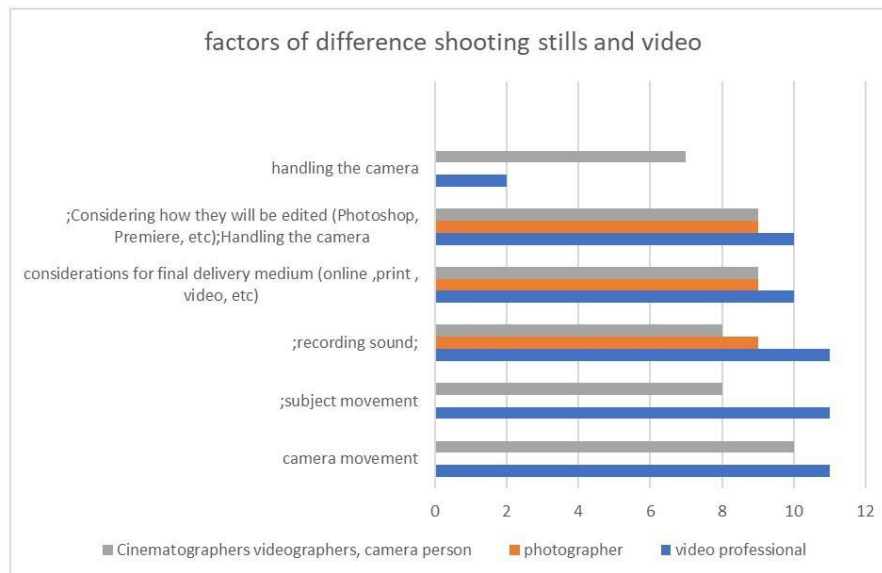


Figure 67: Chart S19 differences shooting stills and video.

The survey also examined the factors that professionals considered as major differences in shooting still and moving images to illuminate the areas of practice that bore significance for the move from one approach and device to another. Options that were given included handling the camera, recording sound, subject movement, camera movement, considerations for editing and considerations for final delivery. This is shown in Chart S19.

Photographers saw recording sound and considerations for editing and final delivery as the major differences. No photographers chose handling the camera (possibly because the camera shape is the same assuming they are using the same DSLR/mirrorless camera for both), subject movement or camera movement.

Both groups of moving image professionals chose all categories to a large degree except for handling the camera which only two of the multi skilled professionals chose. The moving image specialists such as videographers and cinematographers almost all chose this as one of their factors defining the difference between shooting stills and video. chart S 19 areas of difference by role Finally from the survey the majority of professionals consider that the need to produce still and moving images has a negative effect on the image. less than one third felt that it had a negligible effect and no professionals considered it to have a positive effect. Whatever the approach being taken, concentrating on two types of images in the same situation would seem to be seen as a detrimental action. This is illustrated in Chart S20 below.

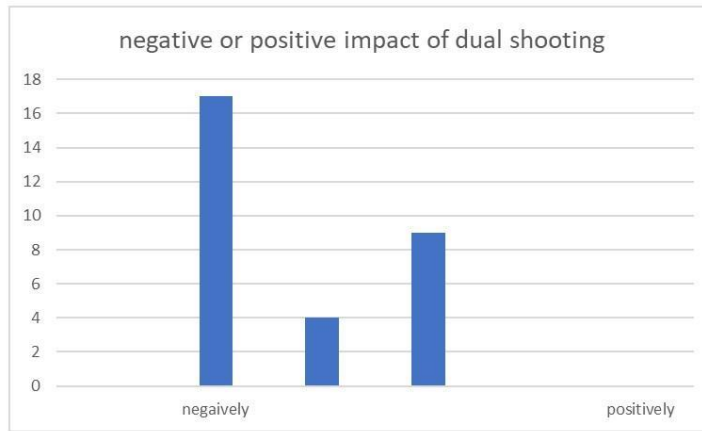


Figure 68: Chart S20 Negative or positive impact of shooting both stills and video.

6.9 Case Study

Introduction

The case study element of the doctorate had been planned to be gathered in the first quarter of 2020 however as Covid hit globally and Hong Kong was still unsure of how to progress after a year of ongoing protests most of the media production in the early part of the year was cancelled. After discussion with my advisor, I moved to using a retrospective narrative case study and analysing a shoot day from 2019 which retained the characteristics that would be necessary to provide a valid example of a production where stills and video were gathered in the same setting. In the case chosen stills and videos were gathered using three approaches: 1. the same location and at the same time using the same lighting setup by a photographer and a moving image professional, 2. in the same location but using separate lighting for stills and video by a separate stills photographer and videographer 3. in the same lighting setup by the creative image professional operating as a hybrid image creator using the same lighting setup,

The single case, case study is that of a corporate shoot day where five locations were used for filming and photographs. In two of the locations, stills were gathered by a photographer and videographer operating as a shooting producer. In two of the remaining three locations stills were planned to be taken using frames grabbed from the 4k video footage and in the last location video and stills were shot separately by the videographer acting as a hybrid image creator but using the same lighting setup.

The frame rate of the video was 25p allowing shutter speeds of 1/50 second to be used for the most pleasing recording of motion and in some shots increased to 1/100th second where a shot would be used as a short cutaway and to increase the potential viability of the still frames while still retaining a comfortable motion in video viewing.

Identity in Thematic narration.

To maintain anonymity and security the names of the participants have been changed from their real names to the following names in the project analysis:

Organisations:

Organisation A - The organisation the video and stills were being created for. Organisation B - The organisation where the stills and moving images were shot.

Organisation B work in partnership with organisation A on some projects including one which was the focus of the video and stills production.

People:

Me - acting as shooting producer/director (videographer/hybrid image maker)

Mr A - The photographer.

Ms B - The contact person / client for the video.

Ms C - The marketing person for Ms B's organisation.

Ms D - The senior member of staff at the organisation where the location filming took place.

The first interviewee of the day.

Miss E - A member of staff at organisation B and the third interviewee of the day at location 2.

Mrs F - A parent related to the project which is the focus of the interviewee - mother of Miss

G - Fourth interviewee on the day.

Miss G - A student involved in the project that is run by organisation A and B. - Second interviewee of the day at location 2.

Mr H - marketing executive at organisation A.

The case study was of a single day's production shoot in one building with five locations used within that building for filming and stills and the context leading to the shoot day. This one-day shoot was one element of a larger project and as such had to retain a coherency with earlier elements that had already been delivered and with the project brief from the client as is the case in all but a few commercial projects.

The case study narrative reflects on the details of the case study from the initial discussions that the researcher had with the client, a large corporation in Hong Kong who the researcher had produced a video project for before and who had a clear corporate identity which they wanted to project through the project. The client already had stills for their major branding however they were in the middle of a rebranding and so their video content and stills for ancillary areas were being planned to be remade. The project I was producing for them was an early part of the move to match their new coherent cross-media identity and as such can be seen to gain a demand for stills and video from the client.

The interactions with the client led to discussion of the multi-image aspects of the project arising as it was decided that new still images were needed for the area of the organisation that the video was for. As several of the areas being filmed were of individuals who needed care in their handling and would have problems with large crew it was decided that for some areas stills and videos could be gathered either from video alone or by myself gathering stills and

videos so that only one new person would be introduced to the environment during the filming. In other areas, where appropriate I would light and film the moving images and a photographer would accompany a representative of the communications team to gather still images.

The project demands for still and moving images.

Examining the case study, we can see that as the project shifted from original brief to final requirements the form of the final delivery and filming considerations moved from multi-skilled video shooter to hybrid shooter. The process of arriving at this decision was unclear during the pre-production phases and possibly because of the late shift to hybrid production process. The clients themselves seem to have not worked with hybrid production previously and were unclear what to expect or what was achievable in this production style.

The organisation's shift to a wider social media engagement strategy during the planning and early delivery stages moved them to require a wide range of content including edited long form videos, short engagement clips and still images. This also needed to fit with their new branding exercise which was being implemented shortly after the project would be delivered. The demands of the online communication platforms were also unclear at this point as they could only confirm two platforms, they would definitely be using but stated that they intended to use the content across a wide range of media delivery. This wide range of delivery significantly changed the demands on the freelance professional.

Projects do often change in their early stages as the client is finalising their needs and deciding on the visual media requirements of the subject material and its final use. In the case of this project the needs shifted through many meetings over several months before the shoot approach was finalised.

With the decision to have a mix of standard video production, stills production and hybrid production made for the project the final days production briefs were agreed on. The filming day under close reflection in the case study took place after several other days filming of moving image content had already taken place. This was at a point where the final decision to output the project as a range of content lengths for use as training material and communication media in face-to-face partner meetings and as online resources was made. This day was the first of the remaining days of content production where the model of a single hybrid shooter (myself) gathering still and video content in parts of the day would be accompanied by a photographer in other sections of the day.

These changing requirements altered the filming style, equipment and schedule of the day to enable these approaches to work for the client, each change delaying the final organisation of each shoot day to meet the new filming needs.

'As the style, scale and intent of the video content changed significantly during this pre-production period it created significant challenges for the production planning as each change altered equipment to be used, timings for the production day and the viability of completing all the filming in the single day. As the filming

was being produced by myself as a shooting producer/director the continual changes confused the message that I understood the still and video content needed to deliver which created an atmosphere where I held confirming equipment bookings and hires until very close to the production day in order to retain flexibility in the face of a continually changing project brief.' (From narrative)

Shifting modes of the practitioner

Analysis of the case study shows that as the shooting days moved from the original plan of video content for a single video to a range of still and moving image resources of various lengths the final approach to shooting changed for each day. On the day focused on in the case study narrative the role of the practitioner could be seen to be shifting from the role of videographer concentrating solely on gathering the moving image to the role of hybrid image maker in two separate modes.

These hybrid modes of practice were the hybrid image maker using the same lighting to gather stills and video as separate content and the hybrid image maker using the same lighting to shoot video with the intent to gather still and moving content in post-production. In the case of using the same lighting to gather stills and video as separate content, the need to adjust the function of camera and equipment and shooting practice was commented on as a move between being still and moving effectively with motion in frame when required. It can be seen in the case study narrative that the initial role is that of lighting.

'When I arrive at a location, I am looking at light sources in the location, natural and artificial, direction of windows for natural light and whether they will allow direct sunlight at any point or if they are in shadow from other buildings or artificial/natural structures. This combined with the daylight conditions and time of year and time of day will affect the natural light in the location and enable me to decide whether it is a viable option as the light source.' (From narrative)

We can see the role of the practitioner shift through the production day in the case study depending on the location and crew involved in those parts of the day. In the first location we can see the role of videographer being enabled with the presence of the photographer.

'As I am filming video and interviews, I also needed to record sound and had to decide what approach to use.... This location was an office space to be used for a single interview. There would be a separate photographer in this location, so I was concentrating on recording the video.' (From narrative)

In the case of the hybrid image maker mode later in the day, using the same lighting to shoot video with the intent to gather still and moving content in post-production the case study

showed a consideration of the motion within frames at the recorded frame rate to optimise the possibility for viable still frames and smooth motion in the moving image:

'This allowed me to increase the light level on the office walls and desk with the room fluorescent and control the shadows, lighting intensity, contrast, and lighting colour temperature on the interviews separately. I placed light as close as possible to the subject to give as soft and bright a light source as possible to enable the switch between exposure for video shooting and a faster shutter speed with negligible increase in ISO for the high-resolution stills as there was no photographer in this location.' (From narrative)

Professionals' interactions are important when delivering lighting solutions for stills and moving images in the same location.

During the shoot day stills and video were gathered in separate locations using the same lighting and using separate lighting by myself and the accompanying photographer. The researcher comments that the separate lighting approach is not unusual on projects where still and video are being gathered especially in events coverage as it has several advantages for gathering each, however for it to work effectively for both professionals it requires an awareness and communication about the process.

'Having arrived I started to plan the final lighting setup and... spoke to the photographer to discuss the shooting approach and the schedule as we each set our equipment to make sure the day would work, and we would not get in each other's way (as little as possible).' (From narrative)

The case study demonstrates that with the practitioner having made the assessments on lighting and lighting approach for the moving image, accommodations for the additional practitioner's movements, lighting needs, time and engagement with the subject are considered to negotiate a flexible movement around each other. This allows both professionals to gather their images and utilise a lighting setup that optimises the needs of the still or moving image for the demands of its selected output destination.

'The photographer used strobe light to counter the daylight and enable a different framing for the close-up shots and group shots they wished to achieve in the second location. These were gathered while I set lighting in the location for the video interviews and after I had conducted the video interviews while I was packing equipment to move to the next location. This enabled neither lighting setup to interfere with either of our gathering of stills or moving image.' (From narrative)

In the location the videographer and stills photographer used the same lighting setup to gather stills and moving images the interaction between the two professionals was significantly different. As the lighting setup used for both stills and video was the same as the optimal angle and was fixed as a necessary part of the interview the shooting angles to obtain optimal results were similar for both stills and video. This required the photographer to be positioned along a similar line to the subject as the videographer but where they could not interrupt the line of sight from the video camera to the subject during the interview. The photographer and videographer had also discussed the process and the photographer adjusted their shooting to deliver in the same space, lighting setup and at the same time as the videographer.

“With the schedule limited and the interview with the first subject limited to a short time the photographer agreed to shoot using my lighting setup for video and to shoot using a silent shutter or during questions from the interviewer using a standard mechanical shutter to avoid interrupting the interview answers with a camera shutter noise.’ (From narrative)

Hybrid and traditional lighting and filming solutions

In two modes of practice as the hybrid image maker and separately as videographer where the accompanying stills photographer used the same lighting setup for their images the continuous lighting setup allowed gathering of still and moving images. The practitioner uses their personal history of lighting and camera work to produce insight into the practice of the case study to give insight into the decisions being made to enable a lighting and filming approach that is viable for stills and video.

‘Moving from studio lighting approaches where almost every subject position has a separate three-point lighting setup to allow for continuous multi camera shooting to location lighting with a single video camera where lights are often moved with each reframe to enable the ‘perfect’ light in the frame through my career has allowed me to see where and how lights fall and how cameras respond to light across luminance and colour ranges.’ (From narrative)

We can see that within the case study the lighting approach integrates its artistic decisions with the technical requirements of gathering the still and moving images with flexibility between single and dual lighting setups to allow for dual shooting or to optimise the lighting for separate still and video gathering. However, it is also clear that the practitioner sees the planning for dual gathering as a compromise in one image or the other. When discussing the areas of gathering where stills and video are lit and shot separately the case study uses phrases such as ‘optimised for still images’ and ‘to achieve the best images’. When discussing the dual gathering setups phrases including ‘compromised lighting’ and ‘need to increase the camera ISO higher than I would ideally use’ are used.

This does not invalidate the use of the dual lighting approach as the narrative makes it clear that the continuous lighting setup used to gather both stills and video can rely on the technical improvements in camera technology to place the gathering of both image types within a technically acceptable range if not the ideal range for the best quality. In the instance of the case study, it can also be seen that the lighting approach for hybrid gathering is one of compact size and flexibility enabled through the use of compact sources and modifiers for the solo hybrid shooter primarily through recent LED sources allowing bicolour and RGB mixing to match, supplement and modify existing lighting conditions.

‘With every shoot I want to have options for lighting modifiers and for this shoot chose to use a medium softbox for the LED main light which has an inner reflective surface that the LED can be fired into, to give a range of focussed and defocussed light options and with a front diffusion attached can give a soft light source with additional control using an eggshell to narrow the soft beam spread. I would combine this with a medium 4 in 1 reflector. This modifier gives the option for a reflective white, silver and gold surface, a black surface for negative fill and use as a flag and an inner silk that can be used for diffusion.’ (From narrative)

The case study narrative shows that the technology used on the shoot day enabled the gathering of stills and moving images from the same device and from the same lighting setup through separate professional practice modes and as a function of the camera to switch between stills and moving images. This is not a new development; however, it is a recent development as discussed elsewhere in the project in more detail. In the case study we can see the switching between modes enable the capture of still and moving images to happen comfortably for the practitioner and the subject of the image capturing process.

There is no need to switch between ‘video’ and ‘photography’ modes for the subject during hybrid capture and this may potentially make the process better for the practitioner and the subject of the media capture. This is demonstrated in the case study where it can be seen that the transitions to stills from video, when they are captured by separate professionals before and after interviewees, create different environments and take interviewees from the video interview where they are being guided to relax in a static lighting situation to a photographic situation where they are guided from position to position and in the case of strobe lighting ‘surprised’ from moment to moment.

7 Findings and Discussion

7.1 Introduction

As a work-based research project the theme of investigation was prompted by my experience of change in the media production industry with regards to increased demand for still and video production on the same project, often in the same location, and the shift to delivery of both by the same professional in some cases. The primary data gathering, and analysis informed and illustrated that aspect of the research. The ongoing analysis and insights demonstrated that the perception of the researcher that increased demand from within the workplace as a professional came from an increase of demand for both stills and video production when it could more reliably be accredited to the increase in video content pushing projects which would have been stills previously, becoming stills and video, to the video professional with an expectation of both being delivered.

The project set out to examine how the role of the professional has changed in Hong Kong and to investigate how lighting has changed and how lighting is used in the increasing use of hybrid gathering. Within this section I present a further analysis of the various data sources and then build a conclusion from this discussion of the project's findings. This section draws links between data sources (interview, case study, survey, literature) and through discussion of practice and theory presents a detailed discussion of the findings from the data.

I will explain how the hybrid professional is still developing with the skillset, in response to technological and social change affecting the perception and utilisation of the image creation role as a distinct entity and as a role that has become subsumed within many other roles. I will also discuss how lighting and camera technology has changed the role and ability to utilise new approaches to lighting for still and moving images in the same setup.

My personal experience of the change draws on my expertise as a photographer and moving image professional and in more recent parts of my career as a hybrid image creator and as a shooting producer/director where image gathering is one part of the necessary skill set for the modern role.

Through the findings and conclusion, we can see how an assemblage of the photographer and cinematographer (here being used to represent the moving image professional assemblage) become the new assemblage of the hybrid image maker through generation of new capabilities as elements of the earlier assemblages are territorialised in the new. From the survey we can see this illustrated as the production of stills AND video was primarily by professionals with multi skilled roles and one moving image specialist with no photographers producing both as their primary output.

I draw on new theories of photography and structural theories of the moving image to examine the hybrid image maker and the position of the elements of image and practice that

are shifting with hybrid image practice and changing technology and lighting practice and the continuing development of the networked device/practitioner.

7.2 The development of still, moving and hybrid capture in Hong Kong is a result of interacting technical and social factors.

Practitioners supply an inconsistent narrative as they discuss change from within the industry and comment on a shift in practice that is still happening, still evolving as communication evolves and technology evolves as well. Individuals in the project highlight aspects of change that intersect with their practice and experience and the analysis allows us to see how the changes are happening regarding hybrid gathering and professional thoughts on the still and moving image.

The data gathered shows that demand for still and moving image production in the same projects is in higher demand in weddings and corporate which are the most likely areas to have a demand for hybrid production with corporate productions increasingly requiring dual gathering as well. Across the roles within the sampled professionals the photographers highlighted only weddings as a sector that provided a demand for both stills and video. Moving image specialists saw corporate and documentary as the areas where the demand would be the most likely and multi-skilled professionals such as journalists and shooting-directors were the group who saw demand for stills and moving images increasing across all four areas.

We can also see those areas of greater separation of roles in production teams or specialist areas including commercial, entertainment, drama and portraits were not chosen as areas of demand for hybrid production by any of the professionals.

The use of still and video production in everyday life is increasing and the demand for video has increased and continues to increase in its importance for communication in both personal and business situations. The internet and social media platforms have become crucial in marketing and communicating with partners, clients, and customers and this is driving the increase in the demand for both stills and video which has a direct impact on image creators.

Although the demand is increasing and the technology to deliver both is improving every day, the data gathered showed a lower level of current demand for hybrid gathering than the project's entry position expected. The interview analysis showed this in revealing the theme 6 that Hong Kong organisations and media clients see photography and video gathering still as mostly separate roles with distinct dissimilarities reinforced possibly by industry practices and initiatives that reinforce traditional approaches and roles. Image creation professionals and clients in the interviews and survey provided a picture of an industry where the still and moving image continue to operate in largely separate gathering approaches and expectations, but with an underlying assumption that change to a position of hybridity becoming more commonplace was inevitable in the future. There was a significant minority of acceptance that the ability to shoot stills and video was becoming more important on more work in the current working

context. This data provided a valuable insight into aspects of demand for freelancers and aim 2 and objective 2 regarding hybrid image practice in Hong Kong.

The data from professionals sampled through survey and interview continued these insights and provided a picture of a slow increase in the professionals' ability to produce still and moving images. There was an assumption that there is a need for both to be part of a skillset moving forwards for the professional, whether to gather themselves or to coordinate with other professionals in environments where both are being gathered simultaneously. Throughout the data it was clear that demand for the ability to gather both has increased and primary data also showed that gathering stills and moving images provided challenges for professionals using the additional skillset (Interview theme 1 and questionnaire regarding RQ3). In the case of still image professionals sound recording was seen as an area of significant 'discomfort' when working with the moving image and moving image professionals saw using strobe lights in still capture as an area they needed to learn (questionnaire re RQ4). They also saw the camera ergonomics as a significant issue when using a DSLR or mirrorless camera as controls that were needed to be accessible when shooting the moving image from their experience were no longer available such as physical control over ND as professional video cameras often have ND built into the camera body and DSLRs and mirrorless cameras do not (interviews and questionnaire re RQ4).

The data highlighted the perception from both clients and professionals in Hong Kong that gathering stills and video in a hybrid situation with a single professional can negatively affect the captured image. Even within the case study, where hybrid gathering was approved by the client a photographer was also involved in several of the hybrid gathering scenarios as the client felt the potential for higher quality images was improved using distinct professionals for still and moving images where possible.

The case study also illustrated how the technological improvements in still and moving image capture enabled the seamless (from the interviewee and client perspective) gathering of stills and moving images as a function of the camera to switch between stills and moving images. Within the hybrid gathering setup in the case study where the single professional was capturing both still and moving images the continuous light setup presents an unchanging environment where the camera's identity shifting between modes with the professional is invisible to the subject and client unless highlighted by the professional.

This switching between modes of capture enabled through the same device and, with continuous lighting setups for hybrid gathering, the same light, may provide a factor in a significant part of the inconsistent narrative found in the interviews, where the still and moving images are seen by some professionals as separate entities and by others as essentially the same, just moving or not moving. In the case study we can see a change in conceptual position but also physical reality when moving between the still and moving image for the practitioner as they move between modes of capture.

As the image maker moves between modes our relationship to the photograph or video changes through the demands of the still and moving image. In the still image professional work is consumed by the subject of the image whether that subject is a subject within a scene or the

scene itself such as an industrial image, landscape, or cityscape. As a result, the professional still image in the majority of cases will not let the subject leave the frame and we do not let the frame leave the subject. We position the subject/scene within our frame whether the contents of the frame present an identity that travels beyond the frame or not.

This is not to say that the camera and subject do not move but that the relationship between the still image camera and the still image subject is one of relative constancy. Even as our subject moves, we move with them and if we move around our subject to reveal aspects in still images from various angles our subject still remains within our frame all the time looking for moments where the capture of the still image is ideal. Moments within movement and moments at rest, but always to capture a moment even if that moment is hours long in a long exposure of a skyline and we capture time and movement of our scene and subject moving across our static frame.

Subject and scene are also the focus of the moving image however as the majority of professional moving image work has been and still remains the creation of shots to be interlinked in edit to convey a narrative, the relationships of shots to other shots is always taken into account which demands a relationship with the scene and/or subject in a different way to the still image where images in the majority of cases work in isolation relative to other images.

In the moving image as we consider this relationship to adjacent shots in edit, we make different choices when recording the image to those made when shooting stills. We do let the subject leave the frame and we do move the frame away from the subject in certain shots. We use both techniques to let the frames work with each other to tell time's story for the performed narrative built on interacting frames. This use of montage is fundamental to the moving image in most professional work and its relationship between frames and across frames to create intent and meaning (Pudovkin, Eisenstein) informs our decision making and creativity as we make the moving image.

This is not to say that we do not create shots in the moving image that retain the subject in shot, in fact for the majority of shots where a subject stays in frame and for the majority of shots where the subject enters, or leaves frame the subject will remain in frame as the focus of the shot. The difference in temporal relation to and presentation of the contents of the moving image compared to the still image also allows us to present and shift the subject and focus of the individual shot as it progresses. Moving image professionals use a range of techniques to achieve this, from pulling focus where a narrow depth of field in the image will allow slices of depth to be in focus and for the focus of the image to shift between planes and subjects as a result, moving our attention from one subject to another. We can also move the camera and pan or tilt or track from one subject to another to physically move within and across our scene from subject to subject or with our subject to illustrate them and their world, the *mise en scene* of the shot.

The moving image has worked in this manner for most of its history however we may be in a time where the video and still function is crossing over as single moving images in social media are used to present the world of the subject. The *mise en scene* of the social influencer is as important to their identity as their identity within the moving image. News can now be

presented in single moving shots with graphics and captions to tell the story (SCMP, 2020) and the moving image professional may no longer need to think of how shots relate to each other in these cases but how the individual shot tells the story. The hybrid image creator is functioning as the intersection of this transitional time and integrating the intent, art and theory of the moving and photographic image.

7.3 Camera and imaging technology developments are influencing hybrid delivery.

Primary data shows both dedicated camera technological developments and smartphone developments are influencing the ability to gather the hybrid image and the increase in the demand for stills and video from single professionals.

Device uniformity is a development that has had a significant effect in assumptions around image capture and shifting practice. The ability to capture still and moving images has moved to a single camera shape or rather two shapes. The DSLR camera shape is the first of these camera shapes and has advantages and disadvantages, but has been adjusted for hybrid image gathering in many ways and although it is possible to use dedicated video cameras to gather stills they are designed for moving image capture and the sensor design, typically favouring sensitivity and reduced image scanning time over increased resolution, does not present the degree of dual functionality that recent mirrorless cameras focus on to greater degrees. The second and most common dual gathering device shape is the smartphone and, ergonomics aside, this image capture device is used by more people than dedicated cameras will ever be.

We can see that cameras (dedicated and smartphone) have developed to the point where their technology is more effectively enabling hybrid gathering with increased resolution of video and still images, RAW video capture, increased dynamic range in video and AI processing across gathering and post processing of images including scene recognition, autofocus and improved noise reduction and other image areas fundamental to the hybrid production.

Autofocus systems are typically implementing a contrast, phase detection or combined system with Panasonic continuing, as one example, to pursue contrast detect using a depth from defocus approach (Panasonic, 2020) with improved success in recent versions however still lagging phase detect systems. Combined with the distance measurement from time of flight (TOF) sensors including LIDAR and AF sensor (Apple, 2020) and AF algorithm development including recent rapid development and implementation of AI AF algorithms and approaches have improved the accuracy and speed in gathering still and moving images. AF accuracy and reliability in a wide range of situations and ambient light levels is a significant factor in the ability to operate as a single operator in a hybrid situation and the developments in smartphone technologies are continually improving this key technological requirement.

When combined with continuous manual focus capability during AF operation in mirrorless and DSLR lenses, the new systems allow the image creator to reliably gather in focus content

in situations demanding both image types of images and in all situations the professional may find themselves in.

Sensors have developed and the developments scale depending on the imaging device being created from small sensors in mobile devices to larger sensors in professional still and moving image cameras. Areas of development crucial to the viability of cameras to gather still and videos in a hybrid situation are sensor resolution, dynamic range, sensor readout speed, colour array development and alternative sensor design approaches which may or may not be viable in future imaging devices.

Resolution in video has improved the viability of frame grabs from moving images for a wider range of still image uses from web to print and large commercial images. Video resolution of 4K is now common across hybrid cameras, video cameras and smartphones with single frames producing an 8-megapixel image. More recently cameras recording 8K video have arrived and are capable of delivering 32 megapixels still images from single frames with the Blackmagic design 12K cameras capable of delivering 80 megapixel still images (Blackmagic Design, 2020).

Recording in these higher video resolutions also allows the down sampling from higher resolution sensors to produce high quality lower resolution video which may also deliver better lower resolution still images allowing a 12K to down sample to 8K or 4K and an 8K to down sample to a 4K or Full HD resolution.

The second factor increasing the viability of creating stills from video is the development of dynamic range improvements of up to 16 stops using recent stacked CMOS designs from Sony (Sony,2018) and canon dual gain output sensors (Canon, 2021). This allows the still image captured from a video stream to compete in dynamic range with still images directly recorded from the camera in still image capture.

With increased resolution and dynamic range within the video frame the development of a range RAW video codecs and the possibilities it gives the images from video frames to be adjusted is the third major factor that is improving the viability of creating stills from video frames. As discussed in the literature the approaches to encoding RAW video have resulted in major formats from REDcode RAW to BRAW and Prores RAW. The ability of the RAW video formats is constrained by the design approaches of the manufacturers with ProRes RAW in particular offering a range of post processing options that vary with the camera being used as the capabilities of the RAW data result from design decisions from both Apple and the individual camera manufacturer, but all the RAW approaches add adjustment to video frames that were not possible in previous video formats.

Blackmagic BRAW, Red's REDCODE RAW and Arri's ARRIRAW are implemented directly by their parent companies and therefore deliver RAW post processing options that are comparable to RAW processing from still images that have been recorded in RAW formats. These include the ability to alter white balance, ISO, exposure, and other factors giving a full equivalence to the RAW from a still image.

The Colour filter array (CFA) design has also progressed through various models from the most common Bayer pattern which avoids certain artefacts when the entire sensor is read out at the full sensor resolution however is less than optimal as sections of the sensor are read out.

Other approaches have been developed with the RYYB CFA shown to have certain advantages in transmission through the filter array that improved signal to noise ratio however it presented disadvantages in the processing of the colour gamut.

The Blackmagic 12K CFA uses a non-Bayer pattern that allows equal colour readout without additional colour artefacts when smaller segments of the sensor are read out to give lower resolution for video and for higher frame rate options (Blackmagic Design, 2020). Fuji have delivered successfully with non-Bayer arrays in the fuji EXR filter array that was designed to improve dynamic range and reduce aliasing in the readout of the sensor, however it is significantly less well supported in post-production than cameras with Bayer pattern CFA's.

CMOS designs have delivered alternative sensor designs including the Sigma Foveon sensor array which layers sensors on top of each other to read single colours per sensor as the wavelength of sections of the received image penetrates to separate layers allowing full colour per pixel location without a debayering algorithm needing to be applied after sensor readout (Sigma, 2017). Although these sensor designs presented unique advantages in image processing the simpler and more effective approach has been the development of the CMOS chip to increase its readout and enlarge its photosites relative to the resolution of the sensor. Moving to a variation of the BSI architecture where the wiring between photosites was moved to the rear of the sensor allowed the silicon of the photosites to be reversed to directly receive photons without being blocked by the interconnection architecture. This produced as large a photoreceptive process as possible (Sony, 2018).

The development in technology that can potentially have the greatest impact on the capabilities of the camera is that of AI pre- and post-production algorithms in segments of the image capture and signal processing pipeline. AI with deep learning and machine learning approaches and technologies provide a modelled system trained through neural networks to recognise specific parameters and engage with them to increase the functionality of the technological processes they inform or control with camera autofocus systems as just one current example (Wang *et al.*, 2021).

The still and video images are created by individuals and the assemblage of photographer and cinematographer and now hybrid image maker includes expertise in image capture from assessment of a scene to the exposure adjustment and white balance and subject placement within the resulting image. AI algorithms allow assessment control and advice for all these areas to be given to the operator or directly to the camera, in effect adding the expertise node of our assemblage to anyone operating the camera. It can suggest or control the autofocus, exposure and camera colour and contrast curve based on the scene in the camera view and give advice on subject placement.

AI technology runs through neural processor unit(s) (NPU) typically integrated with the image serial processor (ISP), general processor unit (GPU) and the central processor unit (CPU) within a smartphone or as an additional processor or process within a dedicated camera. AI is a rapidly developing area of image gathering and other areas of AI processing in image production are noise reduction (Topaz Labs, 2020), autofocus subject recognition and tracking (Olympus, 2020) and scene recognition and colour profile adjustment (Huawei, 2020). These ongoing

developments in AI for image gathering and processing will only continue the theme raised in the interview. 'Phone and camera technological advances are enabling a wider range of image capture professionals (and amateurs) to capture both still and moving images for professional use.'

7.4 Technology and practice develop together to deliver new lighting for stills, video and hybrid gathering.

Technology and social change have increased the output of still and moving images, and how we light those images at the same time has been affected by technological and social change as much as our cultural expectations of the image. Image style and popularity changes at a rapid rate in a media rich society as new generations experience images of wide diversity and equally repetitive stylistic monotony at a previously unattained frequency and quantity. From stylistic effects and looks of the moment to the wide range of styles between monochrome 'unlit' portraits to #unfiltered images and heavily filtered saturated and modified moments of a virtual life, the hybrid gathering and lighting for the networked, media rich, social media driven environment is challenged daily to achieve something new.

Lighting for cinema and photography had always dealt with the same resolution, colour, and dynamic range as they used the same photochemical medium. Television and video were, in comparison, significantly limited by the technology in place to produce broadcast images which were limited to Standard Definition with a maximum frame size of 576 vertical lines in PAL and 480 vertical lines in NTSC. As late as the 1990's and early 2000's although HD and Full HD were arriving the dynamic range of video images was still limited in terms of gathering and output to low dynamic range of around 5 stops which was significantly lower than film emulsion of the time. As a result, when lighting for this we would need to contain our dynamic expression within these limits. Lighting and control of light was often needed to reduce the dynamic range in a scene to fit within this constriction and as professionals we always strove to deliver the best images we could with the best lighting.

With current technology this distinction is becoming less and less of a reality as the video image can compete directly with the photograph in resolution, colour reproduction and dynamic range. 12K video can produce 80-megapixel images from single frames and 8K video can produce 32-megapixel images from still frames. The video image has developed high dynamic range recording and formats capable of up to 16 stops which gives a much larger creative palette for light control and lighting within that expanse of light and shade enabling similar or identical lighting for stills and moving images in more and more circumstances.

Moving image professionals in primary data gathering saw differences in lighting as an area that separated the still and moving images as the use of strobe sources is not possible when lighting the moving images in all but some rare effects lighting circumstances. As such most moving image professionals did not have a great deal of experience in using strobes and saw their use as a skillset that would need to be gained to light the still image more completely.

The questionnaire data shows that the control of light for the image is seen as very important by the majority of professionals with less than one quarter seeing it as less important (Chart, S7). This does not necessarily mean all those professionals will light using artificial sources, but it illustrates the basic constant of image creation, the shaping of light, is understood by professionals to be key to sculpting the image, both still and moving. We examine the project space we are working in and consider the requirements of the client. We respond to the situation by planning how our light will create and focus our viewers' attention to meet those requirements in the final image and whether that light needs to be created or modified and how.

As we plan hybrid capture and effective lighting for that capture, we have to ask ourselves where and when in our temporal spatial environment, that is the moving image, is suitable for the still image capture? And how does our lighting enable this moment within our motion? Or do we need to separate the two to be able to create the image as Li says professionals in her experience find themselves needing to.

'One photographer said "if I'm photographing, I can't concentrate on it. I can't do it in the limited amount of time, both photo and video. I have to think differently", (Li).

In this hybrid situation lighting for movement is a significant difference between the majority of still and moving image lighting. In architecture and commercial images, we may light spaces, but we are rarely lighting individuals in space in the same way that we do in the moving image. The choice of style and substance of movement through space for the moving image changes by project. In a corporate video, for example, we will, in most cases, want our subjects to be well lit as they move through the shot and through space if the shot is following them. This requires lighting to evenly fill the space and at constant luminance levels, either through consecutive, overlapping lighting zones or through a single distant source covering the area to avoid light level change owing to inverse square intensity change during the subject's change of distance to the light source during the movement.

In still images in the same situation, we can light the space and then light for the subject in the single point where they will be captured. This requires a simpler setup in many cases or a setup with less light sources than that required for the moving image. A similar setup to this for a moving image would result in our subject walking from darkness to light and back to darkness.

This highlights how a lighting scheme that is suitable for a similar model to that discussed for the moving image and subject movement in a space as described above we are also providing a light source that can capture still images for the moment to enable hybrid lighting planning for both forms of image. This allows flexibility for movement and static capture and with sources that can provide momentary luminance increase with flash sync control illustrates the potential benefit of continuous light sources for hybrid gathering setups.

In a quote that will potentially raise a negative response with my photographer colleagues I will quote John Alton,

'If you can light for cinema, you can light anything.' (Alton, 2013, p. 80)

In current practice, lighting for capturing both stills and video at the same time or in the same location is more frequently achieved using continuous light. It is also, in larger events or when using separate stills and moving image professionals, supplemented with strobe for the still images allowing higher shutter speeds to help freeze the image and adjust the depth of field to the still image's requirements during capture. When using continuous light, the primary and secondary data showed that current and developing practice favours the use of LED sources because of its various advantages including relatively low heat output, dimming control without colour temperature change and in dual and multi colour array panels, control over colour temperature and colour.

With professionals recognising that camera capabilities are bringing the luminance level requirements in many situations lower, enabling continuous light to provide suitable conditions for still capture, the likelihood of an increase in gathering of stills and video using the same lighting sources is increasing and will continue to change accepted practice when capturing and lighting for hybrid gathering. The significant rise in the use of continuous light, in particular LED, in photography studios also increases the capability to light for still and moving images by more professionals in the working environment.

Even with these increases the survey data demonstrates that the use of the same lighting setup and design for stills and moving image capture is increasing in situations where the two are gathered together but with only half of the surveyed professionals even considering use of the same lighting design for the two image types there is still going to be a separation of lighting approach and design for the majority of image gathering.

For still image production a significant factor in this decision is that the power and portability of strobe (speedlight type strobes) still has an advantage over continuous light such as location shooting on bright or sunny days where high output is required to overpower or compete with areas illuminated by the sun. However, similarly there are advantages with LED sources (RGB, RGBW etc) allowing colour and colour temperature to be matched without additional equipment and without the associated loss of time to adjust equipment. This does not stop the use of the two systems together and a hybrid lighting approach to hybrid image gathering may be in many cases the best way forwards, enabling a flexibility of power and colour control. What we see in the next section is the very clear impact of LED lighting and their effect on hybrid image practice.

7.5 LED lighting is having the largest impact on lighting practice and enabling hybrid image practice.

What is clear across all primary and secondary data is that the single most significant change in lighting technology over the last decade is the dominance of LEDs, which have established themselves as the de facto lighting standard source in moving image capture and increasingly

as the continuous light source in photographic studios. This change has occurred over this very short period with a relatively slow initial take-up building to rapidly increase the LEDs presence in the industry in the last ten years and even more rapidly in the last five years as Francis explained in his interview.

The survey data shows a significant increase in the use of LED among professionals across still and moving image roles and in the interview themes we see this trend confirmed with the discussions illustrating that over a very short period LED has become the standard light source on set. The case study illustrates some features of the LED's that have made them so appealing and effective in practical production use with their low heat output allowing the use of sources close to subjects while retaining a comfortable environment and the ability to dial in colour temperature allowing sources to match ambient lighting quickly and accurately and with full colour selection using the RGBW sources allowing a suitable colour wash to be applied to the background that matched the corporate identity of the projects client.

The rise of LED's has occurred because of this variety of factors including the practicality of led lights in production with low heat output enabling a cold light source unlike the hot light of incandescent and arc (HMI) sources. This combined with the mobility of the LED source thanks to its lower power requirements enabled brighter battery powered light sources to be used in the field which enabled a more effective day for location production. Despite the variable colour fidelity in earlier and lower cost LEDs (which professionals could correct in the field with slight colour correction gels depending on the particular LED) this was rapidly improved and continues to be improved. Further developments included increasingly accurate phosphors for colour accuracy and modification of LED arrays to use RGB, RGBW and other array options including lime emitters in the case of the Arri Orbiter (Arri, 2019).

The LED component itself is also very robust compared to the glass envelope of other light sources and allows for very durable units to be constructed. Although the LED emitters themselves are very robust, they require control electronics to accurately adjust a consistent electrical supply and control other factors such as colour mixing through varying output of the array components in a mixed source fixture. These electronic control systems are susceptible to a range of damaging factors including moisture, temperature change and shock requiring more robust LED fixtures to have additional features built around the electronics to protect them from these areas. To control the temperature of higher output LED sources a cooling system is required and the most common and cost effective system is a fan cooling system which introduces a problem of its own to the use of LED for moving video, that of the fan noise interfering with audio recording which from my own personal experience I can say is sometimes as annoying as air conditioner noise and almost impossible to remove cleanly in post-production as the fan speeds in many LED units is inconsistent which then changes the audio frequencies produced as it modulates its speed.

The LED technological developments have occurred at a rapid rate with output improving sixfold since the original Litepanel 1x1 in 2002 to the astra 1x1 6x panel producing 1500 lux at 3m enabling LED fixtures to compete with incandescent sources and HMI sources without producing similar heat making them a viable source for hybrid gathering when using a

continuous light source. When switching between still and moving image gathering in the same setup the arrival of LED sources with HSS and with/without power increase during HSS (Rotolight, 2019) and (Godox, 2020), enables optimal settings for the two types of images without changing the lighting design/setup and can thus facilitate a more effective shooting process.

In many situations where lighting is used for hybrid gathering the operator may be working alone (typically in weddings and journalism where being unobtrusive is an important part of the job and so a single person can function more effectively). A light source that is flexible in adjusting its colour temperature or matching other colours and one that is remotely adjustable in its output and colour is an ideal light source for the hybrid image maker in these situations. The modern multi-colour LED source is currently the best source in many hybrid situations with the interview data making it clear that the LED has become the de facto standard light source for moving image and hybrid gathering. The survey shows that professionals are still valuing the colour produced by their light sources so using light sources will not adversely affect the recorded colour of the subject is very important to image creation professionals. Light output is an important factor as it defines what area or over what distance your light is a viable source, and it seems that many professionals are using lights on location as battery power is important for as many professionals as light output.

We also see in the literature that there are a range of conflicting standards to describe the quality of light that provide a range of data that may or may not be gamed by manufacturers to make their lights seem more appealing. Standards such as CRI (possibly the most common) have a narrow range of criteria that can easily allow manufacturers to target in order to make their light quality seem better than it is. More recent systems such as TM30 have significantly more detailed measurements and reporting systems which make them much better for practitioners to make assessments with.

In practice professionals use lighting approaches from single source to multi source and in hybrid image practice there may in cases be a preference for models and approaches that minimise the number of light sources used by the practitioner purely from a practical point of view. However as the case study shows it does not reduce the ability to utilise factors from approaches established in previous lighting models such as three point lighting, area lighting, butterfly lighting, Rembrandt and others.

7.6 Practice in Hong Kong is adapting with social change

Changes in the Hong Kong media landscape have occurred rapidly during the period of the research project because of global change and then in the changes arriving in the form of year-long protests movement in Hong Kong followed by the implementation of the national security legislation which coincided with the arrival and effects of Covid 19 on the city and a global scale.

The complex mix of social, technological and industrial changes have brought change to the media professionals in Hong Kong and to the media landscape in Hong Kong. At the same time

there is a consistency to practice and expectation of role specialisation that largely maintains separation in still and moving image roles in Hong Kong, one that is consistently driven by established practice in media production within the city. As Liam comments from the point of view of one of the city's largest media companies:

'Where we are I can't see it (a move to hybrid production), at least not in the foreseeable future. As I said unless there is a cost reason for it, we will continue to use separate videographers and photographers' (Liam)

The city still houses large media organisations with budgets that allow separate professionals to gather still and moving images and these organisations have little to no interest in using hybrid approaches. At the same time there is a demand for hybrid professionals in the city that increases as the size of the organisation decreases as we see in interview data. There is simply too much demand and expectation for both still and moving images in corporate communication for organisations to not be producing both. For larger companies this can and will mean having an internal media team that can produce content for the organisation or for using larger specialist team members including separate still and moving image professionals, and for smaller organisations will mean employing hybrid professionals to produce still and moving images. This is clearly illustrated in the round 2 interviews where the interview theme '*Demand for Hybrid image gathering in Hong Kong tends to increase as the size of the client organisation decreases:*' was identified in the thematic analysis.

With changes in the city prompting some organisations and businesses, in particular NGOs, to relocate outside of the city and the loss of their projects, which were more likely to utilise hybrid approaches there is a potential shift to larger productions. Media companies being used in these instances may increase the city's tendency to monopolistic and oligopolistic business practice further. This, in turn, may minimise the range of media companies and delay a larger increase in hybrid gathering as they have a tendency to use separate still and moving image professionals.

There is another trend for image creation professionals in the city to gain both skill sets as can be seen throughout the primary data collection, whether the skills are currently being used or not. The city is developing a hybrid capable image gathering profession and as with any city it will make use of that skill set. For the professionals it opens opportunities that they may or may not utilise but opportunities that allow greater flexibility for work in image creation as Claudia explains in her interview.

'I think you need to shoot video as a photographer as you get bored as a photographer and video is exciting. One of my friends, as a fashion photographer got bored and tried video and stills in the same field to offer something new to clients. From that perspective my husband is a filmmaker and wanted to get into photography and I said you're crazy there's room any photographers and he did it anyway and during the Hong Kong protests he got most jobs as a photographer,

and he did some things for channel 4 etc. but more regularly as a photographer than video' (Claudia)

And the city still values high quality images. Large media companies, even those using professionals without lighting skills know that the lighting of a still or moving shot can add significantly to its quality and is therefore used when it can be:

'It's very important to us (lighting). For every live shoot I would feel uncomfortable if we don't have lighting and clients might not pay us. And I check when I book crews. The brand has to look good. We need a degree of professionalism, so we put a value on lighting. If it's something we are doing, and a client doesn't bring lights that is different.' (Sim)

And although the city's media companies and departments value lighting there are many occasions where simply gathering an image is seen as more important and that the capabilities of modern cameras allow image capture without lighting that is 'good enough'. We can see this in interview round 2 theme 2; *'In a range of still and moving image roles in Hong Kong there is often a total lack of lighting because of technological change and a lack of lighting skill and experience leading to lighting being seen as the exception and not the rule in many cases in Hong Kong.'*

7.7 Phones, mobile networks and social media change audience and practitioner interaction with the image.

Where practice in Hong Kong seems to be slowly but inevitably moving to an increase in hybrid production smartphone technological advances are enabling a wider range of image capture professionals and amateurs to capture both still and moving images for professional use. Smartphones are also a central platform of development for image processing algorithms including models for adjusting light and shadow in the image with reference to the human face and these developments drive acceptance and use of smartphone as a viable professional tool and function as a well-funded technological drive for technologies that can potentially be applied to professional cameras in the future.

Primary data from interviews, questionnaires and the literature review all show the importance of smartphone development in changing image capture platforms and enabling still and moving images to become an important element of social media platforms for businesses and organisations as much as individuals globally and here in Hong Kong. The survey and interviews show the significance of smartphone developments to practise and the practitioners. Although it is camera technology that is seen by the majority of impact on practice, almost all professionals identified smartphone change as a significant figure in motivating the gathering of stills and video and in having an impact on practice.

When it comes to the shift in practice to hybrid gathering the survey illustrated almost half of the professionals sampled believe the developments in camera technology alone have had the largest effect in allowing stills and moving images to be created in the same setup and by the same person. A small number of professionals saw smartphone developments alone as the most significant factor in the shift. This is further informed and supported during the interviews where interview Theme 3 identified the rapid development of smartphone technology as having changed their use in image capture, editing and distribution.

Analysis of the data shows that smartphones are becoming integral to areas of practice from gathering to distribution of image content and communication as most of the surveyed professionals considered smartphone developments to have made an impact on their work. Although some of the impact of the smartphone development was seen as outside of direct practice it is also important that primary data showed that professionals see it as significant in how stills AND video are becoming a factor for their workplace.

For a technology becoming increasingly important in motivating and delivering still and moving images it is significant that image recording quality is only rated by one third of the participants as important and that a significantly smaller number participants saw the ability to shoot still AND moving images as important as we see in the questionnaire results. This could be attributed to the identification of the image makers 'self' and the separation of roles as still seen by most professionals.

The smartphone is among the most common image gathering devices identified by professionals and the use of the smartphone as our primary communication device and its constant presence with us providing continued access to the device and enabling its use when gathering images to put people at ease are major features in making it viable for professional use. The devices function as both image gathering and communication devices with network integration allowing the instant sharing of still and moving across social media platforms has accelerated its use. It can be seen in the data as important in making the smartphone a significant tool for the professional in an increasingly network dependant workplace.

We do not 'collect the world' any more as Susan Sontag (Sontag, 2008) said but rather the still and moving image pass us by in momentary glimpses of other people's lives and thrown away imaginings of our own and the function of the image, both moving and still has gained this modality enabling the professional role to function as an extension of the client's social presence.

This social presence is in many cases the new centre of business and corporate communication shifting media production to facilitating the ongoing output of content to facilitate a favourable network image perception. The network identity is presented and built with a rapidly shifting image style that draws from previously established image norms in photography, television and film. With reimagining of style from social media constructs such as the selfie, the Instagram influencer and the YouTube personality, each influence affects the image look and lighting approach. From posed, highly lit and stylised Instagram posts to documentary styled minimal or natural light approaches, each provides a separate set of social cues to the viewer of both good and bad lighting in social media and online channels.

The networked social media images demand for increasing use of lighting for certain looks and needs of content creators, influencers and professionals is making use of the flexibility of the LED to provide adaptable, instant use light sources for the social media production cycle. This demands instant, always with us lighting that is portable and flexible in its colour and intensity to match the constant presence and instant access of the smartphone. The increasing demand which has accelerated the development and availability of compact, RGBW, battery powered units. To meet the demand companies such as the Nanlite Pavotubes and Godox TL60 and the Aputure MC rush to produce wand and block designs with magnetic attachments.

These combinations of improvements in response to social media production demands broaden practitioner access. The importance of communication through various network portals with smartphone technological developments, including AI lighting adjustments, exposure assistance and composition guidance among others, are enabling a wider range of creative image professionals (and amateurs) to capture both still and moving images for professional use which is clearly seen in the interviews with Adam commenting:

'...and I've used them (smartphones) to get nice shots where a camera would make me stand out and I've got nice timelapse of streets with them and you can't see the difference in the final video.', (Adam).

and Liam who adds: -

'...and we have events where the press list is just a print press, and everyone is shooting video on their phones ... I see them with their phones, and I think "oh you really are going to shoot it on your phone", (Liam).

7.8 An assemblage of practice for practitioner research

In this final area of discussion, I present an example of using a conceptual framework of assemblage of practice for practitioner research to examine the assemblage of the hybrid image practitioner, pursuant to further examination of these factors. The assemblage of practice, using relevant theory on the practitioner and device and gathered data, allows the complexity of the practitioner role to be examined and illustrated. As part of the conceptual framework assemblage theory can examine the emergence of the hybrid image practitioner assemblage from the intersection of photographer and videographer/cinematographer assemblages. I aim to use the assemblage as an analytical device using DeLanda's development of assemblage theory as it 'focuses on the problem of emergence' (Buchanan, 2015). This is despite Buchanan's consideration that this is a simplification and error on DeLanda's part, as he admits it adds new and interesting ways of thinking.

The conceptual framework of practice for practitioner research proposes that we can see and analyse practice through the interactions of an assemblage in areas of human/object

interaction and capacities, human expertise through practice expertise from experience. It is not a proposed alternative to viewing practitioner research through the lens of reflective and experiential research but rather a framework that observes these insights as part of the researcher's totality of 'evidentiary lines' (Antczak and Beaudry, 2019).

Since there can be no unified grand theory of specific areas of practice, as each discipline's practice is unique to itself the conceptual framework proposes drawing on a number of different theories relevant to the discipline of practice under observation. This will then provide a basis of modelling combined with assemblage theory's scalable interactions between components to be refined through observation and insights from practice and experience.

We see assemblage theory being used in conceptual frameworks from archaeology to policy studies among others. Antczak and Beaudry (2019) in their proposal for an assemblage of practice, in archaeology see its importance as 'a dynamic gathering of corresponding things entangled through situated daily and eventful human practice' and propose detailed examination of practice through multiple sources to certify practice. In practitioner research an assemblage has active data from multiple sources and current data sets allowing the practitioner to present an active current assemblage of practice for practitioner research making a similar conceptual framework a viable option. Conceptualising the still and moving image in hybrid image practice allows deeper understanding and insight when illuminated through research data sources such as those gathered in this project and serves as an example of application of the conceptual framework.

Data from the project's primary data gathering and secondary data provides this 'marshalling of evidentiary lines' as Antczak and Beaudry (2019) comment in their work. The autoethnographic case study in this case added analysis of a spatiotemporal frame before the period of protests and covid-19 effects on still and moving image gathering in Hong Kong. As Khan comments in his use of autoethnography to examine change during a covid lockdown:

"the foremost aim of my autoethnography was to capture the symbiosis between the "work of making" culture, namely the ideas and material practices implicated in producing the lockdown as lived experience ...and the "work it does" on the social (Bennett 2007, 2013; Stanley et al. 2013) by disassembling and reassembling prior understandings" (Khan, 2022, p. 5)

Sebastian Ureta utilises assemblage theory as it 'can better capture the complexity and multifaceted character of contemporary policy processes... it sees policies as assemblages formed by an ample array of heterogeneous elements, from technical standards to everyday practices.' (Ureta, 2013). This is based on DeLanda's 2006 work on Assemblage theory and social complexity (DeLanda, 2006).

With Hoffman and Novak's work on the consumer internet of things we see interactions, emergent properties and capacities of assemblage theory revealing agency in human object interaction.(Hoffman and Novak, 2017) They illustrate their conceptual framework using the model of a smart home and argue that even though this macro level is illustrative of the value

of assemblage in IoT examination, the value and inherent scalability of assemblage theory is key to its use within their framework.(Hoffman Novak, 2017)

The project's aims were intended to examine technological developments including cameras and lighting and their effect on the hybrid image gathering approach. It asked how this role functioned when still and moving images were gathered in the same situation and often by the same individual in Hong Kong. Literature and primary data gathering illustrated the complex interconnection of factors that brought this possibility to fruition and continues to alter the image gathering and lighting approaches in this area. The complexity of these interactions can be modelled using the conceptual framework of practice for practitioner research using assemblage theories scalable interactions and capacities as processes of territorialization and deterritorialization.

We can see that Delanda's attempt at clarification of assemblage and its position as a materialist ontology places it in an opportune position to adapt and reconfigure its concepts to a range of conceptual frameworks. Its interconnectivity and modal structures allow it to deal with innate complexity ties of real-world research. From Antczak and Beaudry's (2019) examination of this as a conceptual framework of practice in archaeology to Ureta's (2012) use in policy studies the potential value of assemblage as a conceptual framework is demonstrable.

New capacities are generated from social and cultural interaction and areas of knowledge/expertise interaction. It proposes that each of these areas of interaction exists on a scale that may or may not be present to a smaller or larger degree in specific areas of practitioner research and that each area of expertise would subsume its own internal assemblages as it interacts in exteriority (Deleuze & Guattari, 1994) with other assemblages.

The conceptual framework is based on the use of assemblage theory as discussed in New Materialism (Coole and Frost, 2010), and Tuin (2012) and Weiberg's discussion of computational photography as materialist discourse (Weiberg, 2018). We see how the interaction and agency of technology is given significance in its effect on us and our effect on it. It illustrates that examining the separate components of the interaction without examining the interaction and agency will leave our model incomplete. Even inert nature has agency (Tuin and Dolfhijn, 2010) in interaction (we have lights in our assemblage as an example) and this raises the question then how much agency does an 'active' technology like AI have?

Our example assemblage is that of the hybrid image practitioner. This assemblage contains interacting components of the still and moving image and emerges from aspects of the assemblage creating articulations of their own within our scope of engagement in the cultural and social views, changing through interaction within the developing technology. As we analyse the hybrid image practitioner assemblage, we examine the assemblage of photographer and videographer/cinematographer and see that these intersect with an assemblage of creative image culture from still and moving images. These interactions allow hybridity brings a new form between and of the still and moving image.

It should be noted that I am narrowing the focus of the assemblage to the aspects of image creation and not the entirety of the professional as this would also include areas such as

business acumen knowledge and other professional areas. This is not to say those areas are unimportant to the professional, but I wish to control the space of this discussion.

Literature and primary data show that the still and moving image are both influenced by each other in areas including composition, colour, 'style', technologies and lighting but, I argue, never in the same way or to the same extent as when produced by the hybrid image practitioner or across such a large number of images as network social culture and platforms produce on a daily basis, as Goggin raises when discussing mobile television as assemblage:

'The usefulness of assemblage theory, however, is that it radically questions the constitution, production, and reproduction of the social, pointing to how particular objects suggest different conceptions, ordering and politics.' (Goggin, 2009, p. 153)

A conceptual framework using a materialist approach is particularly appropriate to work based learning as it can use, 'the realist ontological leanings of earlier materialisms ... through the concepts of performativity, relationality, and discourse' (Forman, 2020). Assemblage theory can be particularly useful and relevant in this as it enables us to see human and non-human components as equal parts of the assemblage with a possibility of a new materialist position that entails agency of non-human materials in affecting other positions.

As we look at the hybrid assemblage, we are examining an assemblage in transition as change is ongoing in the real world in the professional skill set and workplace and the assemblage develops. The capabilities of the new assemblage of image construction are driven by the opportunities of stills and moving images and their intersection as never before. Photographers have experimented using cinema and moving image inspiration and moving image has experimented and produced using inspiration from still images, but the new hybrid creator is taking steps that neither has taken in isolation before.

The new assemblage therefore frames the concept of hybridity and the assemblage of the hybrid image practitioner as a new assemblage emerging from the intersection of the two previously complete assemblages the still image professional and the moving image professional. With this new intersection and assemblage, we are altering the concept and assemblage of 'camera' and 'camera-person', 'still-image' and 'moving-image' to become 'hybrid image-practitioner' and 'hybrid image' as aspects of the communication assemblage through the territorialisation and re-territorialisation with and articulations between and within the old and new assemblages.

This use of assemblage from a conceptual framework of practice to diagram aims to demonstrate the value of assemblage in practice-based programmes where the interaction between aspects can be theorised and modelled as an assemblage to provide valuable modelling of practice for practitioner research.

I now present the hybrid assemblage as a new assemblage formed from the still image professional assemblage (A) and the moving image professional assemblage (B). Important to this analysis is that (A) contains, among other components the still image and (B) contains the

moving image. In the diagram of the stills image professional the assemblage contains the professional, camera, lights and the scene/subject of the image.

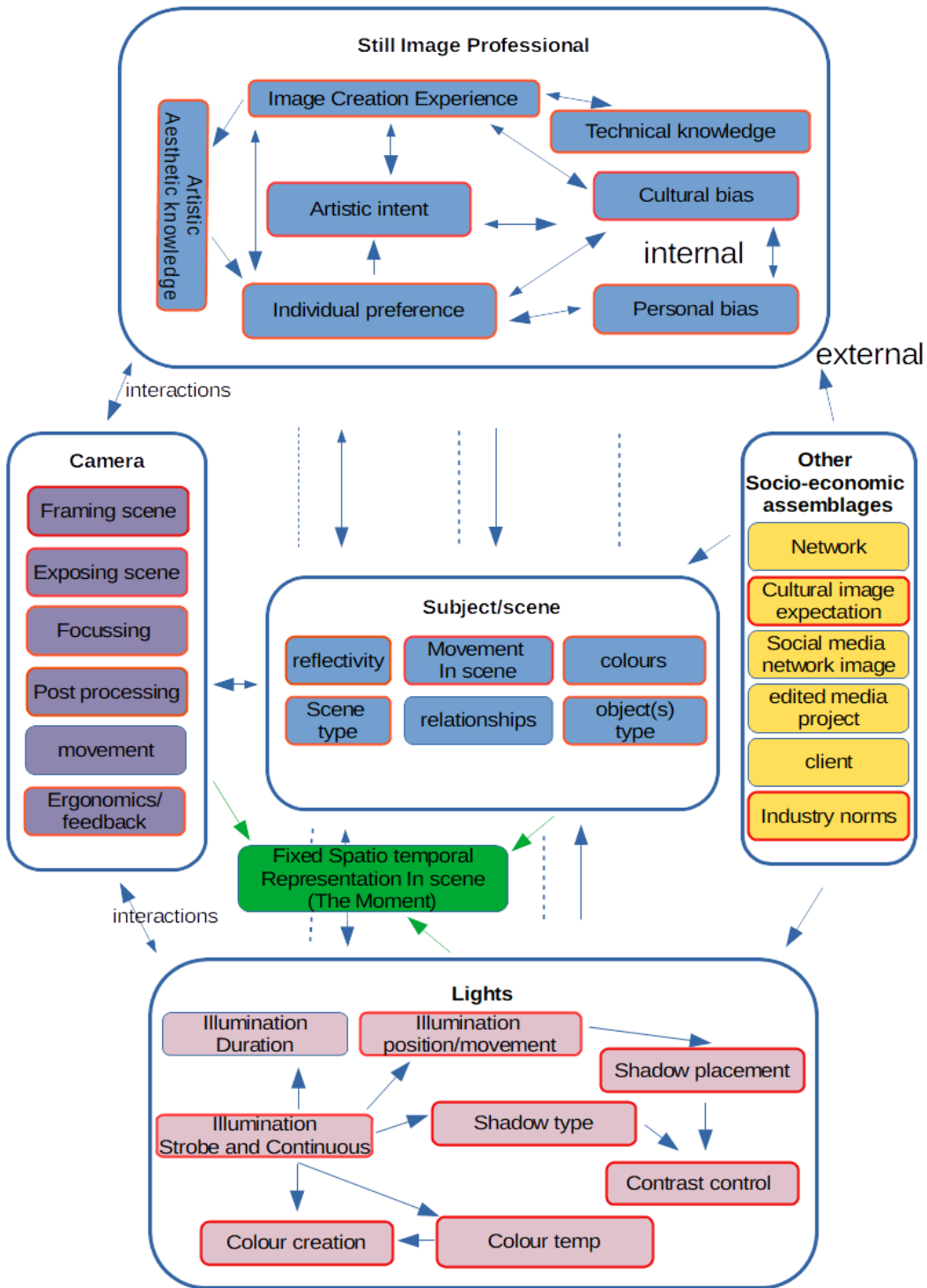


Figure 69: The Still image professional

The moving image professional assemblage also contains the moving image professional, camera, lights, and the scene/subject of the image and in both cases red outlines highlight areas that can affect and/or be affected by computational photography and AI processing.

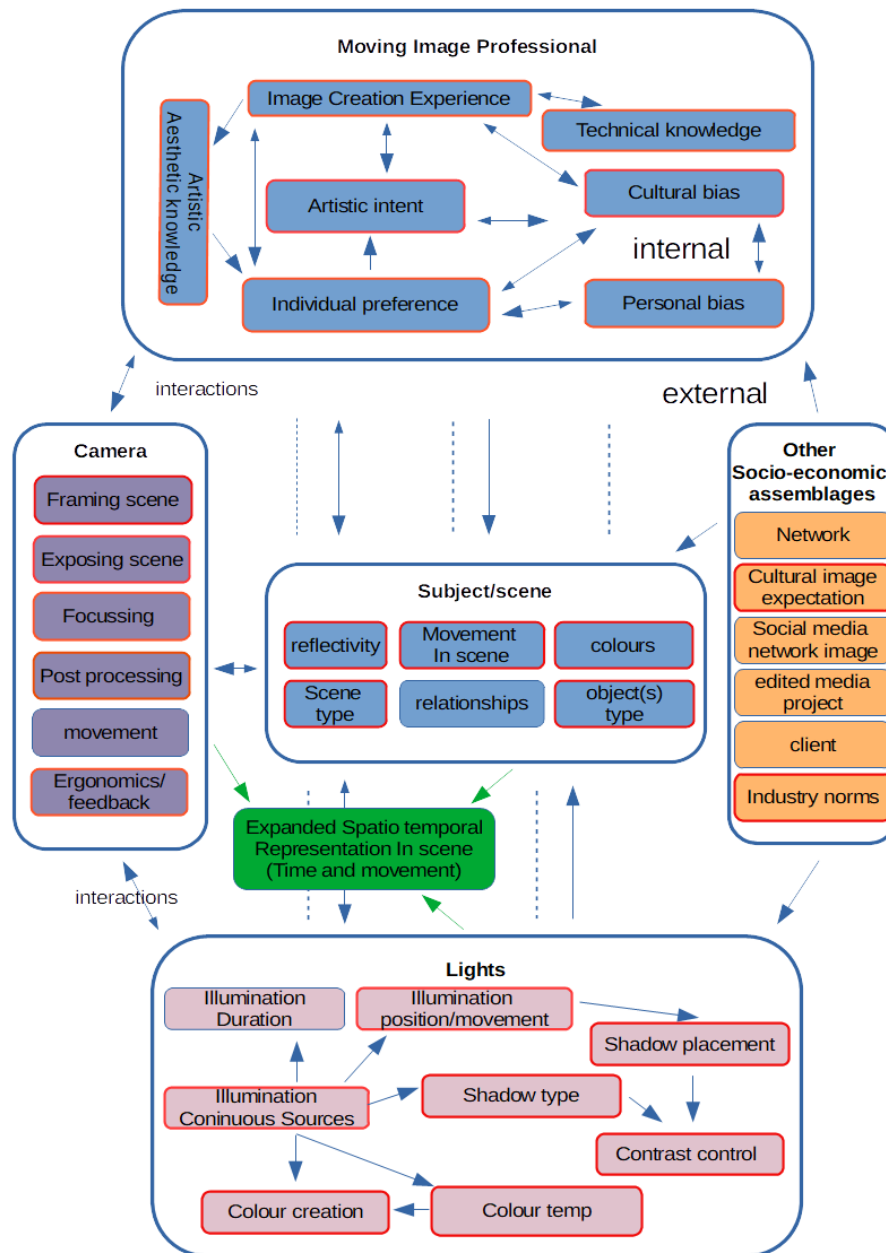


Figure 70: Moving Image Professional Assemblage

In both cases broad socio material assemblages impact the image creator assemblage through interaction with social and cultural constructs and client expectations which is formed from aspects of the broader influential assemblages. These broader assemblages include networked communications and social media as integral parts of the interactions affecting the image, the professional and the potential capacities of the hybrid assemblage. We see professional client interactions in the assemblage which create impact in both directions with these interacting factors affecting the shift in production and client demand allowing the assemblage to posit that these various factors are part of the assemblage.

In perception and creation of the image from clients and practitioners we see the influence from the cultural effects of locally recognisable cinematic tropes, from the speed (Yau, 2001)

and the farce and terror (Yau, 2001) to the bright television of local broadcast and Western (Lee, 2009) and Chinese influences (negative and positive (Lee, 2009)). These contribute to photographic influences and progression of a Hong Kong identity that we can see in social media (Baterna-Pateha, 2020).

The 'professional' is present in both assemblages and may be a component of the assemblage that is replaced to some extent by an AI algorithm developed for image creation to support and guide in that creation. The concept of the 'professional' may be modified by territorialisation of the 'professional' by the new element 'AI' in each assemblage to create a new whole, an evolving assemblage of either image creator. We see the areas of AI influence in red in the first two diagrams.

The external technological change of network has altered Kairos, the rhetorical concept that 'speech should be considered at the right opportune time and concept' as in digital contexts time and location of access is not in the control of the author (reliably or always depending on platform, etc. as in certain instances it can be the same i.e. feedback in Real Time moments.). As a result of this shift in the case of the still and moving image assemblages, the planning for network viewing has to enable a viability of image in its communication function that transcends its time and location. It is an inescapable development in our interconnected world as Wise states, 'our lives are becoming increasingly mediated by these (network) technologies' (Wise, 1998).

The hybrid image practitioner assemblage (Figure 71) is an assemblage that emerges from the intersection of both moving image professional(A) and still image professional(B) and therefore contains both still and moving images, their associated practice and new capacities generated by the interaction of both. This is further extended with additional interactions from technology for capturing still and moving images and generating additional capacities from the other, extending those capacities in ways that the assemblage of (A) or (B) would restrict.

The reality of the new assemblage is one and multiple as Buchanan comments in his call to regain the greater complexity of assemblage presented by Deleuze and Guattari rather than what he considers the misunderstood expansions of assemblage theory from DeLanda and Latour's actor network theory (ANT) (Buchanan, 2015). But equally it is DeLanda's approach to interaction and emergence that provides a power to the new assemblage with the proposed agency of the object and human/societal components in creating new emerging properties and capacities through their ongoing interactions (DeLanda, 2016).

The model presents the emergence of the hybrid assemblage and its integration of still images, moving images and lighting for both at the same time, even with the same sources and with vision and cultural import from changing network driven influences, as bringing the still and moving image together. The socio-cultural influences of Hong Kong images (both still and moving) are shown within the assemblage to affect the production of images in Hong Kong that require delivery of still and moving images at the same time. It also illustrates the expanded temporal framework that the hybrid professional is working in. They are not simply working within time to capture a moment in time or working to expand on times imprint within the moving image but are able to assess the most effective practices from both for the image.

Within this we can see that strobe lighting is limited to the still image assemblage and as a component of 'the moment' captured in the hybrid assemblage. Continuous lighting however encapsulates both still and moving image capture within all three assemblages and hybrid lights that can strobe and perform HSS enable the hybrid professional to light and film the final images to meet local cultural expectations and assumptions around image and content.

As the quality of video improves the dual nature of devices allows stills to be gathered that are greater than stills from previous generations of dedicated still cameras and with equal post-production editing capabilities in RAW video gathering (Sawalich, 2018). At the same time higher resolution images with greater colour range can be gathered from the same device. What was stills and what was previously moving image assemblage capacities are now extended through the continued interaction between still and moving image as components of the hybrid image. The hybrid image practitioners can grasp these new opportunities and creative components in ways not used previously.

As discussed above we can see that light and lighting technology functions as a component of all three imaging assemblages with the only light not crossing between the still and moving professional assemblages is the strobe. Natural light modified natural light and artificial continuous light exist as components exist within (A), (B) and the hybrid assemblage which also contains capacities from the strobe as a light source as well.

Light functions as a spatial and temporal medium through which the image is formed and is how we create the 'visible', in the recorded (as opposed to painted) still image and moving image. Professionals must be aware that its nature beyond the physical can affect the visible with infrared and ultraviolet wavelengths creating an array of artefacts when impacting the target of the camera, whether film or digital sensor. Lighting across all three assemblages allows control of the image from its very start and throughout the image creation and capturing process and with advancing technologies into post-production. As Millerson says, 'a magical property of light is its flexibility - the ease with which it can be controlled. You can totally transform a situation in an instant... or alter it gradually' (Millerson, 1999) or as Gloman and Letourneau describe its production and placement of shadows:

'...produce the most effective shadow patterns. Shadow patterns are created in order to establish mood and location, provide concealment, establish flattering portraiture and help create interesting composition' (Letourneau and Gloman, 2005, p. vii).

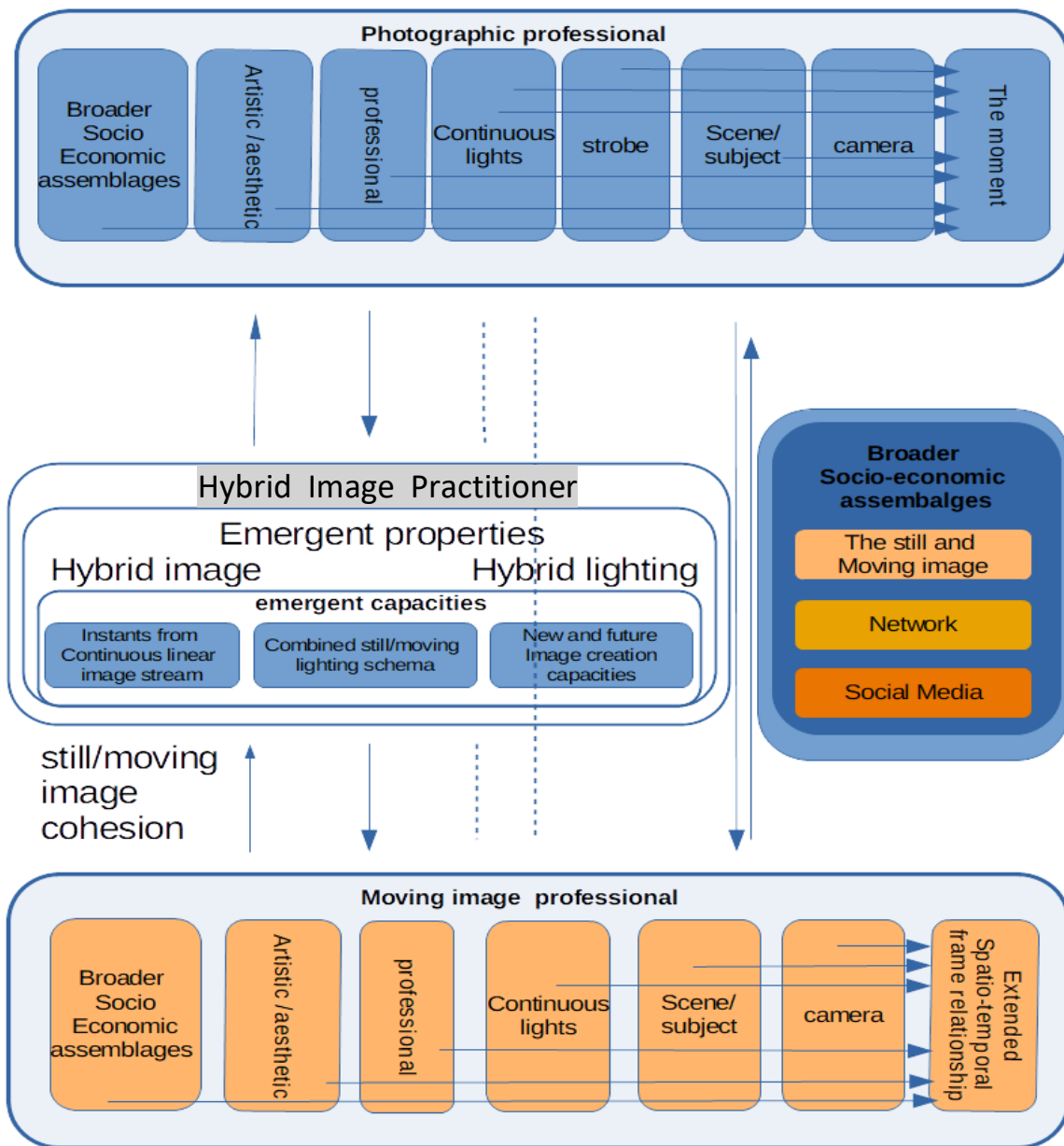


Figure 71: The hybrid image practitioner

And viewers bring cultural, social and emotional associations in their response to light and we as image makers utilise this to achieve desired responses to our images, as John Alton says:

'In motion picture photography the turning on of a light, the arrival of someone with a lantern or the sudden appearance of any light is used to enhance drama ... Daylight brings relief' (Alton, 2013, p. 56).

And we draw on influences from art and other visual and non-visual media to inspire our creativity to generate new ideas and works to provide unique images for our clients.

Where Goggin discusses media through assemblage as '...referring to the ways in which mobile communications form part of a reconfiguration of the relations between different media, their genres, and the media practices of users.' (Goggin, 2009) I am proposing a similar presentation of lighting for technology in hybrid image practice where the reconfiguration of relations between the lit scene, the image capture and post-production in the necessary duality of practice where stills and moving images are gathered together.

The restrictions of the still and moving assemblages on their capacities (Delanda, 2016) and illustration of self-image within a assemblage through its locking of the functionality once it is formed can, in the case of the originating still and moving assemblages confine the creativity within the still and moving images. We see this identity trying to hold to itself in the real world data, although this does not limit creativity within the assemblage as the interactions of components still generate capacity of the assemblage.

Within the interactions in the assemblage of the hybrid image practitioner the agency of non-human aspects is clear in all three assemblages (still, moving and hybrid) with the camera and lights having a direct effect on the professional and process with associated knowledge, experience, perception and affection (Deleuze and Guatarri, 1994) for each component. A camera 'feels good' to the image maker, a light becomes their favourite because its output is slightly flawed and with a particular lens adds a unique look to the image and to the way the professional creates with that piece of equipment, drawing inspiration from its physicality and past experience with its use.

Technology for gathering the still and moving image including AI, deep learning and other computational algorithms for image gathering and processing are predominantly defined within their remit to the still or moving image and the assemblage potentially illustrates an answer to 'does the professional need to be professional?'

Weiberg (Weiberg, 2018) discusses that the camera is seen as a black box both physically and conceptually where light arrives and the focus of theory 'the photograph' emerges. Even in new photography it is still seen this way as we see the process is the model and the photograph happens. This model applies to the moving image as well as the model does not exclude temporally longer capture. If we therefore model temporally extended capture as an extension to the model, we are then able to include all forms of the still and moving image capture. The hybrid assemblage contains the camera potentially as a black box but the assemblages of still and moving professionals explicitly contain aspects of the camera's interiority. We can see that multiple aspects are open to AI processing including the concept of professional which further illustrates the potential for a new model's position on the establishment of a new hybrid 'professional'. This potentially valuable new model is one I recommend expanding discussion of in the future research recommendation as part of an integrated theory of the still and moving image.

Weiberg also switches to discussing computational photography rather than digital (Weiberg,2018) to represent the parallel shift from a digital duplicate of the analogue (if we assume 'sensor-debayer-image' is equivalent to 'film-process-image') camera to a new space where technology is making decisions beyond our control within the camera. To extend this

explanation he uses the flutter shutter (Raskar *et al.*, 2006) and other computational methods such as multi frame capture and combination (Wronski *et al.*, 2019) to illustrate the distance between analogue and digital analogues moving to computational photography. We can take this argument further if we discuss AI's and NN's which would divorce the present computational photography even further from a simple digital capture analogue of film emulsion and processing.

Within the new theory of photography, the inclusion of processing within the gathering and post gathering editing stages (Costello, 2017) allow the use of AI algorithms that can provide, within a limited scope, assessments and processing of the scene and resultant image in a manner approaching professional output. This addition illustrates that the experience of the professional to make at least some of the choices in the image creation process can be and will be consumed by the ability of AI algorithms, allowing the image creator assemblage to replace 'professional experience' with 'AI model'.

Potentially this most provocative element of the proposed assemblage of the professional image maker is the AI component in multiple areas of the assemblage. This position in the assemblage proposes that its presence has the potential to assist in transitioning from the experience gained by the individual over time using cameras and lighting to create the still and moving image, to the trained AI as 'virtual experience' as an assemblage component. History has shown and continues to show that automation that potentially replaces experience will always provoke an emotional response.

The agency of technology has a long history in assemblage theory including Deleuze and Guattari and in computer science where agent network theory (Latour,) is examined within many aspects including agency in intelligent hardware and software (Jones,2013) is examined. With the advent of AI, the potential for developing agency by hardware and intelligent hardware and software agents in the image creation process is an integrated part of the still, moving and hybrid assemblage.

As discussed earlier in the assemblage description AI may potentially become a component of experience. That a modelled experience may allow us to create beyond 'our ability'. But we are still creating, much like a photographic montage using existing images, the final output is produced by the creator's imagination, intent and artistic vision. The AI 'experience' becomes a component to facilitate creativity for and by the individual, enabling the assemblage of creative hybrid image practitioner to potentially forego some level of experience.

The assemblage of hybrid image practitioner contains the still image, the moving image, hybrid image gathering and the potential for hybrid images that we have not seen yet. It is truly a fascinating and exciting place to be. It is an assemblage that illustrates lighting as the constant within the originating assemblages of still image and moving image and the hybrid assemblage. Where professional expertise in each originating assemblage is defined by the assemblage

Composition as a component of both originating assemblages retains elements of consistency across the still and moving image but only when the moving image is held as a static frame on the world. Light however can be constant across the still and moving image in a hybrid gathering assemblage. That is not to say it is always, but it can be. As discussed earlier, hybrid

gathering can occur with separate professionals or with a hybrid image practitioner and with separate, modified or identical lighting setups. It is the use of identical lighting setup that demonstrates the fundamental position of light and lighting to the assemblage. As with the New Model of photography the assemblage places the light image at the physical beginning of the image construct.

That light is defined by many other aspects of the assemblage from still and moving images, from compositional approaches to cultural and social influences on the reception and planning of the image. Still and moving image professionals from photographers to cinematographers can retain their expertise, experience, and skillset in those domains but the hybrid image practitioner accesses both realms of control and creativity with their position as an intersection of the still and moving image assemblages. As professionals we should allow ourselves to be influenced by the new and the old to inspire our creativity and the hybrid gathering illustrates how we should hold light at the centre of our creative inspiration.

8 Conclusion

Overview

The conclusion is composed of four sections that examine and illustrate key areas of insight from the findings after analysis of the projects data. These are discussed below in relation to the project's aims and objectives. These are followed by reflections on the project, and a summary of the project's main discovery points with commentary on new developments in the area.

The study aimed to review how and if the demands for the production of still and moving images in the same shoot have changed the way freelancers light and shoot in Hong Kong. The first three sections examine areas of its relation to demands on the professionals and how the areas of industry, society and technology relate to affect the practitioner. This includes insight into its second main aim, to critically evaluate image capture and lighting technology. Together with examining approaches for gathering still and moving images, they analyse the differences to discover how they are similar and to what level they can be integrated into a single lighting schema.

Section 1 examines technological change in the media creation industry in Hong Kong with section 2 and 3 discussing some of the more important insights and conclusions regarding still and moving image practice. Included in these insights is the proposal for the recognition of the hybrid image practitioner as a new role in Hong Kong. These areas discuss how still and moving image production are similar with proposal for a new lighting schema that utilises these similarities and opportunities with advancements in technology.

Section 4 presents an artefact of output from the hybrid image practitioner as an example of the viability of the hybrid gathering process in Hong Kong. Three images from hybrid shoots illustrate a discussion of the gathering approach used in each instance. Following section 5's reflection on the project from the researcher's experience, section 6 provides a summary of the main discovery points from the project.

8.1 Technological impact on media creation industry and hybrid possibilities

Technological developments have affected hybrid gathering in the media industry in Hong Kong, which we clearly see in interview and case study data and in findings 7.5 and 7.6. The still and moving industry in Hong Kong has been in an ongoing period of rapid change because of technological development driving social change, through online and mobile communication. These changes have resulted in alterations to client demand and to the practice of the image gathering professional. Interview (interview - theme7), questionnaire, and the case study's data

in its 'project demands' reinforce this conclusion. This has combined with societal change from alteration of the structure of Hong Kong legislation and the ongoing effects of covid 19 on working practices to reduce opportunities for image professionals (SCMP, 2021).

Industry reticence

Although we see the availability and acceptance of hybrid production as viable in the workplace within practitioner and industry data (IV themes 1 and 7), we see a reticence in its uptake for a variety of reasons. These include perception of the hybrid process as delivering compromised output in either still or moving content by clients (interview theme 1). We see practitioners bemoaning the additional skills and knowledge required to deliver hybrid content. With the additional demands during practice in switching modes from stills to moving image content and back (IV Theme 6 and 7 and Case study) causing potential issues.

Beyond this reticence in uptake by clients and practitioners there is a clear acceptance that gathering still and moving images in the future will continue to become more viable with improving technology (IV themes 2 and 3). It is also clear from findings and primary data that technological development in mobile technology in particular is largely responsible for an increase in hybrid gathering.

Hybrid skills and hybrid practitioner identity

In this rapidly changing industry, it is difficult to put a stop sign in a study focused on a workplace driven by technological development. During the course of the study technology continued to develop and change, creating a challenging body of knowledge for the industry and the study to keep pace with.

We see that professionals' practice needs to develop along with their knowledge and skill sets and to include these technological developments. Indeed findings 7.6 highlights primary data showing practitioners gaining hybrid skill sets in case they need them, even if not actively using them regularly. This allows them to utilise the capabilities of the new technology for lighting scenes for still and moving image capture.

The project's findings illustrate how the data gathered did not meet the researcher's original expectations. We see in findings section 7.2 that the shift to hybrid has been, and continues to be, much slower than expected within the professional workplace. It provides new and unexpected insight into the hybrid 'professional' evolving from an existing professional gaining additional skills to the newly proposed hybrid image professional. Here the still and moving skills and knowledge are integral parts of the singular role.

The project's purpose to investigate technology and hybrid practice in Hong Kong began with a professional insight that change was happening. As the research continued it was clear that change was happening and being driven by technology but in unexpected areas. One underlying assumption was that hybrid image practice would increase and yet the data clearly shows this not to be the case, or at least not the whole case.

We see professionals modify and add hybridity to their skill set but retain their existing professional image as still or moving image practitioner. The identity of hybrid image practitioner, at the moment, for many professionals and clients, is not necessarily a positive one.

Camera and lighting developments

The study's insights into technological progress and its impact are equally insightful. At the beginning of the study, cameras were increasingly adding 4K recording capabilities, with some professional moving image cameras able to capture RAW video data. Within the last year of the study several mirrorless cameras had been released that were capable of capturing 8K video and RAW video at prices that made them available to every professional. The Sony A1 was released with the capability to film 8K video and gather still images at 50 megapixels (Sony, 2021). Canon released the R5 which could also gather 8K video and shoot stills at 45 megapixels (Canon, 2021). Nikon announced development of a 1000 fps sensor (Nikon, 2021) and Blackmagic Design released a 12K video camera capable of producing 80 megapixels still images from single video frames (Blackmagic Design, 2020).

These developments continued to increase the capability of the video and hybrid cameras to deliver still and moving images, and place technology with hybrid application in every practitioner's hands. With RAW video available from a rapidly increasing number of devices, the flexibility of post-production from a dedicated still image no longer has the same innate differences to using a video frame. White balance, ISO response and other areas of RAW development are now available for editing with the video frame and the still image. We see external recorders from Blackmagic (Blackmagic, 2021) and Atomos (Atomos, 2021) adding RAW recording to an even greater range of cameras. We even see smartphones getting access to RAW video (MotionCam, 2021).

In lighting, LED developments have continued, with ARRI increasing the capabilities of its ARRI network for lighting communication and control, LiOS (Arri, 2021), and Aputure increasing the capabilities of its lights through use of the communication protocol SIDUS Link (Sidus Link, 2021). In both cases the companies have delivered effective mobile based control apps.

Multiple LED fixtures with flash sync and increased output modes for still image illuminance, including several with HSS functionality have been introduced by manufacturers. They address the increased use of LEDs for stills imaging (GODOX, 2021, Rotolight, 2021). This flexibility and affordability allow advanced lighting tools to be used by both still and moving image practitioners. Whether they are actually used is something I discuss in sections 8.2 and 8.3. In my own professional experience working with other established professionals, lighting is still a valuable skill set for the image maker in Hong Kong.

AI and smartphone developments

In AI developments, camera developers including Olympus, have improved the AI learning models and deep learning implementations in camera systems for AF recognition and

effectiveness. Areas including models for recognising and tracking animals and vehicles in addition to human faces (Olympus, 2020) have added new data sets and NPU efficiency. Among other areas, AI learning models have been developed and trained for low light level recovery of RAW image data. Such models present a potential for post processing of RAW data in-camera in the future and in post-production software in the nearer future (Chun, *et al.*, 2020).

In increasing use of AI, (as mentioned earlier in sections 7.3 and 3.5), alternative implementations of AI noise reduction also became available in Topaz Labs DenoiseAI (Acharjee, 2020). AI models and algorithms for light and shadow adjustment and simulation as significant areas of ongoing development have been implemented in smartphone software by Apple and Google among others (Apple,2020, Google,2020).

These implementations of AI systems in image capture devices are, importantly, largely invisible to the practitioner in use. Of all the technological developments in image production, they are probably the most significant owing to the scale of impact they can have across the image gathering and delivery process. They are likely to be the systems that may take creative control away from practitioners, unless we maintain our awareness of what the systems are doing.

AI is able to take advantage of the improved data provided in imaging hardware from increases in resolution to additional depth and scene information being gathered. 50- and 120-megapixel sensors have been used in a range of cameras including the Samsung S20/21 (Samsung, 2021). LIDAR, using single and multiple emitter arrays, has been added to a range of camera sensors. This enabled more accurate depth information to be gathered with the camera image, enabling features including three-dimensional modelling of the scene in front of the camera. This has already begun to be utilised in 3D modelling apps demonstrating a potential for further implementation and integration with AI camera and lighting models (PolyCam, 2021).

With the Hong Kong population having a greater than 100% phone saturation (Kemp, 2021) every individual has the potential to be a hybrid creator. With over 86% social media saturation (Kemp, 2021) a large percentage of the population are already taking on that role as an accepted part of their social makeup.

Higher resolution video

The primary data showed the use of the higher resolution video provides flexibility for the hybrid image practitioner (Findings 7.3) as project delivery is for online and mobile viewing for the majority of still and moving images. The size of most screens for mobile viewing limits the need for footage or images above 1080p when supplying content for social media, news and online promotional and communication purposes (Flexclip, 2022). It is also these areas where hybrid gathering is most likely to occur as many organisations as possible and clients need to provide continual updates to social media content. This requires reducing costs by either moving production in house or using hybrid professionals (Findings, 7.6).

The hybrid professional (freelance or internal) can then take advantage of higher video resolutions (4K and above) and their flexibility in cropping the image to allow greater scope in post-production. Other options include producing higher quality, down-sampled, lower resolution still and moving images while recording, that are immediately deliverable to the output specification but with less flexibility. This decision to weigh flexibility in post against the speed of delivery to the client and their output mediums and formats, against additional post time for the freelancer, will be important in budgeting time, quality, and the possibility of return work.

Socio/cultural impact on hybrid practice

After almost two years of Covid restrictions and massively increased online communication (Linkedin, 2021), organisations may continue to shift their production of still and moving images to internal systems and teams. For the independent image creator there may be less opportunity for work and the work that is available may be more likely to be gained by professionals with a hybrid skill set, simply because they can access both still and moving image opportunities in a reduced market.

With the ongoing shift in the political landscape and increasing restrictions on media expression we can see the impact on social and cultural norms in Hong Kong changing daily. We can expect a likely move to more mainland expression in media and as a result in the image (Frisch *et al.*, 2018). We also must accept that certain aspects of 'professionalism' we assume to be in place, that define our expertise, are capably handled by computational and AI based technology in camera and in post (Byford, 2019). This continued technological reframing of image production within a new social model will deliver changes the freelancer may not be able to predict accurately but must be prepared for. A hybrid skill set might just be the extra value necessary to maintain work in this environment.

8.2 New Technology is providing a new way of thinking regarding lighting

Reduced lighting practice.

A significant, unexpected discovery during the research project, was that a complete lack of lighting was acceptable on a range of still and moving image projects (interviews, theme 5). A lack of lighting skills being gained on entrance to the industry, combined with technological change has given rise to a reduced skillset being acceptable. As the technological capability of the camera can, in some cases, mitigate the loss of a lighting skillset, camera and lighting have become perceived as even more separate. Primary data seems to show some practising professionals relying on the camera functioning as a gathering and image processing device for the entirety of the image creation process, without separate control of lighting.

The investigation of the project's aims pulls data from interviews, the case study and questionnaire to infer links, if there were any, between camera and lighting technology and practice in Hong Kong (Aims 1 and 2). Expectations regarding these links by the practitioner researcher were established within existing practice even while being open to change. The researcher's professional experience had shown that the image's potentiality is affected by technological change, with the study revealing a surprising degree of skills change and new creative possibilities. The integration of technology from gathering to post-production using AI modelling (Tsai and Pandey, 2020) and increased sensor dynamic range (Canon, 2021) contributing to the potential removal of lighting from the practitioner's skill set.

Technology integration with hybrid practice may influence theory.

This revelation, through the data gathered, seems to have revealed how integrated the developing skills and creativity of the image maker are with the developing functions of technology. The movement of the professional skill set to require less need for lighting as a component, revealed in the interviews, and to a lesser extent in the questionnaire, is a huge shift in any areas but documentary and news gathering. Light has become interpreted and mouldable within the camera and the post-production process, to a degree not previously possible without AI modelling based on interpretation of scenic models and lighting physics.

This would then position the 'light scene' (Philips, 2009) as an uncontrolled section of the image gathering process. Practitioners, in this case, rely on the ability of in-camera processing and post-processing of the image for, necessary or wanted, creative control of the photographic and moving image process. With this lack of control of the light scene, the photograph cannot be arguably held to an aesthetic value unless we accept that the post-production process, however automated, is still under creative guidance and control by the image creator. It should be noted that this reliance on automation when gathering the image does not remove the creative choice of position and timing from the image creator's hands. These two choices alone may be argued in areas such as photojournalism and documentary photography/video as key creative choices of the image creator (Golden, 2005).

The Hong Kong industry's demand for still and moving images has increased at such a rate, that requests for image delivery or production schedules are increasingly given from clients whose knowledge of the process to produce high quality images is lacking (interview theme 6.7). The perception that cameras can produce amazing images anywhere is reinforced by technology companies bombarding the public with images of phone cameras and cameras that can shoot in any light at any time and produce a great look.

'Our Pro camera system gets its biggest upgrade ever. With next-level hardware that captures so much more detail. Super intelligent software for new photo and filmmaking techniques. And a mind-blowingly fast chip that makes it all possible. It'll change the way you shoot.' (Apple, iPhone 13, 2021, p. 1).

Lighting the scene is not highlighted in these advertisements as they are designed to sell cameras/phones and not lights. This perception places the image gathering device as the key

part of the image gathering process in the minds of many Hong Kong clients, without the knowledge that how the subject and scene is lit, will in many cases make the difference between a good and bad image. Liam discusses this when relating how an increasing number of media clients were having the use of his companies' cameras written into their contracts as they have been filmed with those cameras previously in a favourable manner. They would not however have lights or lighting styles written into those same contracts when it was the lighting that was as important if not more important than the type of camera that was used.

'In Korea, we have actors and actresses and actors who know our cameras so well they demand them to be used in their contacts But they don't ask for the lights and lighting that made them look good.' (Kim - interview).

The significance of light to New Theory is fundamental to the photographic creation as Philips states (Philips, 2009). We can see that the New Theory (Philips and Lopes) is a way to demarcate WHEN as much as WHAT a photograph is as stages 1 and 2 (light scene and device) of the process are formative. However, the concrete article does not exist until stage 3 (Processing creates the photograph).

Of significance in this model is that the model begins with a light image without which the following stages cannot take place. If they cannot take place, then a photograph cannot exist within the new theory. Without light there cannot be a photograph. A seemingly obvious dependency, but a dependency that places light at the very beginning of the photographic process. If the photographer or moving image professional (assuming that the new model is applicable to the moving image) is in control of the light, then it places the photographer at the very start of construction of the image. Without control of the light then it could be argued that the photographer is a servant of the automaticity of the camera to some greater degree.

Technology reduces lighting requirements.

We can see as we discuss interview theme 5, *'In a range of still and moving image roles in Hong Kong there is often a total lack of lighting as a result of technological change, and a lack of lighting skill and experience leading to lighting being seen as the exception and not the rule in many cases in Hong Kong.'*, a danger of developing a new group of professionals who simply have no knowledge or experience in lighting. This is reinforced through the questionnaire's insight into research question 1 where we see that a small but not insignificant number of practitioners consider lighting to be less than important. Technological advances are actively changing the practitioner's perception of their own role in unexpected and significant areas. Where the project's objectives included investigating perception change the researcher had assumed a possible external change and not this internal change.

Technological developments allowing effective image capture to produce adequate images without lighting in a wider range of circumstances. If this is acceptable for practitioners' clients, the question for them will probably be, 'Why should I light at all?' This is a question and

assumption about practice that has the potential to create problems in image production, as Liam comments:

'And they (videographers) are so used to shooting without lights that on occasions when they need to use them, they still do not take them.' (Liam - interview)

For some professionals and media producers, professional or not, the ability to create the ideal image without a mastery or even unmastered control or modification of light can continue. It has the potential to improve further as sensor design and post processing systems in camera manipulate the light of the image as fast as it is received by the sensor, creating a flexible space for image creation.

An alternative future for the hybrid practitioner

But I would argue that there is another possibility for the future of the hybrid professional as I discuss in the next section. An approach that may enable future professionals to achieve the Hong Kong 'look', a look that is influenced by international and national still and moving image history. They may deliver content with inspiration from the City's rich filmic catalogue and a prevalent expectation of high key lighting on broadcast television. These new approaches allow a range of lighting styles and approaches from no light to heavily structured multi light delivery ,on studio stills and moving images, in commercial and corporate delivery in the city.

The primary data does show a viability for a potential total lack of lighting because of technological change in some areas (interviews theme 5). In a wide range of other areas, however, we see client expectations and social media channels driving the desire to produce a well-lit, more polished image. These more polished expectations come with an awareness of the importance of lighting in images from influencers, online creatives and agency driven content (Novet, 2020).

8.3 The 'hybrid image practitioner' and a hybrid lighting approach

The hybrid practitioner and the hybrid skillset

Technological development and its influence on the beginnings of new ways of thinking around lighting or lack of lighting, provide key insights into the project's aims and objectives. The project's evaluation, from data gathered, of image capture technology and lighting technology, and approaches to gathering still and moving images, provided insights into a possible new lighting schema. Data also revealed the integration of hybrid production delivery with local industry expectations and assumptions around image and content (Findings,7.2,7.6). The case study provided a range of insights into production in Hong Kong that require delivery of still and moving images at the same time. Questionnaire data highlighted hybrid demand in

areas of weddings, corporate and documentaries in response to questions aimed at examining research question 3, with news closely following in demand. These sources lead the researcher to suggest the recognition of the new role of hybrid image practitioner and a hybrid lighting schema.

Examination of the technical demands of hybrid gathering through literature, interviews and the case study analysis demonstrated the increasing viability of the process. With advances in sensor resolution, camera processing speed, AI image processing and lighting technology shifting to LED sources, hybrid gathering has become technically acceptable in a variety of approaches. This does not however alleviate the demands of hybrid gathering (Findings,7.4) and its negative perceptions among practitioners and clients (Findings, 7.6).

The arrival of a new professional is taking place as technology and Hong Kong society develop rapidly alongside each other. Change that has been further accelerated with covid 19 and its increase in daily image use on social media platforms by most of the population (Digital Business Lab, 2022). With a rapid growth in demand for online video and the capabilities of hybrid cameras and smartphones improving their hybrid functionality, single devices gathering both video and stills have become the norm. The ability for stills professionals to shoot video and vice versa enabled the development of this new skill set and role. Now the hybrid image practitioner capable of shooting stills and video effectively and often on the same device is a viable possibility in the workplace (Findings, 7.2,7.3,7.6).

Project data and literature demonstrates there is a growth of the capability for hybrid gathering but that the increase in hybrid image practitioners is occurring at a slower rate than might have originally been posited from the industry literature. The photojournalist is not dead - yet, but rather the journalist is now a journalist who takes photos, and videos (Edge, 2015), an example of a new hybrid image practitioner. The same can be said of other creative image professionals, including wedding photographers where data shows the highest demand for hybrid gathering (Questionnaire, research question 3).

Why hybrid uptake is slower than expected.

The observed shifts in practice are also illustrative of the project's insight to objective 3 through its examination of these changes in technology and the perception of hybridity. Hybrid capacity in technology may enable hybrid production but social, cultural, and industrial expectation and norms can reinforce the established identity of the stills and moving image professionals, and become a limiting factor in the transition to hybrid image practice. Indeed, we see these industry norms being reinforced through available funding for development and training in the projects context outline. Multiple industry and government initiatives are restricted to established, traditional role funding in still and moving image industries (createHk, 2021, FDF, 2021) This then further reinforces client and industry perception of the hybrid process as being somehow inferior to established practice (Findings,7.2,7.5).

Findings 7.5 illustrates how practitioners and clients value hybrid skills as valid in certain instances as budgets lower, or where smaller organisation size offers more flexible approaches

to image gathering. In the project's search for insight to objective 2's focus on cultural social and network impacts on hybrid gathering we can observe a slow but definite shift to hybridity. A hybrid skill set may not be seen as valuable universally, as we comment in the findings, but the demand in a reduced marketplace for freelance work has the potential for a successful image creator who can access still and moving image production.

The hybrid image practitioner is arriving though, whether as a still or moving image professionals learning the additional skill set or a new entrant to the industry who has always been exposed to dual gathering devices with their smartphone. Now we have a professional who integrates still and moving images - the hybrid image practitioner.

We are in an ongoing period of change that can be seen to be happening and may or may not be predicted correctly. Organisations may see the change not affecting them immediately, even while admitting it is affecting practice and practitioners beyond their organisations, and individuals will use the dual skillset to respond to market demands and opportunities as they shift in this changing world.

Hybrid practice and technology integrate creatively.

With technology enabling hybrid image practice comes opportunities for new approaches and creative output which professionals have explored through their practice. They explore what the new technology can do and how that can change the delivery of the image. This investigation through creative practice reveals new capacities to the professional. Through their interaction with the functionality of the device, effective or valuable capacity is kept as part of practice while what does not work is discarded. For many professionals the control system of the EOS R, as an example, included a customisable multi-function bar (Canon, 2019) which professionals tried to use but quickly ignored as its response was not reliable enough in a professional environment. This practitioner feedback meant the control system was not implemented in cameras that followed. At the same time however, Canon introduced a control dial to their RF Lenses (Canon, 2019) which allowed users to control a range of parameters from the lens ring. This was responsive and, being on the lens, was easily accessible while operating the camera and has continued as a function of all RF lenses.

With higher demands and expectations of the hybrid image practitioner, practical demands on time and functionality of the image gathering and the creative process become crucial. To deliver images for clients the technology is assessed as it develops to see how it can help with these new demands, and what new functionality is valuable in the new system to address them.

This progression of the image creation professional is always integrated with the development of the image creation technology including cameras, lighting, and software for in-camera and post camera processing and editing. The dual functionality of DSLR's and, more recently and overwhelmingly, mirrorless cameras has been the key driving factor in a move to hybrid gathering for the professional, with expectation to produce both images driven by a global access to hybrid gathering on smartphones. More recently AI has enabled the small

sensors of smartphones to be functionally useful for professional imaging in more instances, and has demonstrated the benefits of AI processing in image gathering.

The study revealed that hybrid enabling technology has been the hybrid camera in the form of the DSLR and then the mirrorless camera, and more significantly the image gathering capabilities of the smartphone (Findings 7.7, interview theme 2). These technological developments are as simple as the ability for single devices to capture still and moving images and as advanced as AI processing during the entire capture and post-production image process. The insights into objective 4 regarding relevant technology and practise for hybrid gathering are intricately entwined with lighting approaches for hybrid gathering in objective 5. The project's insights revealed that lack of lighting, in the traditional sense of modifying light in the real world before capture by the camera, is enabled by a degree of capture flexibility and post lighting modification that continues to develop (Findings 7.2,7.3,7.4,7.5).

Technology enables hybrid practice.

The project demonstrated the implicit understanding of professionals having learnt technical knowledge and physical concepts to manipulate the image through experience. The use of technology allows them to reach a position where they understand the technology and physics of the image gathering moment and can then be creative. AI and other modelling technologies allow them to utilise the technology more instinctively and creatively in a shorter period; it becomes closer to a pencil than a printing press. They feel how a pencil touches the paper and creates a line of various profiles as they angle it and vary its pressure against the paper. They do not need to understand the material technologies involved in placing the lead within the wood of the pencil or any of the structural elements of pencil and paper to draw creatively. Similarly, as a creative image practitioner they can utilise the camera and lighting tools in the same fashion. Technology does not become a 'licence to forget.' (Winner, 1977) but a licence to create.

The capacity of the stills and moving image professional to become hybrid image practitioner has become enabled through the ongoing developments in technology. With the duality of function of cameras and smartphone technology demonstrating a continual shift in the image gathering persona of the device and hybrid image gathering individual. The term 'individual' is used here as the creative image producer may or may not be a 'professional'. In the instance of a smartphone, the gathering software may gather stills and video at the same time or switch seamlessly between the two to access 'perfect' social media moments for that individual.

Networked social spaces and always available communications are provided content from devices where this hybrid gathering is enabled and expected by default. Practitioners need to understand the technological and social models of the software controlling the gathering of images in the image gathering device (Amini *et al.*, 2019) or their creativity will be limited by them. These models for processing and 'ideal' images are programmed by individuals and as such open to bias in their interpretations. (Gaonkar, 2020)

Practitioners may or may not be in control of the hardware in the way they were with a simple mechanical film-based camera however they are still in control of light. Light has always shaped the scene in three dimensions and creative image professionals use a wide range of lighting techniques, models and approaches. Ones that have been tried and tested through still and moving image practice, to more effectively supply a sense of depth in the two-dimensional image. They are in control of 'The light image' (Maynard, 1997), and they are creating the light image rather than simply recording the light. Then the automaticity of the recording process envisaged in theory is preceded by a planned creative process to 'paint with light' (Alton, 2013).

Lighting approaches for hybrid and established productions

This section of the paper discusses how critically 'evaluating image capture and lighting technology and approaches for still and moving images to analyse the differences in approach and equipment to discover how they are similar and to what level they can be integrated into a single lighting schema' (Aim 1) provides insight to practice and presents a proposal for future practice. This conclusion draws on data gathered and analysis undertaken in an attempt to also understand aim 2 'To investigate productions in Hong Kong that require delivery of still and moving images at the same time and analyse how this affects lighting and filming the final images to meet local industry expectations and assumptions around image and content.' Understanding these areas allows the study to present the following analysis and conclusion, elements of which are included in the following argument.

There are a range of approaches to gathering still and moving images in hybrid gathering situations in the same location and at the same time. The most established approach is the use of separate professionals to gather the stills and moving images. An approach that research shows is reinforced by professional identity and cultural/societal expectation and assumption around the role of the professional in achieving excellence in either the still or moving image. These separate professionals may use one of three lighting approaches. This approach provides the most flexibility in lighting as, although the situation is the same, the lighting and shooting for stills and video will be able to be tailored to fit the remit of the stills and moving image using the full range of shooting and lighting techniques available for the relevant image.

In this approach there is another technique where the stills exposure and strobe can be taken during the time between video frame recording using a sync device for the separate cameras and lighting systems. This approach has been implemented by Satellite labs Framelight system (Satellite labs, 2018) to allow larger setups with separate still and moving professionals use the time and space to gather their images without interfering with the other professionals. This system however relies on a technical approach enabled through between frame capture of stills on a second camera. Using a sync device to strobe and capture between frames without affecting the continuous light for the moving image limits strobe duration as it cannot exceed the between frame blackout periods.

In the first lighting approach for separate professionals the use of separate lighting for stills, typically using strobe sources and separate continuous lighting for the moving image

increasingly uses LED fixtures. It may, however, use any established luminaires from incandescent to HMI or fluorescent to achieve the desired results.

The second lighting approach for separate professionals is the use of the same lighting setup which requires the use of continuous lights to enable the moving image to be captured using the same light as the still images. This can be modified to allow the still image improved flexibility with the use of LED sources that allow sync with a power increase during still exposure and in some cases HSS allowing greater flexibility over exposure control during still capture.

Separate professionals may also find themselves using an approach with a continuous light setup for the moving image that is maintained and modified with strobe during still capture. This gives a degree of additional control over subject exposure and modelling during still capture while maintaining a continuity with the moving image.

In the case study, approaches one and two were used and the interviews demonstrated the importance of communication between professionals when using the above approaches for successful delivery of the lighting and image gathering. As the production day progresses, forward planning and flexibility in approach with effective communication allow the still and moving image professionals to work in concert with each other to deliver within a hybrid gathering situation.

In hybrid image practitioner approaches, one practitioner is gathering stills and moving images in the same setup using one of three approaches. Beginning with the use of one continuous lighting setup for stills and video. The capture of stills and video at separate moments or stills gathered while shooting video using a between frame capture, possible on some cameras such as the Sony rx100 (Sony, 2020), and when using a flicker free high frequency luminaire. In this approach stills gathered using a HSS or standard shutter sync option are now achievable using LED sources with power boost and sync options.

The second approach for the hybrid professionals is the use of a continuous lighting setup with stills being gathered from video frames in camera or in post-production. With this approach there are limitations from the shutter speed that is achievable in order to retain a smooth video recording and typically is most effective when approximately twice the frame rate of the video format being recorded, so a video running at a frame rate of 25 fps would ideally produce a shutter speed of 1/50th sec and a frame rate of 50fps would produce a shutter speed of 1/100th of a second. There is degree of flexibility in this, however longer or shorter shutter speeds will produce visible artefacts in the video recording and limit its viability.

Finally, the hybrid image practitioner may use separate lighting setups while switching between still and video capture during the process and use separate continuous and strobe setups or continuous and strobe sources in the same setup. This approach gives complete control over lighting for still and video to be tailored to the image being captured and retain the complete range of creative control over each image. It should be noted that this approach is the most time consuming of the approaches and as such may not be viable in some hybrid cases. Assuming that budget and time constraints are what has driven the project to utilise hybrid capture, this would predicate the hybrid image professional potentially working on their

own. Therefore, they would need to simplify what equipment they would take with them and utilise to best facilitate the production day while creating effective images.

The data illustrating the increased use of LED's and of simple modifiers (softbox, diffusion panel and reflector), demonstrates the current practice of a rapid production day. This is combined with professionals, in many cases, controlling minimal initial light sources with a preference for easily manipulated modifiers to facilitate the speed of production. The use of LED's can only continue to increase as the facilities built into fixtures make them even more attractive to all image makers. Features such as increased colour fidelity and remote networked control, using standardised DMX and other non-standard protocols to control sources in a setup from a single location.

I did find it interesting that only one professional chose flags as a modifier as the other modifiers chosen will emit a larger softer source that will direct light across the entire scene. These modifiers limit the dynamics of a location without some kind of interruption close to areas of the scene or subject (such as using a flag), as they need their illumination reduced in areas of the scene. This may potentially point to a more common use of light source close to the subject relying on the inverse square reduction in light output to minimise the key light's impact on the rest of the scene as used in location 1 and 3 of the case study.

Where lighting for hybrid gathering is also continuing to develop is in a smaller number of LED fixtures integrating flash sync capability. With a momentary power boost mode, they enable a greater range of flexibility when switching between still and moving image gathering during hybrid gathering (Rotolight,2019). These hybrid lights also offer HSS to extend the viability of using a wider range of shutter speeds when shooting still images. However, this typically comes at a reduction in output of the source, requiring a use of higher ISO and potentially degrading the image. With higher power LED's this may not be an issue and the flexibility during hybrid capture may well be worth the compromise.

With the increased use of simple modifiers and a reduction in crew sizes in the situations where hybrid image practitioners are hybrid gathering, it may be time to look to a new lighting model, which I refer to as the hybrid light. A 'lighting' model I know that will not be liked by some of my colleagues as it embraces the control that AI and virtual modelling of lights can bring to our toolkit, and some colleagues may see this as giving creative control away.

AI enables the new lighting practice.

Artificial Intelligence pre-processing and deep learning can bring marked improvements to the camera and post-production of the image (Olympus, 2019). Rapid developments in subject recognition for autofocus systems allow a range of subject aspects to be recognised and tracked. Included in these are vehicle and animal body shapes, including birds in flight, and face detection of people and several types of animal faces. Scene recognition has been implemented using AI to allow a range of exposure and colour adjustment decisions to be made. These can more accurately record the image the algorithm recognises in both pre and post capture processing.

AI, including lighting models of face structures and AI tracking, are becoming so good that in bird focus systems, as one example, multiple targets are recognised and tracked simultaneously (DPReview, 2021). It is possible see lighting models being tracked and applied over multiple subjects in a scene to build a scene lighting mode that can be manipulated in the future.

Each of these areas affects the image being recorded through the camera either before, during or post capture. More recently it is the AI recognition and adjustment of lighting in an image post capture that could possibly have a more significant effect on our lighting of the image as we move forwards.

Google's portrait mode for the Google phone app on android phone uses an AI model built from thousands of images of human faces. The processing produces a shader model that can be applied to the recorded image to apply a new 'light' to the image including shifting shadow placement as the light moves (Tsai and Pandey, 2020). The AI image processing chain is enabled using a neural Processor unit (NPU) in combination with the image serial processor (ISP), central processing unit (CP) and general processing unit (GPU) in the smartphone. The adjustments take place in real time, although it is not currently without limitations, and some images will cause the AI algorithm to render incorrectly or fail completely and not generate a new 'light' with its associated shadows.

Lighting is concerned with illumination but equally with placing shadows and controlling those shadows from the relative intensity of the light to the shadow area and the softness of the shadow. Related to this area of lighting control there is ongoing work on routines that can eliminate or adjust them on subjects and with correct recognition of the shadows transition area based on paired neural networks (Chunxia, 2020).

Using these new 'lights' and their shadow controls over subjects in the image using the AI modification it is possible to add real lights in the real world to direct or shape only the subject key-light. This allows minimising real world light sources and therefore setup time while retaining the control over light that a would traditionally require a larger lighting array. The future of lighting in some areas may be controlling the starting point of lighting with real-world lights and using our AI controlled and added lighting elements to finalise our 'lighting' of the image.

With light and depth information now being received by multiple camera sensors in smartphones including LIDAR, and hopefully in dedicated cameras in the future, we may be able to remodel our light, establish depth and shade, and change them in ways not possible before. This not suggesting that practitioners hand their lighting creativity over to the AI in our cameras and phones, but they let the AI light become another tool in 'painting with light'. Another creative addition to the image and lighting toolkit, from filters in front of our lenses and barn doors on our lamps, to take full advantage of what they, with more neural processors and neural engines, can supply to the creative toolkit in a future hybrid image world.

In post-production the use of AI can speed up work by automating areas, such as sky replacement in Luminar AI, and in processing repetitive tasks, and this has already been implemented in software including Adobe Premiere and Blackmagic Design:

'The DaVinci Neural Engine provides simple tools to solve complex, repetitive and time-consuming problems. For example, it enables facial recognition to sort and organise clips into bins based on people in the shot, to reframe shots and more.' (Blackmagic Design, 2021)

and Colourlab AI uses AI algorithms to:

'Advance colour grading workflows by removing the manual process of matching shots. Traditionally colorists accomplish this with technical prowess and experience, but Colourlab Ai turns colour grading on its head, saving enormous amounts of time by perceptual colour-matching with astounding accuracy and blazing speed.' (colourlab.ai, 2021, p.1).

I am not suggesting we 'become digital' (Nicholas, 1995) but we embrace the digital and integrate our thinking and lighting in the real and the digital.

Creativity in lighting, whatever the approach being used, is not to be lost. Whatever the technical approach and the analysis of the systems, the technology, and the influences from us and our industry, colleagues and culture, we are always striving to be creative. As we watch light fall across our subject we make subjective decisions on beauty, impact and the effect on our framing, our relationship to the subject and the scene, and we position our lights and camera in response to the creative needs of the images. Whatever pressures are exerted on the image production day, as image makers we must always remember that without light there is no image and control of light, from positioning the camera and subject relative to available light, to modifying available light or being in total control of all light sources, is the fundamental starting point of all our image creation.

8.4 Artefact: Output from the hybrid image practitioner

This section presents a small artefact of output from the hybrid image practitioner as an example of the viability of the hybrid gathering process in Hong Kong with three images from hybrid shoots and a discussion of the gathering approach used in each instance.

The Images are from a single instant of production with examples of different hybrid approaches taken on this shoot. Image 1 was lit with continuous LED sources and a high resolution still gathered from a 4K video stream after recording.

image 2 was a still image taken using strobe lights in soft boxes to provide a high key soft(ish) environmental portrait. It was taken using a hybrid camera (EOS R) switched to photographic mode before switching back to video mode and moving to LEDs within the same modifiers for video clips.

Finally, Image 3 was a still image using the same camera in photographic mode but shot using the continuous light from LEDs within soft boxes.

We can see in the images that they function as both illustrative examples of the hybrid image gathering approach and various lighting approaches and also as a representation of the social construct during covid-19 in Hong Kong where masks were included in every photo and video shoot as at least one option to adhere to covid-19 social gathering legislation.

When filming, the production team are required to wear masks and only those being filmed can remove their masks during the production (FSO, 2020) although in sports, masks are not required (FSO, 2020). Filming in Hong Kong has recovered enough that freelancers and SMEs in media production can now still make images under these conditions.

Image 1 A portrait gathered from a UHD video frame.

In this image the subject and background were lit with continuous LED lights as the video interview was the main content and the still was an optional thumbnail image for the web.



Figure 72: Artefact 1

Image 2 A portrait gathered using strobes within the same mounting as LED fixtures.



Figure 73: Artefact 2

In this image the client requested a high key environmental portrait to emphasise the 'health' of the food and the chefs. Two strobes and soft boxes lit the Chefs and the end the Kitchen to provide a relatively soft and even light, although a rapid pace of shoot on the day meant that the shadows are a little too harsh in some areas.

Image 3 A portrait gathered using LED continuous light.

In this image the image was captured using photo mode on the camera to produce a 30-megapixel image that could be cropped as necessary. It was taken using the LED setup later used for video and designed to light the subject while not overpowering the environmental lighting.



Figure 74: Artefact 3

8.5 Reflections

As I reflect on the research process, I would like to emphasise how the process of reflection itself was a major result of the project's insight. It has been my capacity to review my profession and the people in it differently.

Examining my own practice and starting with the literature review and context literature I saw how the knowledge base of the professional and non-professional was overlapping increasingly through network sources and technological developments. During this stage I also reflected on my own professional development including the transitional years of the 'DSLR revolution'. In 2010, at the start of this 'revolution' I filmed a documentary investigating child trafficking in Bangladesh slums using DSLR cameras to shoot video in order to gather the narrow depth of field capable through the larger sensors. This involved dealing with technological limitations of cameras at the time that would overheat regularly, requiring the use of two cameras that could constantly be rotated between to allow them to cool down. It also meant using compact still camera lenses with very poor focus breathing control which forced a very fixed focus during shots and in moving shots required the camera to be kept at a fixed distance from any moving subject to avoid focus changes.

In a very practical way, the crossover illustrated how my professional and personal lives were changing and being affected through change occurring around us. The crossover in skills and knowledge of hybrid gatherers became more apparent as I worked with journalists from the BBC, CNN and content creators producing everything from Kickstarter videos to comedy content. This continued through the 2010's covering a wide range of projects from subdivided housing in Hong Kong to funding for new food products, until 2020 when covid and the NSL in Hong Kong severely limited certain types of production.

A change in my perspective

When I started the doctorate, I took for granted my knowledge and the lack of it in those without equivalent experience. These assumptions changed as I examined the technological changes and how they were enabling different opportunities for people to acquire knowledge. They let me; in my role as an educator; establish a new positioning to assess learners needs and existing knowledge. This, in turn, allowed my delivery of learning materials to become more effective for learners. The observations and insights from critical reflection let me see my role as an individual and professional cannot be furthered without this reflection and knowledge. I believe this will affect and define my professional future and this change in my perception through the project is discussed below.

This reflexivity in my doctoral learning helped reveal my own presuppositions and emotional ties to aspects of practice that could potentially influence my interpretation of the data and form conclusions. At the same time the reflective process helped inform my analysis and conclusions from insights through my own professional practice and new insights into my own technical and professional knowledge.

Research impacted personal insights to practice

My doctoral journey has been many things to me. It has been an extension of my professional and academic journey, a long adventure through theory and practice, where I was present in periods of change and experienced how that change affected my own professional role and the roles of those around me. It allowed me to reflect on the details of my own practice and ask the questions: What do I do? How do I do it? Why do I do it? And where do I go from here?

Throughout and beyond the research, the role of image creator as part of my identity has informed my experience of my practice and interaction with others but also with my perception of the world around me. I spend a large amount of time assessing what I see from the viewpoint of the camera and that learning, both conceptually and corporeally, informs multiple layers of my professionalism and practice that are challenged by developments investigated in the research.

The revelation that image creation is moving away from including lighting as a central aspect of its control and creation is a sad possibility for me and at the same time an exciting possibility. Creating images, from scratching on cave walls to painting and photography has always involved an implement of some kind (unless we are tracing shapes with our fingers) and whether photography and moving image creation is seen as artistic or devoid of artistry owing to its automaticity, for those of us creating these images we see our intent as the creative moment. We see that intent from conceptualising the image through positioning of the camera to the lighting and to the exposure of the image through to post-production. We still create an image and as I look at the creative output in new technology platforms, I see a future of infinite creativity.

Presuppositions and the reality of changing roles

I have never been shy of technology; indeed, I have actively grasped it in all my career paths from music to photography and moving images and then to the hybrid image. It is a way to enable creativity, especially now with its interfaces and advances allowing so many more people to express themselves visually and it is always personally surprising when I see other creative professionals restrict their creativity within existing definitions of their creative roles. The project confronted me with this restricted identity among professionals and among the industry including clients to a much larger degree than I was expecting.

The reality of the challenge undertaking doctoral research

With the surprising insights to professional identity and practise the study of the doctoral programme was a very personal and at many points an emotional experience. At the start of the programme Middlesex University still had some presence in Hong Kong (I was indeed part of that presence) and we as doctoral students would receive visits from supervisors or at least members of the doctoral team in Hong Kong from time to time. Even with this intermittent local support the challenge of doctoral research was significantly psychologically taxing as Ali and Kohun discuss in their paper on dealing with isolation in doctoral programmes (Frederick,2006) and isolation that had an impact throughout the remaining time on the programme along with deep periods of impostor syndrome and the psychological impact of social change and lack of freelance work during the pandemic.

This isolation was further problematised with the move of the Middlesex University DProf in Hong Kong to a completely distance learning programme where the isolation can play an even more significant difficulty for students (Croft et al,2010). It is interesting that even recent papers such as (Carley,2012) discussing the problems of distance learning ignore emotional/psychological factors as negative or positive factors in distance learning when evidence in research suggests they are significant factors in continuation and completion of distance learning programmes (Croft et al,2010) and this positivity for programme delivery and financial benefits may well supersede concerns when designing and delivering such programmes from materials, structure, support and adequate staffing and student supervision.

This is not to say that my advisor, Dr Elda Nikolou-Walker, was in any way detrimental to the process, in fact entirely the opposite is true. The support and advice from Elda played a significant factor in my ability to complete the programme and I will forever be grateful for her help.

Personal benefits from practice

The doctoral research process has brought significant benefits to my knowledge and practice, and additions and developments to my professional network should also be highlighted as major areas of beneficial impact throughout the programme. Where my initial thesis position was based on assumptions formed through confirmation biased observations of the original workplace, I found myself in the data gathering and analysis actually pointed to a world of maintained barriers in many places and a slower uptake along established professionals but a position where the future uptake could be seen as inevitable in a large array of professional roles and industry sub sectors.

The reflection on this picture of industry and need to maintain a professional identity within a defined role by many practitioners with the reflections from my case study narrative process where my own role transitioned between modes of practice individually and when working with another image professional has given a personal insight to my own changing professional identity and how these interactions and socio-cultural influences lead to changes in my professional practice.

The doctoral process also developed new interactions with other image professionals as I moved from colleague to insider researcher and back again, each time changing my colleagues' perception of me within the professional sphere. These changes in perception allowed me to interact in new ways and promoted the building of existing professional networks and relationships in unexpected areas including consultation for large media organisations on new projects as their perception of my potential role changed through the research process.

The continuous study, accumulation of subject knowledge and investigation into the surrounding socio-economic and industrial factors that impacted the research area improved and altered my research and development approaches and capability with the investigations distinct approach to data gathering. The mixed media methodology, as I discussed in my methodological considerations, made sense as an approach as it felt like bringing aspects of a story together in journalism and factual production but the depth and scope of the research was significantly wider and deeper than a media story would often be, feeling more akin to a

documentary than a factual story or news item. Applying this level of focus and detail to primary data gathering changed the level of interaction with the participants and forced me to reconsider my approaches to survey and interview gathering while revisiting the case study in detailed narrative form gave new insights into practice and reflexive observation.

A challenging project through challenging times

While the project process itself developed new professional insights the process of the project itself brought new challenges and developments as it progressed through its various stages and in an exceptionally weird period in history both globally and for Hong Kong. I felt periodically illuminated, surprised and sometimes confused by the process as the project presented its own changes as access to other professionals shifted and moved with in and out of online and face to face communication all the while chasing an area continually shifting with what seemed like daily developments in image technology and lighting technology (specifically LED developments).

And while this information changed, I fought with trying to balance theory from moving image and photographic theory with a materialist insight using models from assemblage theory and the practical aspects of technical developments of image gathering and lighting technology and practice within a changing Hong Kong. The struggle though, helped inform my analysis of the primary data with the literature and insights from applying reflexive observations on my own practice and the practice of those around me, helping form the links between changing lighting/vision practice in Hong Kong and technological/social change.

The planning and management of the doctorate is one of the more challenging processes I have undertaken even when compared to running live broadcast operations while live studio directing on twelve-hour shifts. The challenges I found with the doctoral management were logistical when gathering data including location (real and virtual) practicalities and personal, through negotiating access to participants over the extended period of data gathering and through careful interview technique when gathering data.

Additionally, I found the application of ethical design and interaction with the participants, before and after their data was gathered, to function as a more care-based approach than the legal responsibilities considered in media production when planning for rights access to participants and interviewees. The responsibility of the doctoral researcher is a well-defined but personal responsibility where in many media processes aspects of care are shared across roles from health and wellbeing to legal ethical requirements of data/content gathering and use. This change from the majority of my ethical responsibilities in media production was a change I felt a particular moral obligation to ensure proceeded to provide the very best care for the participants the whole process could provide. When this is combined with the personal time management of the extended period the DProf occurs over we find a project that is challenging to maintain across a range of temporal periods and a project that developed my skills and experience as I undertook it.

Pursuing a doctorate in an area that is being driven in many aspects by technological change felt like chasing an ever-changing goal and it was thanks to my project management skills that I was able to stop myself gathering an overwhelming array of information as the technology

related to the research continued to change and still continues to change. I refer to this continued change in my findings and conclusions, but it felt at times like it would never stop as my interactions with light and camera technology in practice have not stopped developing with the technology.

How the research would reposition future research

Where technological change drives changes in practice and opens changes in creativity as discussed in the project there was also a feeling that I lost an important part of the analysis through the academic process. While writing and trying to deliver an academically acceptable paper it also felt as if I was losing, or rather not conveying my creativity and passion. As I read and revised the paper, I realised that I had lost my voice. The spark that drove my career in image creation does not sit in the work as it should. As a result, one of the recommendations for future work addresses creativity in hybridity.

If I could start the process again, I think this is a balance I would strive harder to deliver as what should come across in this paper is that passion and creativity that myself and all the other creative image professionals, I have had the joy to work with over the last twenty-five years bring to the image every time we attempt to make our next image. It is this passion and creativity that sits at the nexus of all the other factors from socio-economic and cultural expectations around images and image-professional roles to technological developments that offer new possibilities for our image creation, and it is this passion and creativity that will enable us to light our way forwards.

8.6 Summary of major discovery points

In conclusion the project has produced four key discovery points. These are the new role of the hybrid image practitioner, a new conceptual approach to considering lighting practice, the ongoing developments in technology driving change in image production, and the conceptual framework for practitioner research that utilises assemblage as a core component. These four areas are summarised below:

The Hybrid Image Practitioner as a new role

This proposes that reframing thinking around the role of the hybrid image practitioner is important, necessary and unavoidable for industry and practitioners to best utilise the unique capacities of this new role.

The project's primary data illustrated that industry has an implicit understanding of change regarding hybrid skill sets but attributed them to still or moving image professionals acquiring new complementary skills. This data revealed widespread acceptance that the hybrid skill set would play an increasingly important role for practitioners, however established practice and industry language continued to limit the consideration of a new role.

The hybrid image practitioner role is important as it reframes the hybrid skill set as one that is uniquely powerful in its own right and not merely a mix of skills added to an existing skill set.

The hybrid image practitioner integrates their thinking around the creation of still and moving images, bringing a new perspective to production where they are viewed as ends of a spectrum rather than separate mediums.

This role has arisen in a short space of time as technological changes in cameras, smartphones, networks, and lighting facilitated this new capacity for hybrid image production. This capacity has been adopted by established still and moving image professionals but has also led to a new generation of practitioners with no knowledge of legacy devices that limit gathering to either still or moving images. These new hybrid image practitioners will be important to the industry as it moves forward. They will be key to innovation and development of hybrid image production as the need for visual communication continues to develop as an essential component of the connected workplace.

For image production industry professionals and organisations, an understanding of the value of this new role will be crucial moving forwards. As the research data showed, the discrete skill sets for still images and moving images are large and complex in their own rights. Hybrid image production adds further complexity, challenging existing skill sets. It will therefore be equally important to provide opportunities for new education and training before and during a practitioner's career.

A new concept for considering lighting practice

The project revealed how changes in lighting technology hardware and software were allowing practitioners to interact with lighting in new ways. The development of smaller, more energy efficient LED lighting technology allowed greater control and freed practitioners from the restraints of utilising lighting technology and approaches requiring large crews and large power supplies.

As a result, the real-world use of lighting has rapidly encompassed a wide range of techniques and approaches previously restricted to large professional crews. Colour shifts from a lighting source as one example was hugely complex and required large fixtures with filter arrays. Multi colour LEDs allowed this lighting technique to be used in small setups by single operators utilising multiple small fixtures. Combined with the equally important integration of wireless control systems in fixtures managed through smartphone apps, single practitioners have become capable of delivering lighting setups previously restricted to large scale productions.

These real-world changes have become the first stage of new thinking over lighting, but the major shift has been the integration of real lighting in the live image and virtual processing of lighting in the final post-produced image. As the light image is set in the real world it's received image is examined by camera systems that allow for three-dimensional depth information, illumination, colour, object recognition, and scene recognition. These data sets allow AI processing to simulate additional light sources that can be controlled within the device app in the case of smartphones. They can also be combined with the two-dimensional image information and sent to post-production apps that allow for further control over the 'light' within a shot. We can move from seeing the light within an image as a received construct of

physical elements in the real world, to a combination of real and virtual sources to illuminate and control illumination of objects and scenes in the image.

This is an important new concept as technological developments have allowed the real and the virtual in production and post-production to be merged in a very short time. The basic concepts of real and virtual lighting space have been in place for much longer, but the implementation of a merged lighting space has only become possible owing to recent developments in AI, image modelling, and lighting technology.

A.I. and other key technological developments have driven change

The project revealed that technological change in key areas of lighting, cameras, smartphones and AI has provided a perfect storm of change for the development of the hybrid image gathering practitioner. As mentioned previously, the development of LEDs rapidly changed the lighting landscape and gave access to a wide range of lighting fixtures and approaches for still and moving image practitioners. At the same time, camera development, in particular the addition of video to DSLRs, prompted a massive change that produced viable hybrid production devices. These innovations continued with camera technology moving to mirrorless bodies where video and still images were even more effectively gathered.

The hybrid gathering device then continued to innovate rapidly within smartphones. These acted as a nexus for technological development as their huge sales potential prompted manufacturers to make each new phone and app more competitive. The resulting improvements in hardware and software for image gathering, editing, processing and distribution, further accelerated their viability as professional image gathering devices.

Network communication spaces, including social media platforms, drove demand for visual content. New opportunities in this space increased the need for workplaces to hire content creators or adjust existing roles to include still and moving image production. This in turn increased the demand and viability for hybrid image practitioners.

AI underwent a period of rapid development during the past decade, accelerated with the addition of NPUs in smartphone processors. This increased the pace of development and implementation of AI across image gathering, virtual spaces, virtual lighting, and scene/subject recognition, as mentioned in the previous section. In cameras we saw a greater implementation of AI systems across all camera systems to improve the user experience and effectiveness of the camera from initial image gathering to post-production output.

New Developments

The development of LED lighting continues as more energy efficient sources become available, although they are possibly approaching a physical limit of output efficiency. Future development may concern other areas, such as lighting control systems, colour accuracy and variations of new LED emitters to facilitate faster and more accurate control over intensity, colour temperature and colour rendition. The continued evolution of these advanced lighting sources and control systems can only offer new creative possibilities to the hybrid image practitioner.

In production we see continued innovation in virtual backdrops with the use of LED screens and software systems including Unreal Engine. These virtual backdrops allow realistic rendering of virtual spaces as the camera position and lens angle is tracked in the real world to allow accurate presentation of the virtual space in the studio space. Success with these virtual studio set-ups on large productions such as 'The Mandalorian' continues, and smaller productions and studio spaces have started utilising the technology to make production timescales more efficient and more flexible.

The integration of ambient lighting from a projected 'world' eliminates many problems with previous 'green screen' approaches including real time reflections and colour casts on the real-world objects in the scene. However, they have problems of their own. For example, distant and near light source in the virtual world are still projected from the LED screens at a fixed distance and may interact with near objects in an unrealistic fashion. Nevertheless, these new developments suggest that the integrated thinking proposed in this thesis may be beginning to occur.

We have seen further development of AI in image gathering and post processing of the image. This has included effective subject recognition and tracking of even partially obscured subjects. We may, however, see some limitations placed on generative image AI have driven much controversy recently with their use of existing works as input data sets without the creator's approval. These controversies may prompt adjustments or new guidelines to ethical and moral decision making in AI implementation that will need to be considered by hybrid image practitioners. Hopefully such guidelines will produce AI systems with decision making based on equality and care for the individual.

Finally, we have seen the recent production of multiple camera-to-cloud devices and infrastructures which allow the camera image to be transmitted over any available network. Instant access to the video content or still images in suitable formats for online delivery is then available. Such systems and devices allow production teams to work more effectively and provide immediate feedback from post, editorial and VFX teams during a shoot, to deliver the most suitable footage for the project.

Assemblage as part of a conceptual framework for practitioner research.

The final main discovery point of the research was the proposal for using assemblage theory as a key component in practitioner research. It proposes a conceptual framework for practitioner research using assemblage theory, theory relevant to the area of practice, and real-world insights and data from practitioner expertise to examine practice. This model can produce insights that add detail into the complexity of practice.

The framework proposed was illustrated with a detailed discussion of the hybrid image practitioner using this model. It allowed insights from practitioner data, literature, image theory, and lighting theory to be combined with those from an assemblage of the still image practitioner and moving image practitioner. This in turn allowed an examination of an

assemblage of the hybrid image practitioner. This detailed model gave insights into areas of current practice and the interactions that generate new skills in the context of existing practice. The interaction of the areas of this framework provided unique insights into the role of the hybrid image practitioner.

Within this assemblage its processes engage and accumulate the range of the project's research to provide an image of how 'productions in Hong Kong that require delivery of still and moving images at the same time affects lighting and filming the final images to meet local industry expectations and assumptions around image and content.'

I suggest that the framework presented could be utilised across practitioner research allowing theory and practice to be more clearly analysed and presented to both an academic and professional audience. This would provide a valuable framework for the future work proposed at the end of this paper.

9 Recommendations

The project's findings provide insights from the primary and secondary data that allow a range of recommendations to be provided. In this section I present five recommendations including a two-part recommendation for future research to follow this project.

Recommendations:

1. Improve lighting education and training.
2. Integrate thinking around roles.
3. Improve lighting standards presence on fixtures.
4. Access still and moving image lighting approaches.
5. Future research
 - a. Aesthetics of hybridity
 - b. Developing a new theory of the mechanical image

Finding 7.2 asserts that the development of still, moving and hybrid capture in Hong Kong is a result of interacting factors from technological development in lighting camera and output mediums. This affects the creative image maker in multiple arenas from client and audience expectations of the image through envisioning the image. It affects the physical process of lighting and image capture and the post-production of those images, whether in-camera/device or in post-production software. These combinations of factors produce a consistently changing body of knowledge and practice and require new entrants and existing practitioners to attain up to date knowledge. This need for education is discussed in recommendation 1.

This knowledge base would need to include technological information on gathering, lighting and post-production developments as we see in Finding 7.3 that each of these areas are directly affecting hybrid gathering. The demand for a hybrid skill set and knowledge is discussed in finding 7.6 and highlights why these areas of integration are required which is discussed in recommendation 2.

Finding 7.5 discusses the significance of LED lighting development in stills, moving image and hybrid production, its rapid, continuing development including continuous light output and camera sync able strobe output continue to increase its viability for hybrid gathering. However, we see a range of inconsistent standards in specifying the light output with a range of accuracy that some lighting manufacturers game to increase the appeal of their lights. These factors lead to recommendations 3 and 4 discussing lighting standards and the need to draw on still and moving lighting approaches in hybrid gathering which also draws on Findings 7.2,7.4 and 7.6.

9.1 Improve education and training for lighting and hybrid gathering.

There is clearly a continuing demand for skills and knowledge development for new entrants to the industry in Hong Kong, specifically in lighting for both the still and moving image. The research summarised in Findings 7.5 showed it is the integration of lighting with camera technique and the understanding of the two as inseparable parts that seems to be lacking in new entrant education, or rather that lighting knowledge may be entirely lacking. This occurs because of separation of lighting and camera teams in television production and film production producing a vacuum of coordinated approach in the way the two areas are seen. We see in Findings 7.2 and 7.5 that these industry norms are reinforced and can establish knowledge gaps that are important to fix for the modern practitioner.

In addition to these areas lacking in new entrants' knowledge we see across all of the findings that the rate of technological and industrial change is constant and that lighting and hybrid skills and integration of knowledge from stills and moving image practice is valued by clients, organisations and professionals. If these stakeholders see this happening, then it reinforces how important it is to improve education and training in hybrid image practice and lighting.

For a future education that can provide justice in its delivery to future professionals the integration of image and lighting knowledge and practice should be a priority. This would enable those future image makers to engage with the entire range of techniques for their image creation as appropriate to the situations they find themselves in. Whether needing to film or shoot an interview in a house, an office or a studio, or shooting content for a commercial, or dramatic presentation they would be prepared. To accomplish this will require building lighting and integrated still/moving image knowledge into media programmes with opportunity for practice integrated with other areas of practice. This learning space would allow the possibility to experiment and understand how vision and light can develop to allow for application later in the workplace.

As it also seems that lighting is not necessarily a part of the skill set of existing video professionals (interview theme5), organisations that employ such professionals directly should be building lighting knowledge into CPD for those image making professionals. This will benefit the professionals and the organisations as the professionals will then be able to assess when they need lighting and how to supply or modify lighting to gather a more effective image.

With an increasing demand for hybrid skills as discussed in Findings 7.2 and 7.5 and in the case study where 'Demand for Hybrid image gathering in Hong Kong tends to increase as the size of the client organisation decreases' CPD should also be offered for practitioners to gain complementary skill sets. A brief educational outline is supplied in sections 9 and 10 of the appendices regarding aspects of this recommendation.

9.2 Integrate thinking around hybrid roles and real/virtual lighting.

I believe a significant change that would benefit freelancers is a move from the perception of still and moving images as separate roles. This change will not occur overnight but changing our thinking around the lighting and capture of still and moving images and planning shooting both simultaneously will benefit a range of productions and in an increasingly visually demanding social network we live in is a change in thinking that will have to occur in the future, if not the very near future. The need for this change in thinking is illustrated within Findings 7.3 and 7.6 where data shows how technological developments across camera and imaging technology are increasing the possibilities for hybrid gathering. It is also shown that a need for a hybrid skill set is understood to be needed by practitioners, if not now, then in the near future.

For professionals, lighting and planning for post lighting approaches in the future of the hybrid image gathering approach is a change that will happen incrementally for multi-skilled professionals who are dealing with their entire production workflow. Equally it will be important for professionals dealing with just the front end of gathering as, as is currently the practice, understanding where the image will go after it is delivered and how it will be treated allows us as image makers to light and shoot in the most effective manner and format for that post-production process. Delivering the image that is the most effective for the client's needs will always increase the chance of gaining more work with that client. This requires a shift of thinking of light to before capture to both before and after capture with lighting being placed or modified to allow apparent/virtual light to be placed or adjusted more effectively in post and for a shift in thinking of still OR video to still AND video before and during capture.

Rather than thinking of lighting as the starting point of the image we should think of lighting as the beginning and the end of the contemporary image. whether lighting as it is displayed/projected or lighting as it is manipulated in a three-dimensional record of the initial light image.

9.3 Improve lighting standards presence on fixtures.

We see in Findings 7.5 that quality of reporting systems and standards for light quality measurements vary which can create problems when assessing how a light will appear on camera. To deliver effective lighting for still and moving images we need to be able to more reliably assess our sources quality of light and for this to be possible the lighting production industry needs to be more consistent in using better measurements for their sources than CRI with its known gaps in assessment over colour rendition. A consistent move to more detailed systems would greatly benefit the practitioner. More companies providing accurate tm30 or SSI measurement of sources would make a significant improvement in the professionals' ability to decide on the correct source to use in any given lighting situation. To a degree we have seen this start to happen with some manufacturers who specialise in making LEDs for image creation using SSI and TM-30 however a greater number of manufacturers are still using CRI and this needs to change.

9.4 Access still and moving image shooting and lighting approaches.

The hybrid image maker is in my opinion an aspect of the future of image creation as a role and as a skillset of a whole range of professionals and other roles in the world. This position is reinforced through Findings 7.2,7.4 and 7.6 where the need for a hybrid skill set is seen to be a necessity and the hybrid skill set is being driven by technical, industrial and social change.

Professionals who are entering the industry and existing professionals should gather lighting and shooting approaches from both still and moving images to allow themselves full access to the range of techniques and approaches that have developed over the last one hundred and more years. In addition to providing the practitioner with a hybrid skill set it enables them to gather work in both spheres and increase their professional flexibility in an ever-changing industry.

This accumulation of skills and knowledge is more accessible now with online communication allowing us as professionals to talk in forums and gain insight through a wide array of online platforms and media. And if education in Hong Kong takes my recommendations there will be greater training and education opportunities in Hong Kong. We are at a point where the ability to light for both stills and moving and to take aspects of creativity from both arenas and apply them as we see fit is at its most accessible and creative, and we as image makers can use that to enhance our own creativity. or a hybrid image practitioner with an entire rig of small battery powered lights in a bag with control apps to set and sync everything from colour to intensity and lighting effects. multiple small lights to shape the space.

9.5 Future Research

The research project revealed insights into a wide range of factors regarding the still, moving and hybrid production processes. It examined practitioners and industry within Hong Kong however it could not examine every area of practice. Here I present recommendations for future research. The first, 'aesthetics of hybridity' is an addition to the body of research presented that could not be covered in adequate detail and requires significant research of its own.

The second is a proposal for development of an integrated theory of the still and moving image with its beginnings in the research undertaken in this project. It proposes that theory and real-world research are highlighting areas of consistency in a temporal framework for the image that a new theory can be posited but needs significantly more time and investment to present adequately.

Aesthetics of hybridity

As a stage 2 extension of this study, I would propose a study in the aesthetics of hybridity. Where this doctorate studied links between practice, industry and technology it provided, as a result, little insight into the aesthetics and artistry of the creative hybrid practice.

The project revealed a changing world where there is both a reluctance to claim the still and moving image as an identity together. While this revelation showed conflict in identity it also revealed an acceptance that individuals are and will most likely be gathering both still and moving images more often in the future (Findings 7.6).

Integration and insight from both moving and stills continue to influence each other and lighting is changing. The ethereal medium we as image makers have relied on in its ever-changing constancy has moved to an even more ethereal position as both real and virtual light meld together in the image.

Camera technologies have and will continue to integrate AI algorithms whether 'real' photographers or videographers like it or not. And in this there is creativity to be grasped with both hands. A whole new world of expression awaits, and the details of that artistic hybrid form will be exciting to study and reveal at a personal and professional level for myself and all of my creative image colleagues.

This stage 2 study would investigate the aesthetics generated by hybrid capture. It would aim to deliver insight into the aesthetics of hybrid capture and would gather data from practitioners, social media and online data sources. Literature in aesthetics of image from still and moving image fields would be investigated and it would aim to expand the insights into whether the aesthetics of images are developed or influenced through the hybrid process.

Developing a new theory of the mechanical image

The literature review shows how theories of image regarding the new medium of photography (Willis and Porter, 1839) quickly followed its arrival. This was followed with theories of the moving image with the arrival of the single moving image and theories of adjacent image content in the moving image (Eisenstein, Pudovkin). Image theories have largely kept the still and moving images consistently separate. Even when discussed together they are discussed in comparison to each such as (Bazin and Gray, 1960)

Here I propose the outline of a future development for an integrated theory of still and moving images. I would argue that both conceptual models and existing theory, however integrated with practice, still separate the still image from the moving image. I suggest they could be effectively integrated, and this would potentially provide new insights to our view of the mechanically created image.

Using the 'New Theory of Photography' (Philips, 2009) as a starting point we can extrapolate to discuss the mechanical image and moving from still to moving and back again. We see this transition along a temporal continuum from the 'moving image' to the 'still image'. This is further illustrated by AI and image construction analysis of still and moving images from IP frame-based encoding systems (MPEG, 2002) to spatial relationship encoding systems (MPEG, 2002). The reconstruction of neutral density filtration through multiple frames (Olympus, 2019) demonstrates the mechanical image records a nonlinear progression from still to moving images. These virtual analogues of the real world seem to illustrate a temporal 'spectrum' in our perception of the image from static to movement.

This future research would aim to integrate still and moving image theory. It would gather data from relevant fields in the moving image and photographic fields to allow and support relevant arguments. Literature from practitioner sources and theory in relevant areas of image capture and construction would aim to present a theory that could expand our insights into the image with hybridity as a starting point.

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Appendices

Part I.

Work Done:

1. Case Study

Every production has a story, and every story tells us something about the world and the characters in the story. This case study narrative takes us through the story of one production where a variety of hybrid filming and lighting approaches were taken. By hybrid I am referring to shooting and lighting stills and moving images in the same location and at the same time using the same lighting setup by a photographer and a moving image professional, or in the same location but using separate lighting for stills and video by a separate stills photographer and videographer OR often by the same person functioning as a hybrid image creator. In this story I captured stills and video in the same lighting setup as a creative image professional operating as a hybrid image creator using the same lighting setup.

Every story has a start and ours begins when a previous client contacted me to discuss revisiting a video, I had made for them the previous year. Ms B wanted to add new content to replace some elements that had changed since the previous video was made. The conversation finally led to the production which would start in 2018 and end up finishing in October of 2019 with interruptions occurring several times through social disturbances in Hong Kong during 2019. Luckily it would be finished before the impact of Covid 19, and an almost complete stop came in a wide range of media production in the first few months of 2020.

As a result, this story is being told in hindsight and with the benefits of thoughtful insight into what happened, but with the disadvantages of an unplanned distance between the events of the story and its telling. Unlike many stories of the past, this one had many resources to help tell it and reflect on what happened and elaborate on why they were undertaken in the way they were.

As the story is of a video production that became a hybrid production there is a wealth of production material to help, from pre-production emails and notes on pre-production meetings, production planning notes and sketches including lighting plots and equipment planning sketches, to shoot schedules and equipment lists. There were also

reference still images and notes from production reces regarding the location and interviewees and shooting limitations or opportunities.

As media was being produced for the project, I could also refer to the rushes and raw images with the project files for the edited still and moving images and the final still and moving images. Memory is fallible and personal, and these information sources helped to build as reliable a narrative of the production leading up to and with a focus on the production day. This allowed this story to reveal the role of the still, moving and hybrid image creator in planning, shooting and lighting, and the interaction between the people within the case study in creating the scenario where the image creation happens.

As with many stories this one has several locations, and it moves from one to one in a somewhat non-linear fashion as I relate important elements to each other within a corporate shoot day where multiple locations were used for filming and photographs with a diverse range of people, technologies and practices. It is a personal tale but equally a discussion and reflection on process, practice and interpersonal, social and cultural expectation and impacts on media production from concept to completion through the lens (no pun intended) of shooting and lighting in a hybrid gathering and production space.

So many factors come into play in a production, from technical capabilities or limitations of the equipment being used to interactions between crew, clients and anyone else involved on the day to the environment of the location and how it changes between the recce and during the course of the shoot day. I always start with an idea of how I would like the project to look and that goes through negotiation with the client and the world to shape it to the final image.

1.1 The 'characters' and locations

Unlike many stories where we introduce characters during its telling I will provide a brief introduction here to the locations and characters to allow a more effective and compact telling.

1.1.1. Organisations:

- Organisation A - The organisation the video and stills were being created for. A large organisation in Hong Kong with multiple sites and local significance.
- Organisation B - The organisation where the stills and moving images were shot.

Organisation B work in partnership with organisation A on some projects including one which was the focus of the video and stills production.

1.1.2. People :

- Myself
- Mr A - The photographer.
- Ms B - The head of department the production was being made for and direct client for the video.

- Ms C - The marketing person for organisation A.
- Ms D - The senior member of staff (CEO) at the organisation B where the location filming took place. The first interviewee of the day.
- Miss E - A member of staff at organisation B and the third interviewee of the day at location 2.
- Mrs F - A parent related to the project which is the focus of the interviewee - mother of Miss G - Fourth interviewee on the day.
- Miss G - A student involved in the project that is run by organisation A and B. - Second interviewee of the day at location 2.
- Mr H - marketing executive at organisation A
- Mrs J - head of communications department at organisation A
- Ms K - communication team member at organisation A
- Mr N - a member of staff at organisation B - interviewed in location 4 and part of some B-roll

1.2. Overview

1.2.1. The beginnings

In the beginning there was an email. Ms B contacted me in late 2017 to ask if I would be available to create an up-to-date version of an existing video I had previously made for their department. This would potentially involve some new filming for elements in the previous video that had changed over time as well as post-production to edit the new content. After a reply to confirm it might be possible, we then met to discuss the new project in more detail.

Ms B and I had worked on several projects for her, her department and her wider organisation over the previous three years and understood the limits their organisation normally worked in from a budgetary and logistical point of view. With this understanding in place our meeting went well, and we agreed an initial timeline and outline of changes and new footage to replace locations and personnel in the original video that were no longer relevant to the department.

The new footage had to retain a coherency with earlier elements that had already been delivered and with the project brief from the client as is the case in all but a few commercial projects. At this point the project was purely a video production with a limited amount of shooting and sufficient post-production time for editing graphics and finishing with feedback and limited change cycles before final delivery. The meeting went well, and I left positive to draft a proposal and budget for the project which I then sent to Ms B.

After this initial proposal and the project given the go-ahead initial shoots were conducted in 2018 with a rough draft submitted for feedback in September of 2018. Awaiting a go ahead on the rough cut we would receive a request to a meeting to discuss

the project. This and subsequent meetings would change the scope and aims of the entire project, with the focus of the single production day that is the body of this story being only one small part of the entire production.

1.2.2. The saga of a changing production

The First of those subsequent meetings would to some degree come as a bit of a surprise in several ways. As with all project meetings I went into this one expecting some change or changes. Such is the way of life and projects; however I was not expecting such sweeping change in a single meeting.

Arriving early for the meeting I was quickly followed by Ms B and together we wondered why the meeting had been called. Ms B confirmed that the project had been given the go ahead and the request to meet Mr H the head of communications for Organisation A had come as a surprise to her, a surprise she was clearly a little nervous about, so I brought the conversation to production practicalities to take her mind off of having a meeting with a company Executive.

Shortly after we were joined by Mr H who asked if I could talk him through the proposal and the previous video. I had resources from the previous video and explained how the changes and messaging would make the video up to date and retain the messaging that the company had requested for the previous video. At this point Mr H explained that he felt the previous video was confusing as it had too many messages and then apologised to me that the brief from the company had contained too many messages which I had, quite rightly, addressed in the final video.

Ms B looked a little worried at this point and explained the message points needed to be in the video as it was used as a communication tool to several groups of contacts. Mr H agreed they did need to be delivered but felt it would need to be delivered in separate videos to provide clearer messaging. At this point I pointed out that would be very effective but would require significantly more time and money at a practical level to which Mr H, to myself and Ms B's pleasant surprise agreed to.

And then the paperwork arrived. Shiny new brochures from a consultation company on corporate identity for organisation A including a visual way forward for the organisation including logos, colour palettes and fonts, which largely consisted of fairly standard Hong Kong corporate style of high key, low contrast ratio, lighting look with a narrowly defined fairly saturated colour palette. Mr H turned to me and Ms B and explained that this was where the organisation was going and he wanted to expand our project using the new guidelines as an early shift to match their new coherent cross-media identity.

It was at this point that the project suddenly moved from a video production to a hybrid production and from one revised video to the range of new videos and stills for use in face-to-face presentation and online content. It would need to provide an array of content to provide the separate messaging so we would be moving from a single

longer video to three, ninety-second-long videos and six, one-minute-long case studies to illustrate existing successes of the department with associated stills.

After a flurry of questions from myself and Ms B and a suggestion from myself that I would rewrite the proposal for the project in light of the new aims, B Mr thanked us for the meeting and left. Ms B was both excited and concerned over the new project as she had used the existing video effectively in her communications and face to face presentations with an array of contacts and settings. I reassured her that I would contain a multi-functional video within the proposed content, and we left with a new focus for the project.

I went home happy to be working on an expanded project and sat down to write the second proposal. Knowing that it was ideally working to a deadline for the department to begin using it, I included a proposed timeline and resources with sufficient budget and time allowances to deliver within the available time and the following day sent the completed proposal to everyone involved. And waited, and waited, and waited.

Several communications later between myself and Ms B and beginning to approach a point where there would no longer be enough time to complete the project for its deadline a second meeting would be called. So the race to get an agreement on the project in time to deliver began and with each meeting the project evolved in an often surprising manner as each meeting began with Mr H suggesting items that directly contradicted what had been a green before or were a step back to where we had already been.

The second meeting requested a possible reduction in content to work as a test case for some aspects of the new integrated communication model and resulted in a proposal with two options three, ninety second videos and six, one minute long profiles OR just three, minute long videos to deliver the primary messaging that Ms B's department required. Both options were to deliver stills and video content and the proposal contained options for the stills from video or from myself as a hybrid image creator OR with some stills produced with an additional photographer. At this point a budget and payment for the extended proposal period was also agreed allowing the work to continue.

Our third meeting created an official project focus group consisting of Ms B, Mr H, Mrs J, Ms K and myself to oversee the rest of the project and moved the project aims to more video but shorter video, consisting of three, ninety second messaging videos and nine, one minute profile videos. These would all need to be tied together to deliver a consistent message and aesthetic that matched the new corporate identity but equally focussed its message on each specific audience which would require all of the content to be new. This was the final confirmation that the old content would no longer form any part of the new content and Ms B and I sighed in relief as Mr H confirmed the entire

project budget had been approved and gave the go ahead to finally start confirming shoot days.

With everything in place, the project logistics began to take over, from location recce to finalising shoot days, locations approvals, equipment organisation and a back and forth between myself, Mr H and Mrs J over the aesthetics of the shoot, including the colour, lighting 'feel' and use of graphics in the final video which would affect the framing of shots on location and preference for certain composition during interviews. The days sped past and nearing the first shoot date we were surprised by a request for another meeting of the focus group.

The fourth and final meeting led to the fourth and final proposal for the entire project. As we started the meeting it quickly became clear that conversations at higher levels in organisation A had prompted a change (again) in thinking regarding online messaging and reuse of media. We now needed to produce four, ninety second messaging videos for separate target demographics and a group of seven social media clips that could be repurposed across social media platforms and as such would only be thirty seconds long. With this new social media focussed plan we finally moved forwards to the shoots, the first of which is the more detailed focus of the rest of our story.

Looking back at the process, and indeed during the process, the preparation period on this project felt unusually long as a result of the organisation going through the marketing consultation and rebranding. Adjustments were being made to the style and amount of content to be produced within all of our location shoots for the project throughout the period and with, an often, confusing lack of consistency.

Within those many conversations with organisation A it was finally decided that on the shoot days that a photographer would be hired as well as the hybrid and video production professional (myself) in order to turn some additional still images around quickly (often on the shoot day) for the ongoing development of the organisation's branding content. Video post-production would then allow additional images to be gathered from the moving image content.

As the style, scale and intent of the video content changed significantly during this pre-production period it created significant challenges for the production planning as each change altered equipment to be used, timings for the production days and the viability of completing all the filming and still image gathering in the single day. With filming being produced by myself as a shooting producer/director the continual changes confused the message that I understood the still and video content needed to deliver which created an atmosphere where I held confirming equipment bookings and hires until very close to the production day in order to retain flexibility in the face of a continually changing project brief.

In every production the image aesthetic and creation become only one element of the planning, but it is the image (still and moving) that will deliver the final message and all

of the work during pre-production and production is to deliver that effective final content which I am creating. It cannot be separated from the context of its final output and extra media content that constructs the still and moving image message, composition cannot be planned without knowing how the image will finally be being used or we may end up with a graphic under an interviewees nose or a video under an unrelated advertisement or other content on a web page.

I need to understand the bigger picture as the image creator, particularly with a moving image as additional graphics are often overlaid on the content. In the case of still images this is often less of a concern as many images are used as isolated elements in their own space within the media construct. With the hybrid production for the shoots and in particular planning for stills from video, the knowledge of final context is important as framing for graphic overlay in video will produce a sub-optimal framing for a still image, requiring some video clips to be gathered planning for use with no overlay to allow effective still images to be pulled from the video.

During the project meetings we had also discussed the production team size for the project. I had worked with the client on several projects before as a shooting producer/director and having a single person with a small camera made the subjects of the filming more comfortable. Even at times when I have to light somebody as I have already been working with them, I can talk them through the lit space to make them feel more comfortable. Organisation A and Ms B were keen to continue to use the same approach for the new production which gave the shooting style and equipment a smaller range of parameters for me to plan within.

This 'as inconspicuous as possible' filming style is common in documentary and news work for this very reason as it hopefully allows for a less intrusive presence during the filming to allow people to be themselves. Filmmakers have struggled to be as inconspicuous as still photographers as moving image cameras have always struggled with size and quality. When I started you could not be inconspicuous when filming video as cameras were huge. Today we have many options that are available since compact digital video cameras arrived in the late 90's and more recently the DSLR video boom of the early 2010's kickstarted a shift in technologies and camera designs to hybrid gathering devices that look like a stills camera and are often less intimidating than a video camera of any size.

1.3. Production Planning 1.4. Planning for the day

With our project agreed and timetable in place the nitty gritty of 'how do I do this?' needed to be addressed. With the enthusiasm of a person who still cannot believe they get paid to do the thing they love doing on most days, I set about deciding how, and with what, I would solve the many creative aims and problems that each day of the shoot would deliver. Our first day alone would deliver five locations in one setting and five

interviews with five very different people to deliver the content I needed for the majority of one of our videos and for three of our social media clips, all with associated still images.

1.4.1. Shooting stills and video!

A video production day is concerned with movement in, of and in/out of frame, and photography days are focussed on capturing those perfect instants to represent the message of the project. Hybrid shooting days require switching as a professional between both of those practices while being open to one leading to another and vice versa.

Specialisation in still or moving image production divorces us from the alternative as we narrow our intent to perfect one or the other disciplines and this can allow us to define our actions and chase excellence in our chosen sphere. I personally have found over the years moving from photography to the moving image and then to hybrid scenarios that creatively it can be even more effective to grasp both in the way that we, as humans, are surprisingly capable of achieving. Hybridity in production can be delivered effectively when we accept our duality of thought, that we are capable of reading both still and moving as 'image' and equally as separate instances of the image, and in this way, we can access insights into 'image' from 'still image' and 'moving image' and benefit from the combined specialisations. With this belief formed from personal experience in place I planned the shoot day.

1.4.2. Camera choice

Over the decades of using stills and moving image cameras I have used a wide array from rangefinder to SLR and TLR photography cameras and from super 8 cine cameras to television studio cameras including tube cameras and standard 2/3 inch sensor broadcast cameras recording on everything from S-VHS and Betacam to mini-DV tape and then to solid state recording on small sensor video cameras until larger sensor video cameras and hybrid cameras arrived and began to saturate the market place.

This experience makes the choice of camera very personal and at the same time a technical exercise in choosing the correct camera for the production. Sometimes clients will request a particular camera or recording format and in some cases, they will even request a specific camera. At other times the client will just supply delivery requirements which allows the image professional to choose the camera system and lenses themselves to best deliver the results for the project. This was the case on this production and gave me the flexibility to pull together a lightweight kit that I would be able to use on my own.

The demands of the project's style meant that the client wished for a narrow depth of field during interviews and as such this eliminated mobile devices and smaller sensor video cameras from the selection group.

For the moving image we are still in many cases torn between small cameras, such as mirrorless systems or DSLRs, with large sensors and poor audio controls and inputs or larger dedicated video cameras with good audio controls and inputs. There are even times where production can be kept very small by shooting on an iPad or smartphone.

DSLRs and mirrorless cameras have similar video functions in many cases and with the client only requiring a h.264 deliverable at 1080 25p I had an open option for choice of video camera. I did consider using a small digital cine camera such as the Sony fs5 or the Canon C100 however even though they are small they still appear very complicated and are still significantly larger and more overwhelming for people who are not used to being filmed professionally(see the size comparison between a mirrorless camera with a wide angle to mid telephoto zoom lens and a camcorder with a small sensor and a large zoom range lens in figure 1). This led to using a mirrorless camera system for the shoot.



Figure 1: mirrorless / camcorder size comparison

One of the advantages of using a DSLR or mirrorless is that most people have probably seen one and may have even used one, so it often feels less threatening, as I discussed earlier, and helps me as an image creator be less obtrusive. With this decision made I then chose to use a mirrorless camera with an electronic viewfinder (EVF) instead of a DSLR. The EVF allows the operator to film with the camera and view the image in Real Time through it which is very useful in sunny conditions when a LCD panel may be difficult to see. In a DSLR this is not possible as the viewfinder is an optical path through the lens via a mirror and through a prism that allows the operator to see the image however once the image needs to be recorded the mirror is moved out of the way allowing the light from the lens to hit the cameras sensor and blocking the viewfinder in the process. This stops the viewfinder functioning during video recording in a DSLR.

The ability to switch between the LCD and the EVF at any point while operating is something I personally find incredibly valuable as, especially when operating handheld, I can adjust my camera position appropriately to the shot I am trying to record and the

lighting conditions I am working in from moment to moment. This then lets me achieve the best operating position at any time and improve the shot I can gather.

Although the client only needed a 1080 25p deliverable I decided to shoot in 4K as this would allow greater flexibility in post-production as it would allow reframing if needed to supply a better composition or to allow for more effective placement of graphics in the final video and a clearer 1080p downscaled final output from post. It would also provide a higher resolution (approximately 8 megapixels) still when grabbed from the moving image in post for online resources.

With this decision made I then examined available cameras and decided which to film with. As we work in the image creation industry as photographers or moving image camera people or hybrid image makers, we gather equipment to create our images with. Often, we hire equipment for a particular job but inevitably we gather our own equipment well and gradually we develop a fondness for the visual and kinaesthetic feel of particular lenses and cameras.

In my own case I very much like Panasonic's Varicam look however because of client demand in Hong Kong with a preference for Canon and Sony I have accumulated and grown to like a range of Canon glass (lenses). I have also moved through Canon camera models and at the point this project started had just moved into the Canon EOS R system. This new system had a brand-new lens mount and looked to be an exciting area of optical development with its wider mount Aperture and reduced flange back distance allowing canon optical designs to potentially deliver new optical improvements to the full frame sensor when compared to the longer flange back distance of DSLRs requiring complex retro focal designs on wide angle lens designs in particular.

The new system also has an adaptor allowing the camera the use of Canon's old lenses which made my existing body of Canon lenses perfectly usable on the new camera. Unlike many other adaptor designs the new one included a drop in filter tray which allowed the use of a variable ND behind and of the previous EF lenses. As someone who had spent years using video cameras with built in switchable ND filters and being frustrated by the need to add matte boxes or front filters to mirrorless and DSLR cameras when shooting video to control exposure in order to retain consistency in frame rate and shutter speed in changing lighting conditions or when changing apertures or in order to retain aperture consistency as well the new lens aperture was a godsend. These combined factors led me to decide on filming with the EOS R.

In order to confirm that it would work as I needed it to, I spent several days running tests with the camera. Needing to shoot stills and video, I had to assess the EOS R for this use. The combination of the 30-megapixel sensor from the 5D MKIV combined with a new camera processor promised reliable features including 4K video (albeit from a cropped approximately super-35 section of the sensor), 1080p video using the full width of the sensor and 30-megapixel stills.

The tests confirmed that the camera would produce good quality 4K video in 30-minute chunks as the camera has a limit of twenty-nine minutes and fifty-nine seconds to comply with EU differences between video and photo cameras. The EOS R produced reliable video and beautiful Canon colour science colours and wonderful 30 megapixel still images.

Even though I would be shooting on my own for this project in most instances I still wanted to shoot with two cameras during interviews to allow for different angles when cutting interview dialogue in vision. For small corporate projects I had previously been using the Samsung NX1 which had no log setting but had a flat colour profile to give some of the benefits of log in post and after tests using Media Composer and Da Vinci Resolve, including log / flat profile comparisons I confirmed I could match the look and colour of the EOS R and NX1 allowing me to use the NX1 as second camera on the interviews and as a backup camera.

One very important feature of the Canon camera for myself as a single operator who is shooting, and interviewing is Canon's dual pixel autofocus which allows the video image to be actively and reliably autofocussed with a smooth transition between focus distances that feels very natural when seen. In well-lit interviews the tracking is accurate enough to keep an interviewee who leans forward or backwards while talking in focus and this allows me to concentrate on engaging with the interviewee during the interview once I have set the initial shot.

Another feature of the Canon system allows manual focus control available on demand at the same time by simply adjusting the focus wheel. When shooting b-roll this is very useful as it allows me to define where I need the focus to be and override the autofocus from moment to moment as I or the subject moves. From a camera operator who started in stills when most cameras only manually focussed and as a broadcast television camera person where there were no autofocus options as reliable control over the focus point of the moving image was crucial to telling the story, the ability to switch between the two systems was very important to me.

This section of our story is a blend of technology and emotion where I, the filmmaker, am using the technology but it is affecting me directly in how it interacts with me and how I interact with it and how we co-define the image making space through the day. From the ergonomics of the camera and how that changes my operating compared to other camera designs or even minor differences in camera-to-camera adjustments in the same type of camera. The EOS R, for example, has a larger grip than the NX1 and is slightly taller allowing me a secure grip using all the fingers of my right hand where the slightly smaller body of the NX1 forces my little finger to curl around the bottom of the grip slightly providing a slightly less secure handheld operating position.

Each of these changes in camera shape, in the resolution and display rate of the viewfinder and LCD panel change the way we as image makers interact with it and how

it affects us. They become a part of the whole that is the image maker and each time we use them we let them become a part of our image making identity, remembering the benefits and downfalls of each one we use, to form a psychological and physical response as we hold them and create the image with them.

1.4.3. Lens choice

Once I decided on the camera and lens system, I then decided on the lenses I would be using. The 'look' of a lens is defined by multiple factors and often, more than the technical capabilities of the camera being used, defines the image we are making. The angle of view of the lens, covering fish-eye wide angle lenses capable of capturing horizon to horizon to long telephoto lenses capable of framing a single bird in flight in the distance, lets us choose what we see or do not see with our choice and position of its viewpoint.

Its colour response and iris design shapes the way we see colour across the image and forward or past the point of focus as lateral and longitudinal chromatic aberration separate colours in different fashions at points of contrast in our image and lens coatings and optical design limit or expand optical flaws and characteristics such as flare and ghosting.

And its mechanical design changes the way we and the camera system interact directly with it. If it is an autofocus lens then its manual focus operation is often compromised, although this is not true of all lenses. Manual focus lenses have fixed end stops which allows repeatable focus manipulations where many autofocus lenses often have non-linear manual focus response which speeds up focus response at the cost of repeatable and fixed focus adjustments. Iris control may be manual or automatic and electronic or mechanical and each allows a different feel to the lens when operating it. These factors make lens choice important for a wide range or professional, emotional, aesthetic and personal reasons.

Previous experience and tests with new RF lenses led me to choose to use the RF 24-105 lens from Canon which was designed for the new Canon lens mount and although not parfocal (a lens which when zoomed retains its focus distance - an important characteristic for a zoom lens when making moving images)it had almost zero focus breathing (when the image size changes as the focus distance changes - not a problem for stills but a problem for moving images when you see the image change size in real time). The new zoom lens had a fast, silent autofocus system which is very good for filming the moving image with sound and was optically excellent through the entire zoom range and through the entire aperture range. The new zoom also had Canon's latest image stabilisation built-in enabling very stable handheld video to be shot when operated carefully.

In addition to the 24 -105 as a general zoom lens I also chose an EF 35mm f2 lens for its lightweight, optical excellence and small size. With the EOS shooting 4K from a crop

section of the sensor the 35mm would effectively be close to a 50mm lens giving a very natural perspective when filming. Unlike the more modern RF lens the 35mm has a fairly slow and noisy AF system so I use it in manual focus mode when shooting video.

My final lens was the EF 20mm f2.8. The lens has an Intelligent Field Curvature design which effectively increases the focus of nearer objects at the edges of the lens which on a wide-angle lens so when taking stills or 1080 video with the EOS R nearer objects which tend to be nearer and edge retain better focus than a flat field design lens. Its 20mm focal length on a full frame 35mm image circle produces wonderful wide-angle images and on the EOS R shooting 4K with its image crop the lens behaves more like a 35mm lens and gives a slightly wide view of the world with very little distortion.

In the case of the 35mm and 28mm lenses neither has image stabilisation and as the EOS does not have In Body Image Stabilisation (IBIS) it feels like filming with an older camera when filming video images with the need for a camera stabilisation system to be used for moving or static shots (i.e., a gimbal or tripod) or the acceptance of handheld motion being transferred in a much more direct and visceral manner to the image. The 35 and 28mm lenses are two of my favourite focal lengths when shooting stills with the 28mm giving a clear but not overly wide-angle view and the 35mm allowing a clear foreground and background separation similar to a 50mm lens but with angle of view on space that can include environment in the shot as well as the subject.

1.4.4. Lighting equipment

Where the lens translates the light from the scene onto the surface of the camera and together defines the view on the world that the image records, light is everything for the image. Without light we have no image, just void, and control of light controls the way we present the space to the lens and sensor. Controlling the light lets me play with how we perceive elements in the shot. Is the subject brighter than the rest of the shot and contrasting with it? Does the subject blend into the background? Knowing what my client wants from the image then lets me achieve an appropriate lighting look for that.

Having now decided on the camera equipment I needed to decide on the lighting equipment. The choice of equipment like the choice of camera equipment is made in response to the choices made earlier in the planning process concerning the visual style and feel of the project, the subjects in the image and the locations being used, in addition to the practicalities of working as a one-person team and needing to be able to handle moving and setting up all of the equipment on my own.

This meant that the equipment for the days filming needed to ideally be able to fit into one or two wheeled cases with a backpack as an option if I felt the need to have more gear. It also needed to supply at least one large soft light source to be used as a key light in the interviews. The use of wheeled cases and a backpack came from years of filming and being presented with moves between setups on the filming day that involved unexpected stairs. The soft light choice arose from the soft lit, high key sample images

used in the materials supplied for reference from organisation A. With two wheeled carry cases and a backpack I could move everything in one go between setups.

Over the years this has changed as smaller cameras and lights are available (when I started it was not possible to fit a lighting kit in a small, wheeled case) and it will change depending on the style and demands of each shoot. It is now possible on some shoots to carry all the equipment you need in a single backpack.

With a limited amount of equipment, I planned on carrying one high output LED panel and several smaller LED's that I could use as fill lights, back lights and set lights. I decided on a high output daylight LED as this gave significantly more output than the bicolor LED panels available at the time and I could take a range of colour correction filters if I needed to match the colour temperature to internal lights. I could also use it through a diffusion panel or in a softbox to provide a soft key light for the interviews and any B-roll I needed to gather.

With the smaller LED's I decided on one bi-colour LED giving me the option to match colour temperature between daylight or tungsten sources and two RGB LEDs giving me the option for colour matching and colour washes to areas of the shot if needed at the cost of slightly less light output and a single daylight LED that would give a little higher output.

The single daylight LED had external batteries so I could take several spare batteries to run the lamp for the duration of the shoot. The small LED's had internal batteries but could be charged using USB-C chargers allowing them to be powered by USB battery packs or USB power supplies depending on access to mains supplies at the location.

This selection gave me five light sources that would be suitable for the single person interviews I was filming on the shoot day and the B-roll I would be filming as well during the day. The use of small battery powered LED panels is particularly suitable for a single operator as they are easy to move and position as the operator moves from shot to shot. The LEDs with built-in batteries are small enough to have in jacket pockets and get out as and when you need them.

For a lighting camera person who has been filming for twenty-five years this is like seeing science fiction happen in front of you. To carry a whole array of camera and lighting gear in a single case compared to turning up with a full estate car or truck of lighting and camera gear is an unexpected and amazingly creatively empowering change to the image creator's toolkit and capabilities.

With every shoot I want to have options for lighting modifiers and for this shoot chose to use a medium softbox for the LED main light which has an inner reflective surface that the LED can be fired into, to give a range of focussed and defocussed light options and with a front diffusion attached can give a soft light source with additional control using an eggshell to narrow the soft beam spread. I would combine this with a medium 4 in 1 reflector.

This modifier would give the option for use as a reflective white, silver or gold surface, a black surface for negative fill or use as a flag. Its inner silk can also be used for diffusion. It is useful for control in a variety of situations and on that day's shoot would prove to be very useful as the lighting conditions changed. In order to use it I would need to take a reflector arm to mount the reflector on a lighting stand or to use with a super clamp to attach to a door or a desk or possibly a chair depending on the available space in the filming locations. To enable the use of the lights I would take three lighting stands, one super clamp and two monkey tripods.

1.4.5. Sound equipment

As I am filming video and interviews, I also needed to record sound and had to decide what approach to use. The sound recorded directly to mirrorless and DSLR cameras has technical limitations because of the quality of the input preamps and the use of mini jacks as the microphone connector. I shoot two system audio when using these cameras to get around this limitation. This involves using a separate high-quality audio recorder and then syncing the audio in post-production.

I used a Zoom F8 audio recorder which is very compact and can be mounted under the camera on the tripod or separately. It also has an audio output allowing the mixed audio to be sent to the camera to give better quality audio in and in some cases will allow for the footage and audio direct from the camera to then be used without additional audio sync.

For microphones I like to use a positioned boom mic in interviews whenever possible as I can set it up before the interviewee arrives and have them sit and get comfortable when they arrive and then just adjust the microphone position without needing to place a microphone on them. I also take a lapel microphone with a cable and a lapel microphone with a radio to give options depending on changing situations.

For the boom microphone setup, I use the boom microphone on a boom pole from a lighting stand. The need for sound is obviously a key difference between capturing the still and moving image and with the use of a boom microphone I also need to be aware of how this affects the lighting in the shot as it may place a shadow on the subject or on the background which affects the image negatively.

1.4.6. The final equipment list for the day was:

- Cameras: Canon EOS R and Samsung NX1
- Lenses: RF 24-105 f4, EF 16-35 F4, EF 20 f2.8, EF 35 f2, Samsung 18-55 f2-2.8. 2 x Tripods
- Lighting: Single 1x1 daylight (5600 K) panel LED Single small bi-colour LED with built in battery 2 x small RGBW LED with built in battery Single small daylight LED with external batteries Medium softbox with egg crate. 5 in 1 Reflector arm light stand x 3 super clamp with lighting spigot - used with thread for LED panels with built in batteries.

- Audio: Zoom f8 Cabled Lapel Mic Radio receiver transceiver with lapel mic short shotgun microphone Boom pole and shock mount Clamp to attach to lighting stand

With the choice of camera, lenses, lighting and sound equipment made to enable the production I then moved to more detailed planning of the shoot day. The location had been recce'd with the head of the department the video was for, and lighting plots sketched in advance to give a starting point for planning, however only two of the locations could be accessed on the recce day meaning that three locations needed to be assessed and lit on the filming day.

1.5. The shoot day

The shoot day arrived and thankfully it was not raining so I would not have to worry about the sound of rain in the background. Obviously, I might still have traffic noise to deal with as we are in Hong Kong after all!

This day would have three primary types of footage and stills being gathered. These would be interviews, B-roll of the locations to set the scene and B-roll of the main interviewee(s) undertaking action to add to the b-roll for cutaways in the edit and to potentially add as still content for the organisation's online media.

Negotiations with anyone in front of camera are a continual challenge as every person reacts in a different manner to being in front of camera. Some get loud, some get quiet, some shuffle in their seat or on the spot, some sway and others freeze and stop talking completely. When I am working just as a camera person and with a director/producer or interviewer I am somewhat divorced from the negotiations. On a hybrid, multi-skilled shoot like this one I am central to all negotiations, to every conversation that is happening on the shoot and, in particular, directly involved in the negotiations with the subject of the filming and interviews.

Conversation is very important and body language can tell you when someone walks into a room how they are feeling and may give some indicators about how to best interact with them to put them in a place where they can best be for the interview. Paying attention to that and how they react to the initial verbal welcome can help me know whether to be formal, friendly or supportive, as some options, to enable them through the process and alien environment of a lit interview.

1.5.1. Location 1

Moving into the building and being introduced to the staff at organisation B we were then informed that Ms D's schedule had changed and that we would have to film her interview first and we were shown to our first location. The interview had originally been scheduled for the middle of the day and to be 30 minutes to one hour long and the lighting change would hopefully be minimal during that period causing no problems with matching shots in post-production.

When I arrive at a location, I am looking at light sources in the location, natural and artificial, direction of windows for natural light and whether they will allow direct sunlight at any point or if they are in shadow from other buildings or artificial/natural structures. This combined with the daylight conditions and time of year and time of day will affect the natural light in the location and enable me to decide whether it is a viable option as the light source. In this case when we had undertaken our recce and the schedule had placed the interview in the middle of the day, I knew that there would be daylight streaming in from the window, but not direct sunlight and I had planned accordingly.

Moving from studio lighting approaches where almost every subject position has a separate three-point lighting setup to allow for continuous multi camera shooting to location lighting with a single video camera where lights are often moved with each reframe to enable the 'perfect' light in the frame through my career has allowed me to see where and how lights fall and how cameras respond to light across luminance and colour ranges. This helps when assessing a location for shooting and lighting during a recce.

The plan for the shoot had been to utilise the afternoon daylight coming through the window to provide a diffused soft light for the room and to adjust the intensity of shadows with the reflector on the interviewees face. I planned for a mild backlight to add highlights to the interviewees hair and to help with separation from the background. The background itself was a wall with award posters for the organisation which I would highlight with an accent light. Having dropped the intensity of the daylight to the rear of the room by adjusting the window blinds at that end of the room.

The camera position, that can be seen marked on the sketched lighting diagram below, indicated the angle of view being fairly narrow to see the interviewee and the elements of the location necessary to help tell their story. This allowed me to believe I would be able to use the 24-105 lens or the 35mm lens on the EOS R. I would also position the NX1 next to the EOS R to get a slightly wider shot and to run at 1/100th second shutter speed to improve the chance of gathering viable still frames from the video. I also note that I planned on angling the interviewee slightly more towards the window side of the room so the light would be slightly less side-on than is suggested by the lighting sketch.

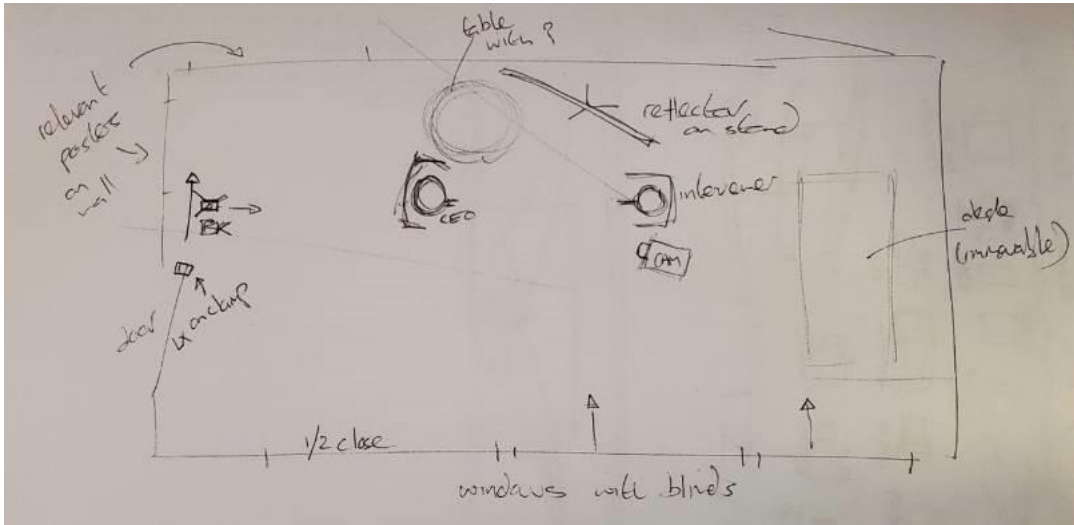


Figure 2: Planned LX plot location 1

The CEO's office space was fairly long and thin with a window along almost the entirety of one wall and this space was where we would be interviewing the CEO Ms C. On this morning dappled sunlight streamed into the office through the trees outside sending a moving pattern of bright light and shadow across everything. As pretty as this was it would be totally unsuitable for the video, being difficult to deal with for the length of an interview and increasing the likelihood of changing light during the interview so I changed the plot accordingly. Luckily the window had shutter blinds running along its entire length and overhead fluorescent lamps.

Having arrived I started to plan the final lighting setup and spoke to the photographer to discuss the shooting approach and the schedule as we each set our equipment to make sure the day would work, and we would not get in each other's way (as little as possible). For the filming there would be five people in the room. This location was an office space to be used for a single interview. There would be a separate photographer in this location, so I was concentrating on recording the video.

I now planned to shoot with the window blinds closed and to light the shoot with the main LED light as a soft key light through the softbox with the reflector still acting as a fill light to control the contrast ratio on the interviewee and with the change of lighting source I also decided to add a detail light to the table next to the interviewee to ensure it was lit to an adequate level compared to the interviewee. The backlight and the set light on the posters stayed in the same place in the lighting plot:

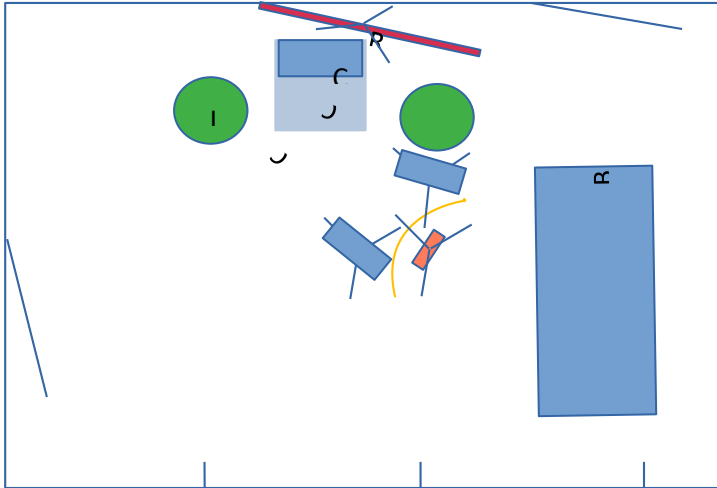


Figure 3: Revised Location 1 LX plot

The people involved were me setting cameras and lighting and recording audio as well as directing the interview. Miss X was being interviewed regarding her organisation's involvement in the project that was run jointly with Miss C's organisation. Miss C sat next to the camera and would ask the questions I had briefed her on and to give Miss X a comfortable eyeline and help the interview feel more relaxed and conversational.



Figure 4: Interview shot location 1 from video.

In addition to the three of us involved in filming, the photographer Mr X was in the room getting stills for organisation A and being guided by Miss D from organisation A.

With the schedule limited and the interview with the first subject limited to a short time the photographer agreed to shoot using my lighting setup for video and to shoot using a silent shutter or during questions from the interviewer using a standard mechanical shutter to avoid interrupting the interview answers with a camera shutter noise.

1.5.2. Location 2

Having finished with the CEO's interview and being supplied with tea and coffee everybody in the production team left our first location and moved to location 2. The second location was a long and wide corridor space with offices on one side and large windows all down the opposite side. This space was at the other end of the location and was fully undercover of dense trees.

This meant that the light coming into the room even on this sunny day was diffused through the trees and as such I planned accordingly to use the available light. The initial plan was to position the interviewee by the window where there was a large seat that ran its length and film with the seat disappearing into frame and to the wall behind which was decorated with patterns from the organisation. This would help place the subject in the 'space' of the organisation. With the daylight in this location, I was able to shoot at ISO 200 f4 and 1/50th sec and F2.8 at 1/100th sec on the EOS R and the NX1. In the other locations I was shooting at ISO 400 at f4 and 1/100th second on the EOS R and NX1.

With the soft light through the window acting as a broad key light and a backlight, I planned to use the reflector to bounce the daylight back to control the shadows and reduce the contrast ratio on the interviewee. I also planned to use an LED through the umbrella above the camera to give a direct catchlight in the interviewee's eyes and act as a mild, same-side fill light and potentially supply a slight boost to raise the light level on the interviewee above that of the background which was also being lit by the window light.

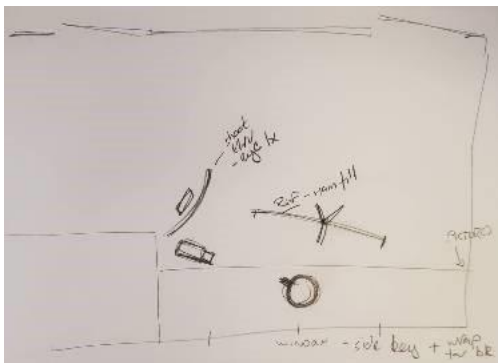


Figure 5: Planned LX plot location 2

(opposing side fill and its advantages / disadvantages aesthetic considerations of lighting look for the shoot - lighting style continuity across shots)

Arriving at this location on the day I quickly realised that the interviewee was very nervous about being in front of camera but was very relaxed talking to a member of staff that they had worked closely with during their time with the organisation. I broached the possibility of doing the interview using the staff member as the interviewer and they were amenable to doing it. I changed the shot on the NX1 to a two shot (to include both the interviewer and interviewee) so I could show the interviewee how they were both in the shot which helped relax her some more. I then controlled the lighting as planned with daylight acting as a main soft key light and a reflector controlling the contrast ratio. I added the main daylight LED behind the interviewer and next to the camera to light the rear side of the interviewer on the shadow side inside the room and to help add a little more fill light and a bright catchlight in the interviewee's eyes.

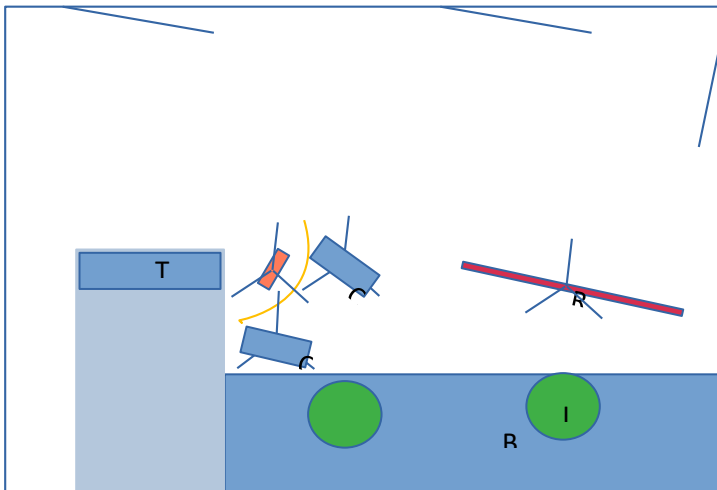


Figure 6: Location 2 interview Ms H revised lighting plot

The photographer used strobe light to counter the daylight and enable a different framing for the close-up shots and group shots they wished to achieve in the second location. These were gathered while I set lighting in the location for the video interviews and after I had conducted the video interviews while I was packing equipment to move to the next location. This enabled neither lighting setup to interfere with either of our gathering of stills or moving image.

This location was also going to be used for the third interview. This would be Miss G who had just been interviewing Miss H. To make the shooting schedule work as efficiently as possible I used the same location and adjusted the reflector to favour Miss G and moved the LED with softbox behind the camera in position B where it would now act as additional fill light and catchlight for Miss G. With the camera moved to position B (see below)

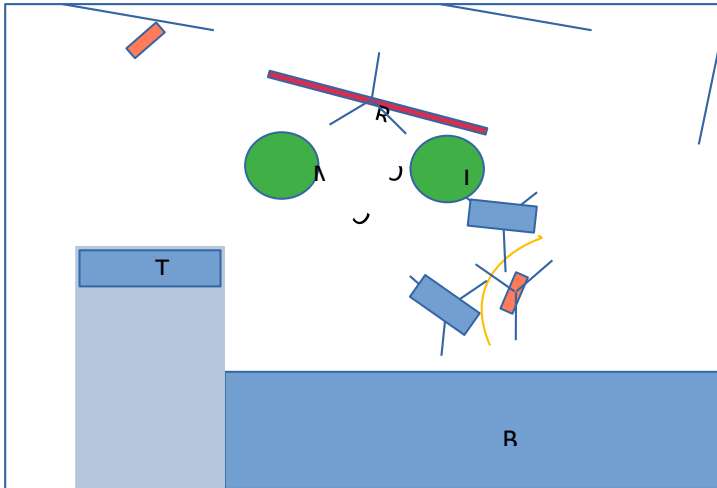


Figure 7: Location 2 interview Ms G lighting plot



Figure 8: Frame grab from interview 3 at location 2

1.5.3. Locations 3, 4 and 5

Having been surprised already in the two locations I had managed to recce I was wondering what the rest of our locations would be when we moved to Location 3 which was planned to be a large office with no windows and with overhead fluorescent lights. Unfortunately, the room had been unavailable during the recce day as there was a meeting in it. This meant I would need to assess and light the location when I walked in. This was the same for locations 4 and 5. I had been told that location four was a Kitchen / Dining area with windows along one side and overhead fluorescent lights. Location 5 would be a small office with no windows and internal overhead fluorescent lights.

1.5.4. Location 3

After finishing at location 2 while everyone took a coffee break, I was able to assess locations 3, 4 and 5 and in location 3 found a large square office with overhead fluorescent lights and no windows. There were doors on either side of the room which I planned to close in order to minimise sound interference from the rest of the building and an AC unit which I would switch off during the interview.

Unlike locations 1 and 2 where there was some space to manoeuvre equipment and people, location 3 was like a lot of Hong Kong offices, cramped. The centre of the room was filled with a large desk and chairs which occupied the majority of the space. One corner of the room had multiple boxes stored in it and a whiteboard was fixed on one wall. The walls were a faded cream colour and several parts had marks that had obviously been made through years of wear and tear. This meant that there was only one direction I could film in where the background was clean and would look good on camera. This was between the boxes and the whiteboard with the interviewee positioned next to the central table.

With this decision I set the lighting with the daylight LED through the soft box as the key light and one of the bi-colour LED panels as a fill light. I positioned Mrs F next to the desk to give a leading line into the frame and help reinforce the interviewee as the main aspect of the composition.

As the room had no daylight and I wished to film with as low an ISO (camera sensitivity) as possible I decided to have the fluorescent lights in the room on to add the ambient light level. The problem with this is they add horrible shadows down the face from directly above. To stop this I used the reflector as a flag above the interviewees face so the subject lighting was all from my lights. The flag is positioned as shown below:

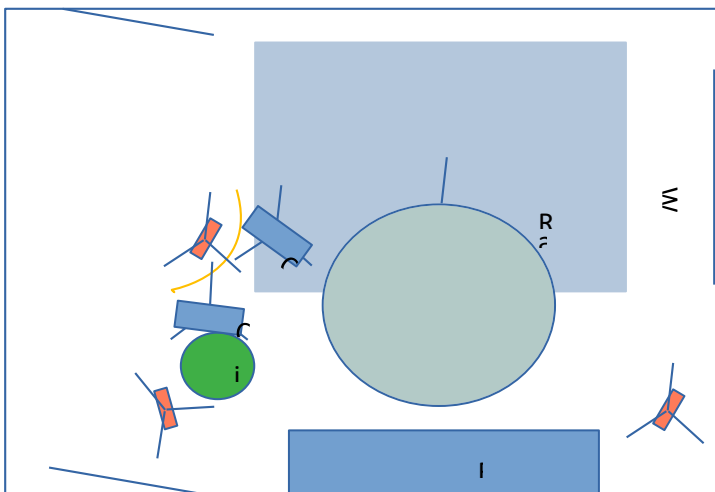


Figure 9: LX plot room 3

This allowed me to increase the light level on the office walls and desk with the room fluorescent and control the shadows, lighting intensity, contrast and lighting colour temperature on the interviews separately. I placed the key light as close as possible to the subject to give as soft and bright a light source as possible to enable the switch between exposure for video shooting and a faster shutter speed with negligible increase in ISO for the high-resolution stills as there was no photographer in this location.



Figure 10: Location 3 Interview 4 from video

With the fixed colour temperature on the interviewees face from the key light and the fluorescent light blocked from the subject but illuminating the room I gained a different colour cast in the background which I could adjust or correct in post to add colour separation between the interviewee and the background.

1.5.5. Location 4

After a break for a short lunch, we moved to location 4, a kitchen/dining area where I would be shooting an activity led by Mr N with Miss G. I would also be conducting a short interview with Mr N in the same setting with Ms G continuing with the activity. The kitchen/dining area had windows all down one side and overhead fluorescent lights. As the activity was to be undertaken standing it would make using the reflector as a flag above then more difficult.

Checking the space, it was lucky that the overhead fluorescents were spaced above but either side of the space where the activity was to be undertaken, This meant that they were only creating shadows down the face which could be filled with two LEDs acting as key and fill on either side of the camera as it filmed the activity. This also meant that as I moved in for close ups on the activity it was easy to adjust the position of the

lights to get the best position and intensity as the frame size and focus of the frame changed.

The positioning of Mr N slightly nearer camera allowed me to conduct a short interview with him while Miss G continued with her activity slightly out of focus in the rear of shot as I moved to a fully open iris to minimise depth of field on the interview. As the activity progressed I was able to move the camera and lights as shown below:

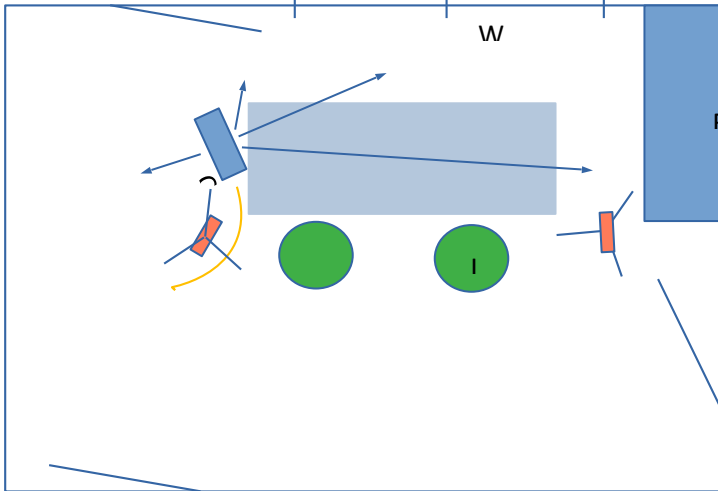


Figure 11: location 4 LX plot



Figure 12: Location 4 Interview 5

1.6. Moving shots from location 4 to 2 through 3.

When producing images, both still and moving, we are planning for the shots we want but equally open creatively to those precious moments where an opportunity creates

itself. As we finished in Location three and Miss G said thank you to Mr N and he thanked her as well, he asked if she could take some paperwork through to another office for him.

Being always happy for more b-roll and already operating handheld I took one LED from a lighting stand and held it as I zoomed to a wide-angle view and followed the action as Mr N handed Miss G the paperwork and she made her way through location 3 and then into location 2 where the far door opened to the paperwork's destination. Quickly reframing at the beginning and end to see handover of the paperwork at either end of the sequence I gathered a three-shot sequence with lots of interesting visual movement and two options for relatively static shots of Miss G interacting and smiling with staff that I could also grab still images from.

1.6.1. Location 5

At this point in the day, we were running very short on time as we moved to the final shooting location, a very small office space where Miss G would be doing another activity. With time constraints in mind, I chose to shoot handheld and adjust the light position on a single stand so I could reposition it as I went and if needed. And I needed it. The room was poorly lit and lit with fluorescent lights with a horrible colour cast. The LED close to Miss G washed over the colour cast and let me record good skin tones.

The room itself was so small that I had trouble fitting in with Miss H and Mrs P who was helping her with the activity and was continually pushing myself against the walls to try and get to a distance where I could frame a good shot. Although claustrophobic the small space and reduced shot opportunity meant that the small LED could illuminate the shot fairly evenly and being close to the subject, at a good light level.

As this activity was being used primarily as B-roll I recorded audio with a Sennheiser short shotgun microphone on the camera hot shoe to gather diegetic sound for use in the B-roll sequence.

1.7. Working with the photographer

The photographer shot in locations 1, 2 and 3. equipment Canon EOS 5D MK III EF 50 f1.4, EF 85 f1.4, EF 24-70 f2.8, Speedlite 600EXRT plus remote trigger In all three locations we had discussed when the photographer could and could not take photographs. The recording of audio as part of the moving image meant that the shutter sound of the photographer's DSLR would be recorded so the photographer could not take images when we were recording the interviews. In location 2 the photographer used the existing lighting setup for several of the images he gathered as I was using daylight with modifiers, so the light level was higher than in the other locations. The photographer was shooting with flash in locations 1 and 3 at points when I was not shooting video. This meant that he could raise his flash sync speed to 1/250th sec and shoot at ISO 100 to get the best quality results for the still images.

1.8. Post-Production

The final chapter of our story is, as all good stories are, the end. In this case the end meanders its way through software and image creation decisions with a feedback loop that takes personal, organisational aesthetic and practical decisions to arrive at our final stills and moving images.

Here is where the flexibility or not of the workflow plays a considerable part in addressing the feedback in that feedback loop. The decisions made in camera selection and recording format can work in a faster or a more flexible manner and how we modify them in post will be the final chance to make the delivery image perfect for our clients use.

Being the editor and the colorist gives me tremendous flexibility in my shooting and allows me to assess first-hand the complete workflow through the production process. With the project at hand, I chose to shoot Canon log codec where I could, using a ninja V external monitor/recorder from the EOS R. This allowed me to maximise the dynamic range and colour space recording in 10bit 422. The NX1 was set to record in its pro setting for video which is a high bitrate h265 8bit 420 encoding. Using its flat, DR profile allowed a dynamic range slightly less than the EOS R and with flexibility to colour match in post-production.

1.8.1. stills and video.

The stills gathering process from video was undertaken in two ways to see which was the most effective in producing still images from the original footage. Using the footage on the SD card in camera I was able to grab frames from the video at any point. On other shoots in the project this was useful in order to provide stills on the day when I was not working with a photographer and when the schedule was too busy to set for stills as a separate period of time.

The majority of the stills generated from video were taken as frame grabs in post as this gave a more accurate assessment of the individual frame before outputting it as a still image. In both cases the jpeg images were then edited in DXO and Affinity before being submitted to the client.

For this project I was producing everything myself and to make the workflow as efficient and as reliable as possible I worked with AVID Media Composer with occasional colour grading in DaVinci Resolve.

1.9. The End

And thus ends the story of a hybrid production. Time occurs before and after this story and this story is just one element of a larger story where hybridity was used to deliver a range of still and moving images by a single professional using knowledge and

experience from still and moving image production to facilitate a workflow that effectively delivers both.

I really started my academic career when I created the Television Production Degree for Middlesex University, and we did that because multi-skilling for video production was becoming possible for a much larger group of professionals and the industry needed to respond and it needed new professionals with new skill sets and knowledge. The aim was, as a friend of mine said at the time, not to be a jack of all trades and master of none but a master of all trades. Hybridity in image creation allows an entire new range of professionals to be exactly that for the still and moving image.

2. Abbreviations and Glossary of terms:

720P - video resolution of 720 lines progressive scan

1080P - video resolution of 1080 lines progressive scan

2K - video resolution of 2048 lines horizontal resolution

4K - video resolution of 4000 lines horizontal resolution

8K - video resolution of 8000 lines horizontal resolution

AI -Artificial Intelligence

ATV - Asia Television

Barn Doors - barn doors are a modifier that attaches directly to a fixture and can come in two, four or more leaves that can be used to block parts of the light being emitted and shape the resulting light beam. BBC - British Broadcasting Company

Beauty dishes - Common in photography the beauty dish is a modifier which is traditionally a reflective dish made of metal with a reflective baffle in front of the strobe position to reflect all the light from the strobe back into the sides of the dish where a matte metallic finish produces a directional but slightly soft light source BECTU - Broadcasting Entertainment Cinematograph and Theatre Union

BETACAM - professional video tape format from Sony

BETA SP - a variant of the Betacam format

BETA SX - a digital recording format using the BETACAM tape format.

Broad / Flood - Broad and flood light fixtures use a wide reflector to throw light in a 'broad' spread and often use a scattered surface to increase the spread of the light. As a result, the broad light is very useful when lighting a large area or providing a general lift in lighting levels in a scene. The design of the broad light works effectively with HMI, incandescent and LED sources.

Butterflies, Larger scrims are referred to as Butterflies and range from 4'x4' frames to 18'x12' frames.

CD/CDAF-contrast detect autofocus.

CCD - charged coupled device.

CEPA - Closer Economic Partnership Arrangement

CFA - Colour Filter Array

CMOS - Complementary symmetry Metal Oxide Semiconductor

CNN - Convolutional Neural Network

CNN/CNNI Cable News Network/Cable News Network International

CPU - Central Processing Unit

CRI - Colour Rendering Index

DCI - Digital Cinema Initiatives

DCT - Discrete Cosine Transformation

DNxHD - Digital Nonlinear Extensible High Definition

DNxHR - Digital Nonlinear Extensible High Resolution

DOP - Director of Photography

DSLR - Digital Single Lens Reflex

EAWBLC - East Asia Work Based Learning Centre

Egg crates - the egg crate modifier to a soft box is a grid of cloth strips that subdivide the single source into multiple soft sources and as a result maintain the soft light but narrow the beam spread of the soft source.

ENG - Electronic News Gathering

EVIL - Electronic Viewfinder Interchangeable Lens

FDC - Film Development Council

FDF - Film Development Fund

FDI - Film Development Initiative

Flags A light will often need to be blocked from illuminating areas of the scene even with an egg crate being used. This is where flags are very useful. A flag is a solid shape, usually made from cloth in a metal frame, which is held in a stand to cast a shadow. Variations of the flag are described by their shape and size and in film called flag, dot, target, blade and cutter. In contemporary use flag is often used as a generic term for the range of sizes and shapes.

Fresnel - the Fresnel lens is used in most cases in a closed face fixture design with a mechanism allowing the movement of the light source along the longitudinal axis between the reflector and the lens to change the beam angle of the lamp.

FULL HD - a video standard resolution of 1920 x 1080

GNMIS - Government News and Media System

Gobos - In film lighting - any element between the source and the subject and is short for 'go-between' In fixture design - a metal insert in a projection lamp for projecting patterns with the fixture. In photography - the physical insert and anything used to cast a shadow between the fixture and the subject.

GPU - General Processing Unit

HBO - Home Box Office

HD - High-Definition video 720 lines resolution

HEIF - High Efficiency
HEVC - High Efficiency Video Codec
HKJA - Hong Kong Journalists Association
HKLCSD - Hong Kong Leisure and Cultural Services Department
HKPPA - Hong Kong Press Photographers Association
HMI - Hydrargyrum medium-arc iodide
HSS - High Speed Sync
ISO - International Organization for Standardization - in photography used to refer to standardised film/camera sensitivity to light.
JPEG - Joint Photographic Experts Group
LD - Lighting Director
LED - Light Emitting Diode
LED soft panel - LEDs within a flexible, woven material panel that can be use in a frame to produce a flat panel light or rolled into a smaller shape or fixed to surfaces or under surfaces.
LIDAR - Light Detection and Ranging
Light Panels - The light panel is a flat square or oblong panel with an array of LED sources attached to its surface - beam angle of the panel is dependent on the beam angle of the lenses in the LEDs.
Machine learning
MPEG - Motion Picture Engineering Group
MTV - Music Television
NN - Neural Network
NPU - Neural Processing Unit
Open face - a fixture typically using a spherical or parabolic reflector with a fixed light source position however some open face fixtures allow the spread of the emitted light beam to be altered by either changing the reflector itself or with a simple mechanism that allows movement of the emitting source within the fixture.
P2 - Professional Plug-In - solid state memory card format
Parfocal – lens design that allows focussing distance to remain throughout zoom range when changed on a zoom lens.
PD/PD - phase detect autofocus.
Planckian locus/Planckian curve - The solid curve with dots on it, through the middle of the CIE 1931 chromaticity diagram is the Planckian locus (also referred to as Planckian curve), with the dots corresponding to a few select black-body temperatures that are indicated just above the x-axis. This is often used to represent the area of the CIE 1931 diagram where humans perceive white light at varying colour temperatures.

Rangefinder - a camera design where the viewing eyepiece is separate from the lens path and twin attached finders overlay a split image that can be brought together as the lens is focussed.

RAW - the unencoded digital data from the camera sensor - its 'RAW' data

Reflectors include folding photographic reflectors, bounce boards and panels such as polyboard (large panels of white polystyrene) and lighting frames with ultrabounce and other reflective materials, in this category. Reflectors can also come in many surface types from diffuse white to metallic silver and gold coatings and even black to be used a negative

RGB - Red Green Blue

RGBG - Red Green Blue Green Colour Filter Array

RGBWW - Red Green Blue White White

RYYB - Red Yellow Yellow Blue

RTHK - Radio Television Hong Kong

SAR - Special Administrative Region

SCMP - South China Morning Post

Scrims/nets are metal or material grids that are placed in front of a light, typically a hard light to reduce the amount of light from the fixture. Nets function in the same way but are more typically made from cloth and placed away from the fixture in holders of open end, open side or closed design.

SD - Standard Definition

SED - Spectral Emission Diagram

Silks/Diffusions - the addition of translucent panels to the frames reduces light and creates a large soft source. This is referred to as a Silk or diffusion frame.

SLR - Single Lens Reflex (camera)

Soft boxes - place the source inside a collapsible (using a modified umbrella design), curved, sometimes parabolic reflector with a translucent front panel causing all the light from the source to illuminate the front panel through direct illumination and reflection. This in turn creates a soft light source of the panel size.

Soft Lights - 1. Studio soft lights - a combination reflector design to emit light from incandescent sources from the large reflective surface and produce a much larger light emitting surface than possible with the incandescent source directly.

2 - an open lamp housing inside a collapsible softbox with internal reflective surfaces and a translucent front panel to produce a very large emitting surface

SSI - Spectral Similarity Index

STLD - Society of Television Lighting Directors

TLCI - Television Lighting Consistency Index

TLMF - Television Lighting Matching factor

TLR - Twin Lens Reflex

TM-30 - IES method for evaluating light source colour rendition.

TVB - Television Broadcaster in Hong Kong

UHD - Ultra High Definition – a video resolution of 4,096 by 2,160

Umbrellas - an umbrella structure with the umbrella material adjusted to suit light modification purposes. These are available with a reflective inner material in silver or gold to produce a directional and large surface area emission source. Semi-opaque umbrellas called 'shoot through' allow the umbrella to become a soft source by 'shooting' the light 'through' the umbrella or using it as a reflective source with a softer output than a silvered umbrella.

XDCAM - a digital storage system for random access using solid state media from Sony includes XDCAM SD, XDCAM HD, XDCAM EX and XDCAM HD422.

3. Sample Images from Hybrid shoots

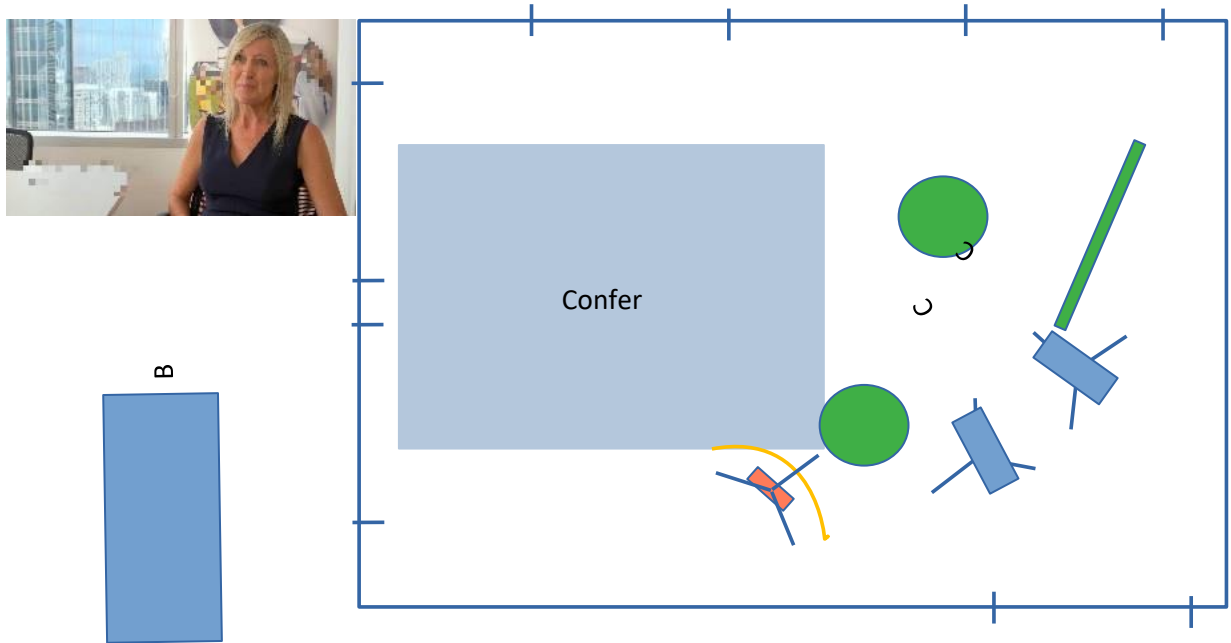


Figure 13: Interview setup 1 stills and video

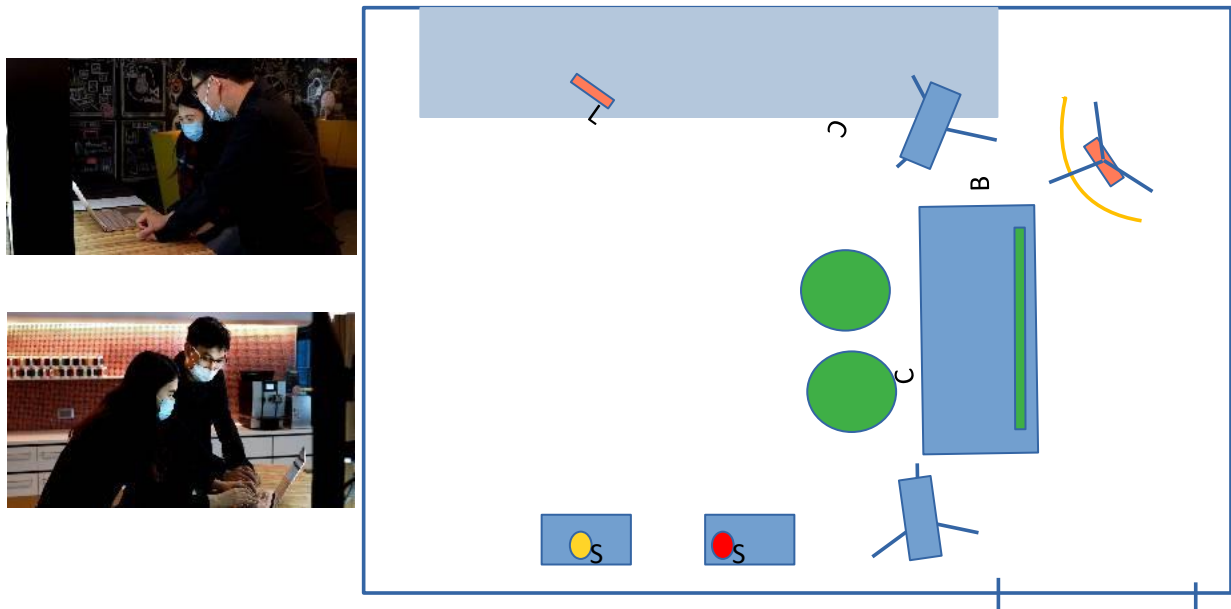


Figure 14: b-roll for stills and video

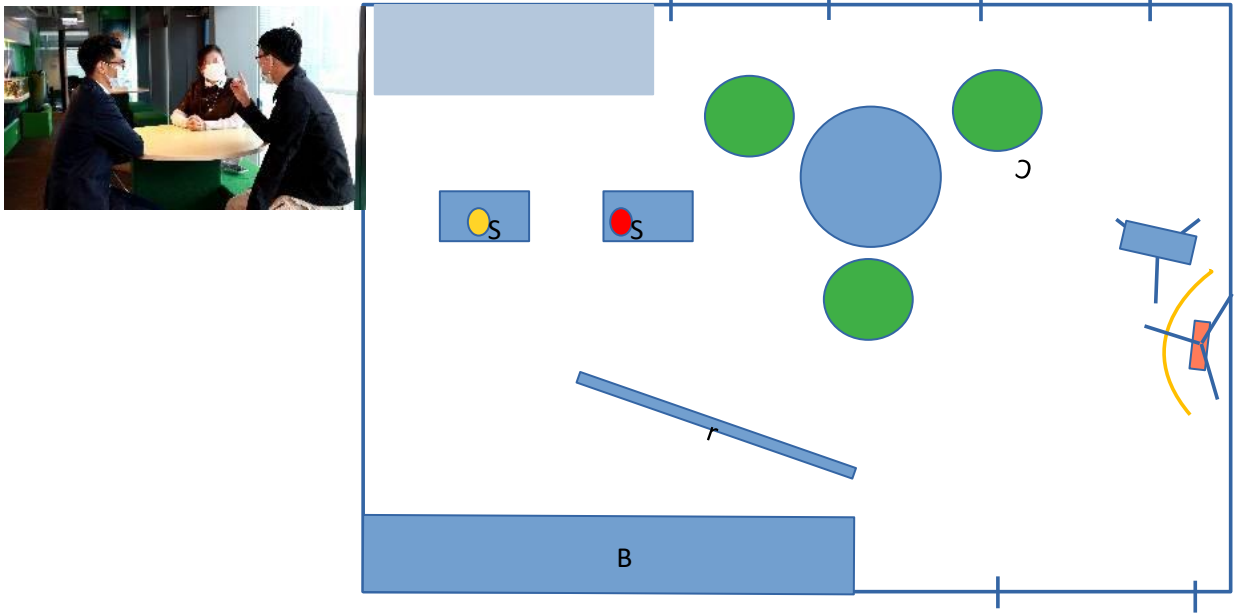


Figure 15: Round table b-roll stills and video

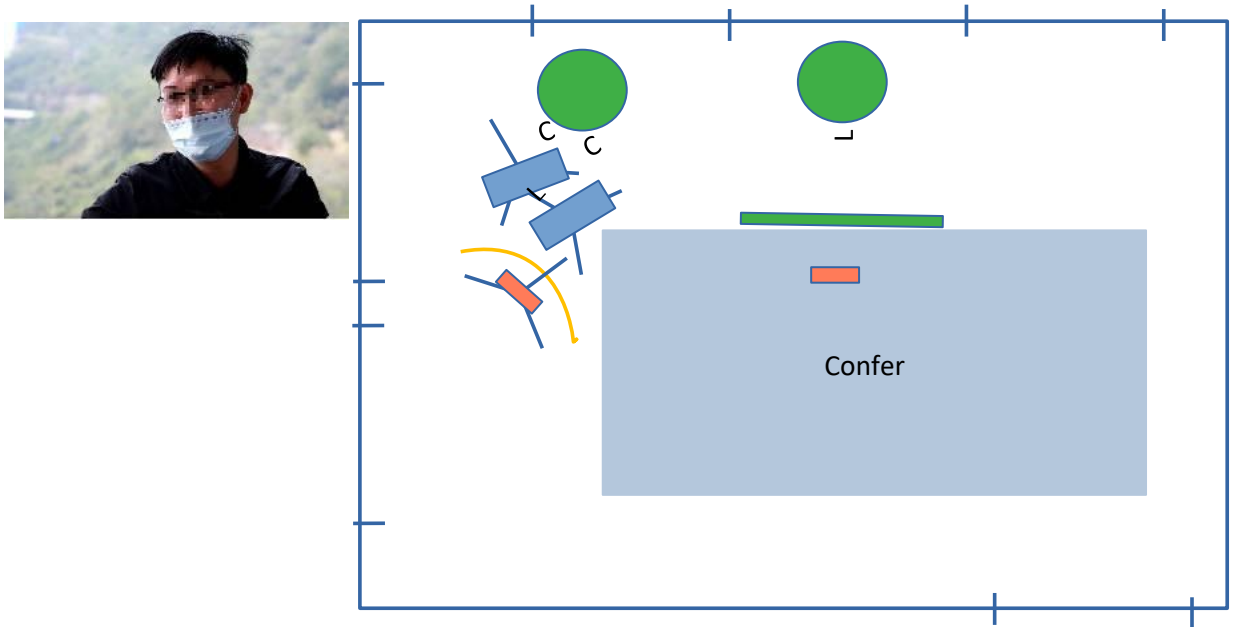


Figure 16: Lighting setup 4

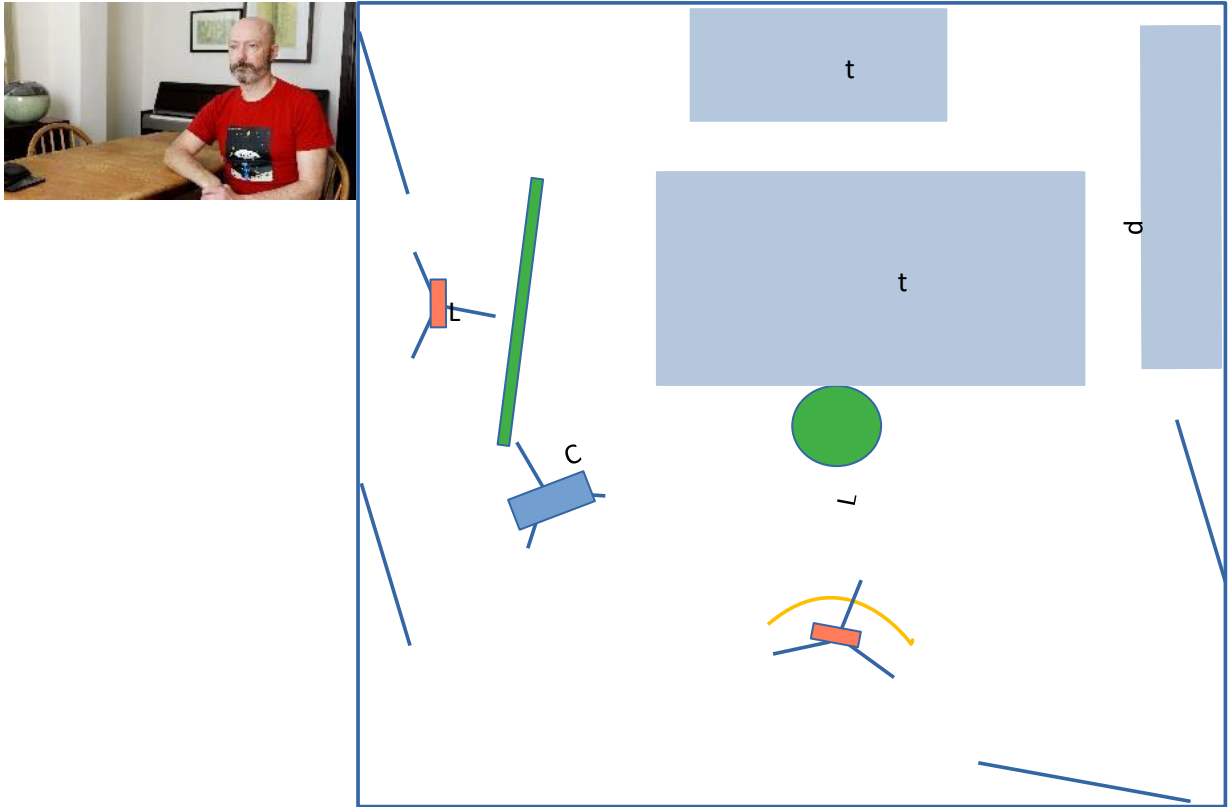


Figure 17: Lighting setup 5

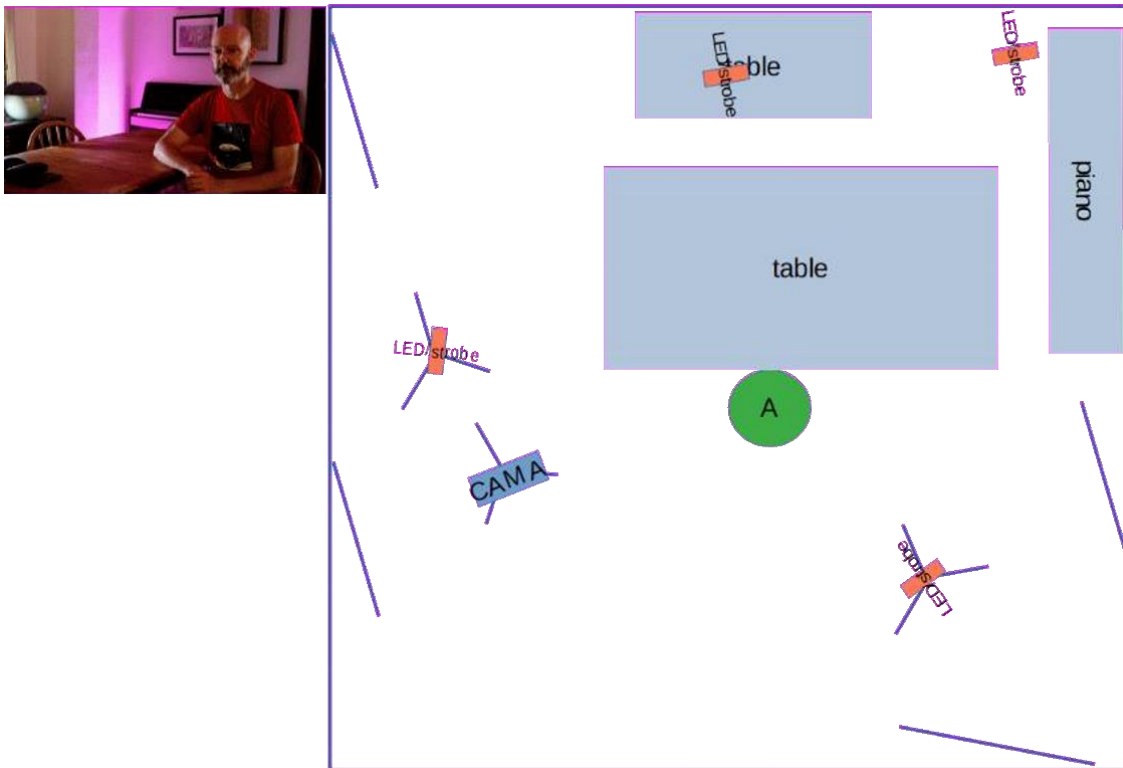


Figure 18: Lighting setup 6

4. Online Questionnaire

Questionnaire

Lighting for Stills and Videos

Welcome and thank you for taking part in this survey. This form is part of a research project investigating the changing needs of professionals who produce still and moving images. Please feel free to answer all the questions you can. Your answers will be kept as part of the research data, but all entries are anonymous. No private data is recorded and no electronic

data such as submitting IP addresses or email is recorded. My name is John Curran, and I am a doctoral research student at Middlesex University undertaking a research project in my professional area of still and moving image production. If you have any questions before completing the survey, please email me at jc038@live.mdx.ac.uk.

IN ADDITION, IF YOU REQUIRE AN ADDITIONAL COPY OF THE PARTICIPANT INFORMATION SHEET SENT TO YOU, PLEASE [CLICK HERE TO DOWNLOAD](#)

Do you primarily produce still or moving images?

Check all that apply.

still

moving

both equally

1. How important is being able to shoot stills AND video for your work?

Mark only one oval.

1 2 3 4 5
very important not important at all

2. How often are you asked to shoot stills and video in the same setup/project?

please choose 1 or 2 options Mark only one oval.

1 2 3 4 5
never all the time

3. When a client is asking for both stills and video do they have separate criteria for both or are they happy for both to utilise the same setup? What requests do they make in regard to each option?

They have separate criteria for video and stills.

They have the same criteria for both.

4. In your experience has the expectation for stills and video from the same professional changed?

Mark only one oval.

Yes (it has increased)

No (it has stayed the same)

No (There is no demand to produce both)

5. Have you added stills or video to your existing skill set to allow you to use it in your work? Or will you add either in the future?

Mark only one oval.

Yes (I have added one already) No (I have not)

Maybe (I may add one in the future)

No (I have no plans to add to my existing stills or video focus)

6. What do you shoot with (please tick all that apply)

Check all that apply.

DSLR Cameras

Mirrorless Cameras Smartphones

video cameras with built in lens Video cameras with interchangeable lenses.

Film cameras

7. Do you need to shoot stills and video at the same time or in the same setup?

Mark only one oval.

No

Yes

8. Do you approach shooting stills and video differently?

Mark only one oval.

Yes

No

Other:

9. What are the main differences you find in shooting stills and video?

Check all that apply.

composition

camera movement

subject movement

I find no differences - they are the same recording sound.

considerations for final delivery medium (online, print , video, etc)

Considering how they will be edited (Photoshop, Premiere, etc)

Handling the camera.

10. Do you shoot: (tick all that apply)

Check all that apply.

weddings

corporate

commercial

portraits

news

entertainment

drama

documentary

Other

11. Which areas do you find more often require you to shoot stills AND video? (Please tick all that apply)

Check all that apply.

- weddings
- corporate
- commercial
- portraits
- news
- entertainment
- drama
- documentary
- none
- Other:

12. Do you think that shooting stills and video in the same setup/project affects the process and quality negatively or positively?

Mark only one oval.

1 2 3 4 5

negatively positively

13. What is your profession? (i.e., Photographer, Videographer, Journalist, Wedding Photographer)

Mobile / Network technology

14. In your work do you use smartphones to capture:

Mark only one oval.

- Video
- Stills
- Stills and Video
- N/A

15. Have smartphones' ability to take stills and video affected your work?

Mark only one oval.

yes

no

16. Have changes in smartphones or camera technologies had the biggest effect in allowing stills and video to be produced in the same setup / by the same person?

Mark only one oval.

smartphone developments have made the biggest difference

camera developments have made the biggest difference

The combination of the two has

made the biggest difference Other:

17. What factors allow you to use your smartphone to capture images for your work?

Check all that apply.

Image quality

Convenience (always with you)

Ability to shoot and edit on the same device.

Ability to share images/stills immediately.

Social media integration

AI features (portrait mode, night-time mode etc) puts people at ease (less

frightening than a camera) Choice of Apps for image.

production/editing

18. How important do you think mobile image creation skills are for new professionals?

Mark only one oval.

1

2

3

4

5

v

not

Lighting

19. Which of the following light sources do you use?

please tick all that apply

Check all that apply.

- Daylight / Natural light
- Flash/Strobe light
- LED lights
- Tungsten lights
- Fluorescent lights
- HMI/Arc lights

20. When shooting stills AND video in a setup do you use the same lights for both or switch light sources for each?

Check all

- use the same lights for stills and
- use separate lighting for stills and
- N/A
- Other:

21. Do you use the same lighting design for stills and video? (In terms of placement and intensity / colour) Mark only one oval.

- Yes
- No
- Other:

22. What are your favourite light sources?

options

Check all that apply.

- Flash/Strobe
- LED lights
- Fluorescent lights
- Tungsten lights
- HMI / Arc lights
- Other:

23. How important is controlling lighting in your work?

Mark only one oval.

1 2 3 4 5
very important not important

24. How important is knowledge of lighting differences between stills and video for your work?

Mark only one oval.

1 2 3 4 5
very important not important

25. Do you use lights with or without modifiers? (i.e., soft boxes, Diffusion panels, Reflectors) please choose 1

Mark only one oval.

1 2 3 4 5
With Modifiers all the time Never use modifiers

A. Which modifiers do you use most frequently Mark only one?

- 1. oval. softbox reflector panel (i.e., collapsible 5in1)
- 2. flag(s)
- 3. beauty dish
- 4. diffusion panel /
- 5. butterfly panels
- 6. umbrellas
- 7. barn doors
- 8. colour filters
- 9. diffusion filters
- 10. metal reflector for flash/led projection lenses.

26. What are the most important factors in your choice of lights? (Please tick all that apply)

Check all that apply.

- Weight
- Color
- Light
- Battery
- choice
- dimmable
- flicker free
- cold light source (heat output not color temperature)
- Other:

27. Are there any further comments you would like to add concerning lighting for stills and video?

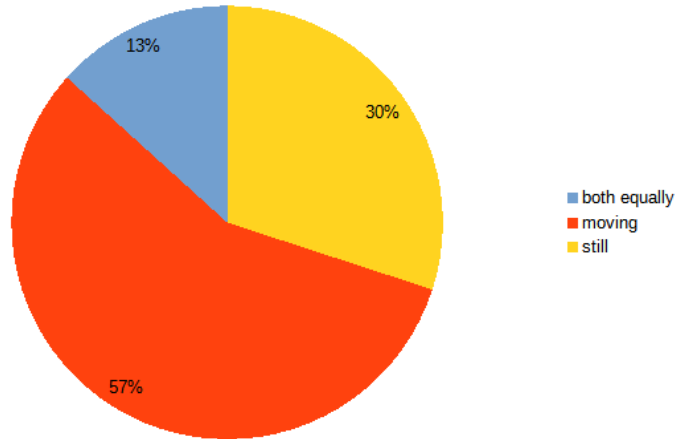
28 Are you using hard or soft lights? please choose 1

- Mark only one oval.
- Hard lights
- Soft lights
- Both
- Whatever the available light is available

THANK YOU FOR SUBMITTING THIS FORM AND YOUR UNIQUE IDENTIFIER NUMBER IS #NUMBER – PLEASE MAKE A NOTE IN CASE YOU WISH TO REMOVE YOURSELF FROM THE STUDY AT ANY POINT.

5. Survey Data Summary Values

1. Do you primarily produce still or moving images?



2. What is your profession?

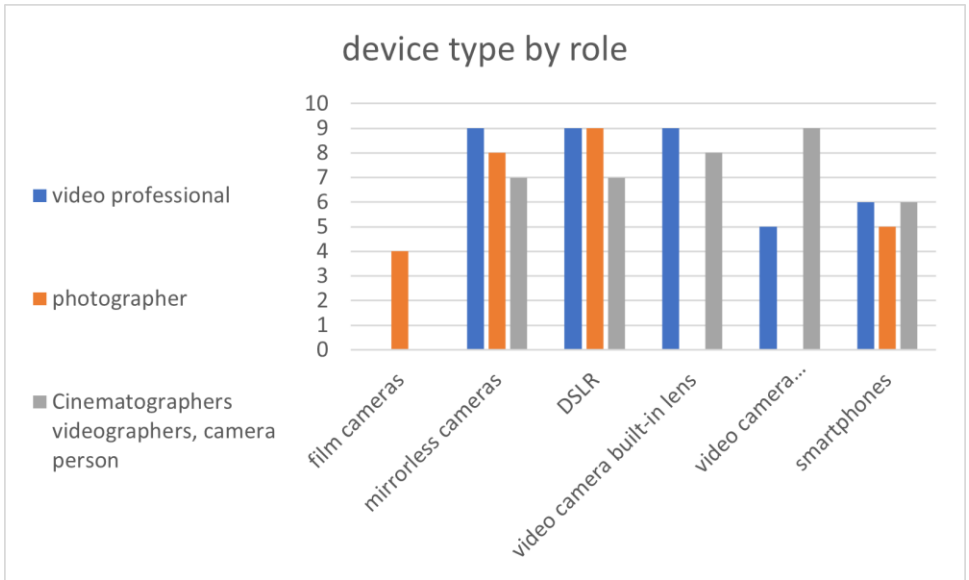
photographer	30%
Videographer	10%
Cinematographer,	10%
lighting camera	3%
Camera person	7%
shooting producer	3%
Filmmaker	3%
producer/director	3%
Journalist	10%
video producer	12%
Shooting producer	3%
Video journalist	6%

3. Do you shoot: (tick all that apply)

Corporate;	20
Commercial	23
News	13
Documentary	9
Landscape	4
Street	4
Portraits	13

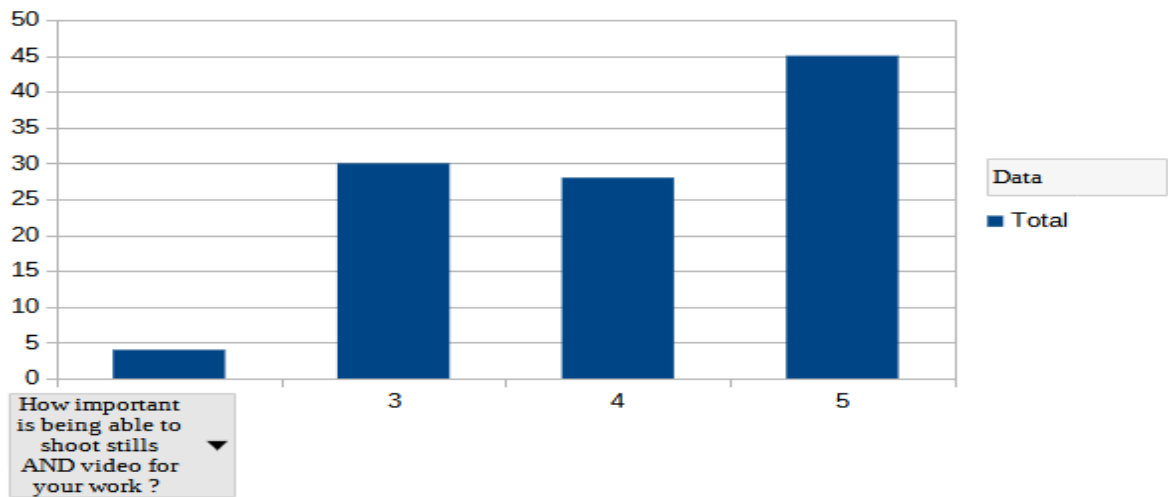
Nature 5
 Entertainment 5
 Drama 4

4. What do you shoot with (please tick all that apply)

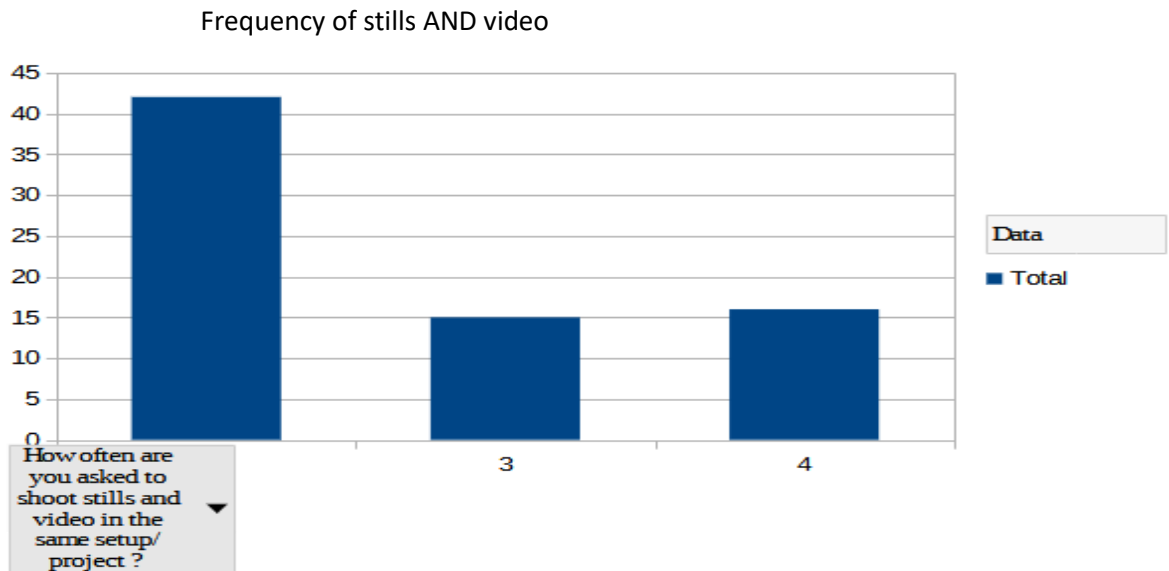


5. How important is being able to shoot stills AND video for your work?

Importance of stills and video



6. How often are you asked to shoot stills and video in the same setup/project ?



7. When a client is asking for both stills and video do they have separate criteria for both or are they happy for both to utilise the same setup?

They have the same criteria for both	14%
They have separate criteria for video and stills	86%

8. What requests do they make in regard to each option?

There were no replies to this text field.

9. In your experience has the expectation for stills and video from the same professional changed?

Yes 54%
No 46%

10. Have you added stills or video to your existing skill set to allow you to use it in your work? Or will you add either in the future?

Yes 70
Maybe 30

11. Do you need to shoot stills and video at the same time or in the same setup?



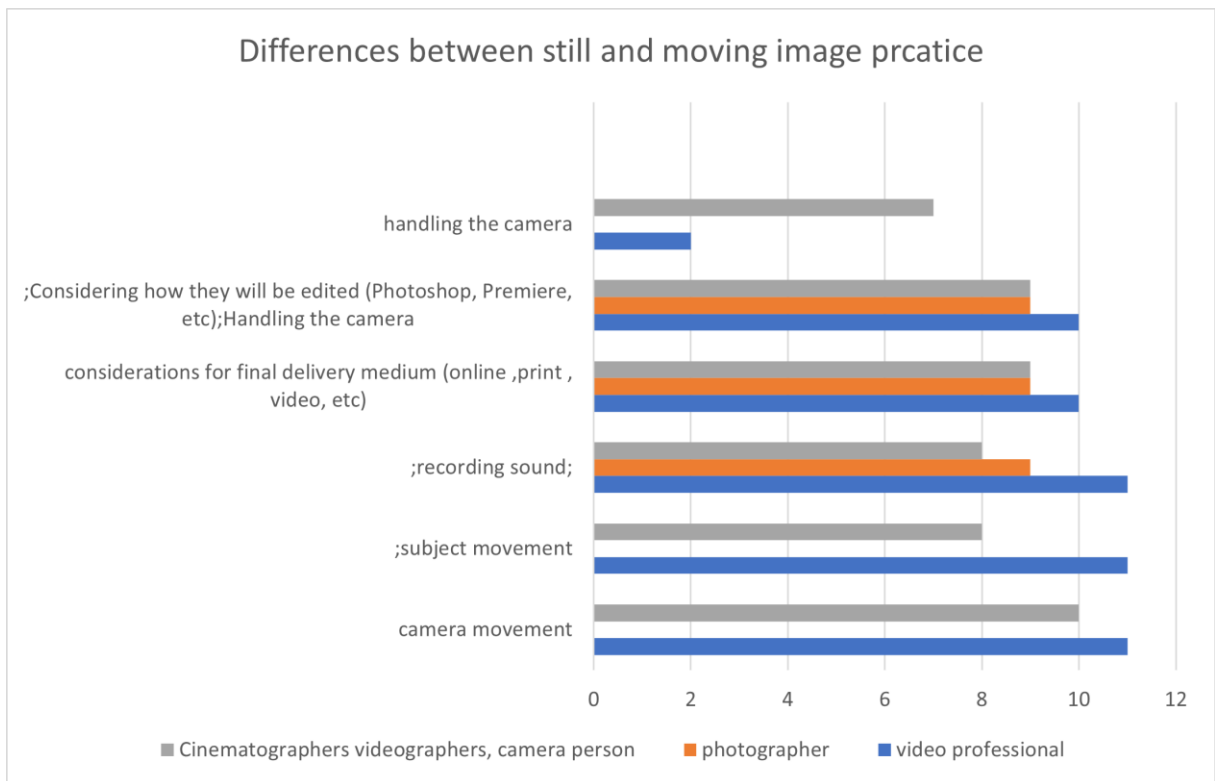
12. Do you approach shooting stills and video differently ?

YES 100%

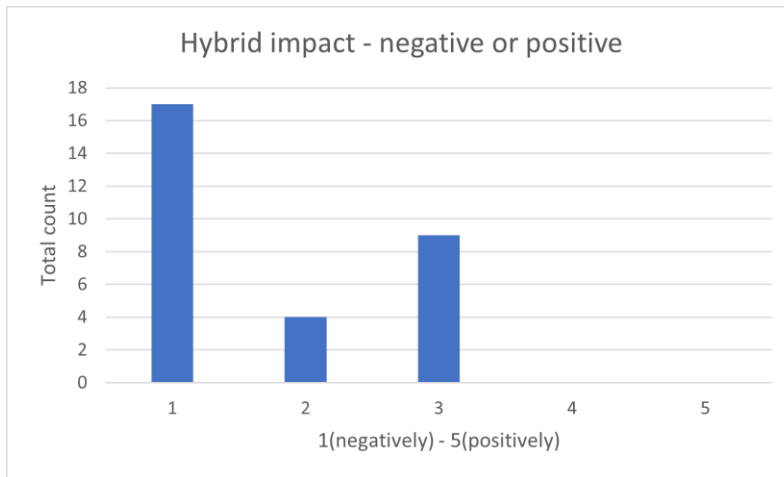
13. Which areas do you find more often require you to shoot stills AND video ? (please tick all that apply)

Weddings 26
 Corporate 5
 Documentary 5
 News 4

14. What are the main differences you find in shooting stills and video ?



15. Do you think that shooting stills and video in the same setup/project affects the process and quality negatively or positively ?



16. In your work do you use smartphones to capture and have smartphones' ability to take stills and video affected your work?

Yes 83%
No 17%

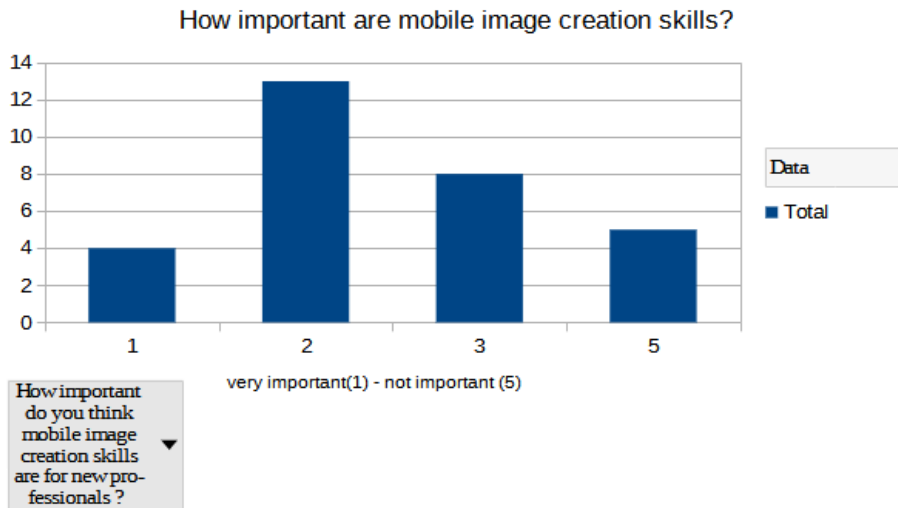
17. Have changes in smartphones or camera technologies had the biggest effect in allowing stills and video to be produced in the same setup / by the same person?

The combination of the two has made the biggest difference 40%
camera developments have made the biggest difference 47%
smartphone developments have made the biggest difference 13%

18. What factors allow you to use your smartphone to capture images for your work?
(Multiple selection option)

Convenience (always with you); Social media integration 17
Social media integration 17
Image quality 8
\Ability to shoot and edit on the same device; 4
Ability to share images/stills immediately; \; 7
;AI features (portrait mode, night-time mode etc) 8
; puts people at ease (less frightening than a camera); 8

19. How important do you think mobile image creation skills are for new professionals?



20. Which of the following light sources do you use (multiple selection option)

Daylight / natural light	30	
LED lights	21	
strobe lights		9
tungsten lights	13	
fluorescent lights	5	
HMI arc lights		4

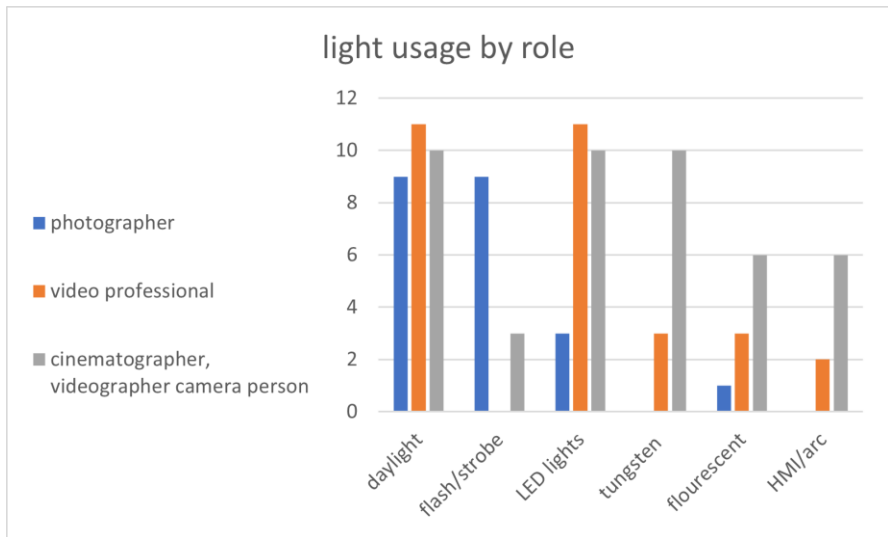
21. When shooting stills AND video in a setup do you use the same lights for both or switch light sources for each?

use separate lighting for stills and video	17%
use the same lights for stills and video	53%
use the same lights for stills and video; sometimes switch to flash for stills	13%
N/A	20%

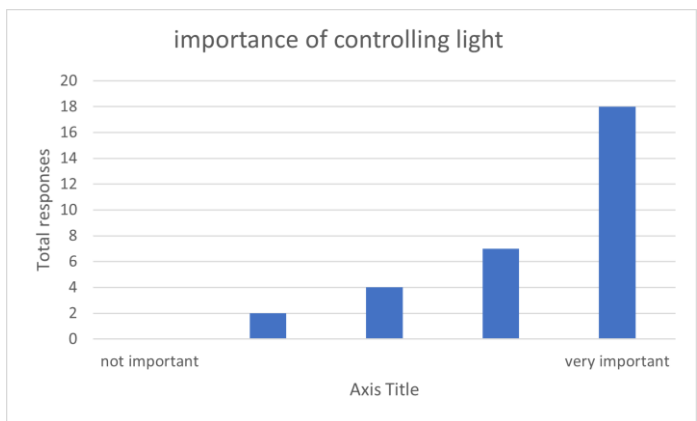
22. Do you use the same lighting design for stills and video? (In terms of placement and intensity / colour)

No 43%
 Yes 57%

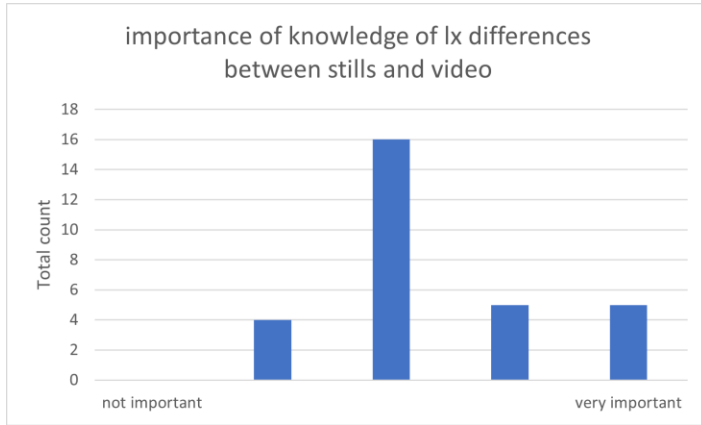
23. What are your favourite light sources ?



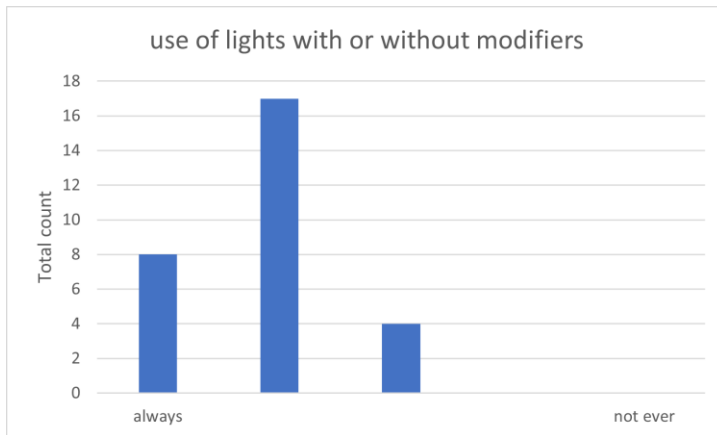
24. How important is controlling lighting in your work ?



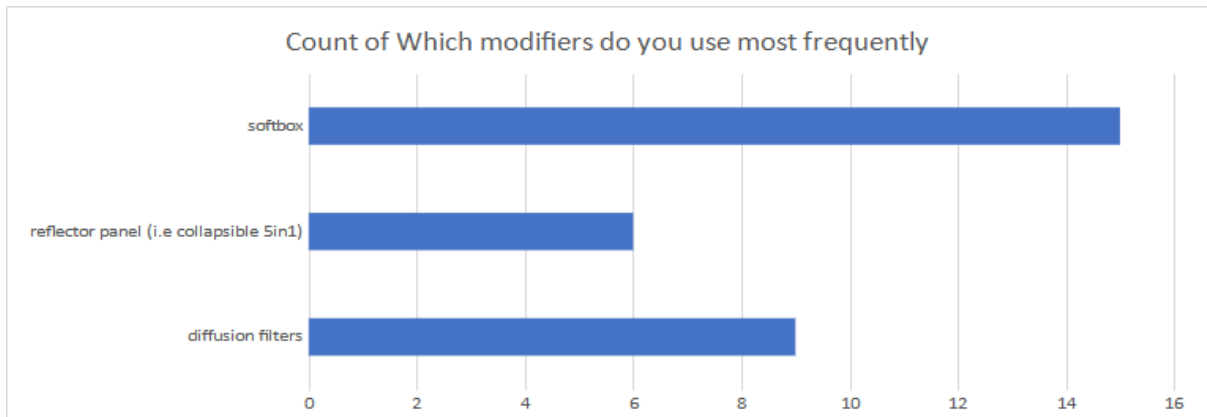
25. How important is knowledge of lighting differences between stills and video for your work?



26. you use lights with or without modifiers ? (i.e Soft boxes, Diffusion panels, Reflectors)



27. Which modifiers do you use most frequently



28. Are you using hard or soft lights?

Both	60%
Soft lights	27%
Whatever the available light is	13%

29. What are the most important factors in your choice of lights ? (please tick all that apply)

Colour Accuracy	30
Light output	26
Battery power	25
Choice of modifiers	9
Dimmable	21
Flicker free	21
Cold light source (heat output not colour temperature)	11

7. Hierarchy Chart of Coding from Interviews



8. Ethics Form

MIDDLESEX UNIVERSITY

PARTICIPANT SHEET (PIS)

Participant ID Code:.....

SECTION 1

1.

Study title

Mixed Methods Assessment of simultaneously shooting and lighting still images and videos in Hong Kong.

2.

Invitation paragraph

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

3.

What is the purpose of the study?

This study is an assessment of approaches to simultaneously shooting and lighting still images and video sequences in Hong Kong. Traditionally the creation of still images and moving images has been carried out by distinct groups of professionals, photographers and cinematographers/camerapersons. Changes in technology and Hong Kong have driven demand for the creation of both types of image in the same production. The project's analysis will help assess the demand for this relatively new approach in still and moving image production and provide guidance on how it can be delivered effectively.

4.

Why have I been chosen?

It is important that we assess as many participants as possible, and you have indicated that you are interested in taking part in this study.

You have been chosen as one of the important groups who is involved directly or indirectly in the type of production being examined by the study and as such have information that is central to understanding the studies area.

5.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. If you do decide to withdraw from the study then please inform the researcher as soon as possible, and they will facilitate your withdrawal. If, for any reason, you wish to withdraw your data please contact the researcher within a month of your participation. After this data it may not be possible to withdraw your individual data as the results may have already been published. However, as all data are anonymised, your individual data will not be identifiable in any way.

A decision to withdraw at any time, or a decision not to take part, will not affect you in any way.

6.

What will I have to do?

- You will be involved in one aspect of the study. This will either require you to undertake a short (30 minutes to 1 hour) interview discussing the area of the study, partaking in a production that will be used as a case study or answering an online questionnaire which will require between 15 and 30 minutes of your time.

Please note that in order to ensure quality assurance and equity this project may be selected for audit by a designated member of the committee. This means that the designated member can request to see signed consent forms. However, if this is the case your signed consent form will only be accessed by the designated auditor or member of the audit team.

6.

Will I have to provide any bodily samples (i.e. blood/saliva/urine)? NO.

6.

What are the possible disadvantages and risks of taking part? There are no disadvantages or risks to taking part in the study.

Appropriate risk assessments for all procedures have been conducted and will be followed throughout the duration of the study.

6.

What are the possible benefits of taking part?

We hope that participating in the study will help you. However, this cannot be guaranteed. The information we get from this study is aimed to help us recommend techniques or working approaches that can be of benefit to the practising professional in the field of still and moving image creation. As such a professional we would hope this information will be of benefit to you in your practice.

9.

Will my taking part in this study be kept confidential?

The research team has put a number of procedures in place to protect the confidentiality of participants. You will be allocated a participant code that will always be used to identify any data you provide. Your name or other personal details will not be associated with your data, for example, the consent form that you sign will be kept separate from your data. All paper records will be stored in a locked filing cabinet, accessible only to the research team, and all electronic data will be stored on a password protected computer. All information you provide will be treated in accordance with the UK Data Protection Act.

As part of the interview, audio recordings will be made and then transcribed for data analysis. Once transcribed the audio recordings will be destroyed and no additional personal data will be gathered. As part of the case study video and still images will be made and may contain the participant. In this case once analysed the areas of footage and still images containing participants will then be destroyed. The only person who has access to any of the personal data before it is destroyed is the primary researcher (John Curran).

9.

What will happen to the results of the research study?

The results of the research study will be used as part of an Postgraduate dissertation. The results may also be presented at conferences or in journal articles. However, the data will only be used by members of the research team and at no point will your personal information or data be revealed.

9.

Who has reviewed the study?

The study has received full ethical clearance from the Research ethics committee who reviewed the study. The committee is the transdisciplinary REC.

9.

Contact for further information

If you require further information, have any questions or would like to withdraw your data then please contact:

John Curran , j.curran@mdx.ac.uk

Elda Nikolou Walker , E.Nikolou-Walker@mdx.ac.uk

Thank you for taking part in this study. You should keep this participant information sheet as it contains your participant code, important information and the research teams contact details

SECTION 2

Middlesex University Guide to Research Privacy Notices

Privacy notices need to be presented whenever data is collected and should be understandable and accessible. Privacy notices must explain the type and source of data that will be processed. They will also set out the processing purpose, data retention schedules and data sharing. Privacy notices must include details of the subject's rights and who the subject can complain to.

The following example may be used and completed for your research purposes.

Middlesex University Privacy Notice for Research Participants

The General Data Protection Regulation (GDPR) protects the rights of individuals by setting out certain rules as to what organisation can and cannot do with information about people. A key element to this is the principle to process individuals' data lawfully and fairly. This means we need to provide information on how we process personal data.

The University takes its obligation under the GDPR very seriously and will always ensure personal data is collected, handled, stored and shared in a secure manner. [The University's Data Protection Policy can be accessed here:](#)

https://www.mdx.ac.uk/_data/assets/pdf_file/0023/471326/Data-Protection-Policy-GPS4v2.4.pdf.

The following statements will outline what personal data we collect, how we use it and who we share it with. It will also provide guidance on your individual rights and how to make a complaint to the Information Commissioner's Officer (ICO), the regulator for data protection in the UK.

Why are we collecting your personal data?

As a university we undertake research as part of our function and in our capacity as a teaching and research institution to advance education and learning. The specific purpose for data collection on this occasion is to;

1.

To critically evaluate lighting approaches for still and moving images and analyse the differences in approach and equipment to discover how they are similar and to what level they can be integrated into a single lighting schema.

2.

To investigate productions in Hong Kong that require delivery of still and moving images at the same time and analyse how this affects lighting and filming the final images to meet local cultural expectations and assumptions around image and content.

The legal basis for processing your personal data under GDPR on this occasion is Article 6(1a) consent of the data subject.

Transferring data outside Europe

In the majority of instances your data will be processed by Middlesex University researchers only or in collaboration with researchers at other UK or European institutions so will stay inside the EU and be protected by the requirements of the GDPR.

In any instances in which your data might be used as part of a collaboration with researchers based outside the EU all the necessary safeguards that are required under the GDPR for transferring data outside of the EU will be put in place. You will be informed if this is relevant for the specific study you are a participant of.

Your rights under data protection

Under the GDPR and the DPA you have the following rights:

- to obtain access to, and copies of, the personal data that we hold about you;
- to require that we cease processing your personal data if the processing is causing you damage or distress;
- to require us to correct the personal data we hold about you if it is incorrect;
- to require us to erase your personal data;
- to require us to restrict our data processing activities;
- to receive from us the personal data we hold about you which you have provided to us, in a reasonable format specified by you, including for the purpose of you transmitting that personal data to another data controller;
- to object, on grounds relating to your particular situation, to any of our particular processing activities where you feel this has a disproportionate impact on your rights.

Where Personal Information is processed as part of a research project, the extent to which these rights apply varies under the GDPR and the DPA. In particular, your rights to access, change, or move your information may be limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we may not be able to remove the information that we have already obtained. To safeguard your rights, we will use the minimum personally-identifiable information possible. The Participant Information Sheet will detail up to what point in the study data can be withdrawn.

If you submit a data protection rights request to the University, you will be informed of the decision within one month. If it is considered necessary to refuse to comply with any of your data protection rights, you also have the right to complain about our decision to the UK supervisory authority for data protection, the Information Commissioner's Office.

None of the above precludes your right to withdraw consent from participating in the research study at any time.

Collecting and using personal data

As part of the interview, audio recordings will be made and then transcribed for data analysis. Once transcribed the audio recordings will be destroyed and not additional personal data will be gathered. As part of the case study video and still images will be made and may contain the participant. In this case once analysed the areas of footage and still images containing participants will then be destroyed. The only person who has access to any of the personal data before it is destroyed is the primary researcher (John Curran).

Data sharing

Your information will usually be shared within the research team conducting the project you are participating in, mainly so that they can identify you as a participant and contact you about the research project.

Responsible members of the University may also be given access to personal data used in a research project for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your records. All of these people have a duty to keep your information, as a research participant, strictly confidential.

If we are working with other organisations and information is shared about you, we will inform you in the Participant Information Sheet. Information shared will be on a 'need to know' basis relative to achieving the research project's objectives, and with all appropriate safeguards in place to ensure the security of your information.

Storage and security

The University takes a robust approach to protecting the information it holds with dedicated storage areas for research data with controlled access.

Alongside these technical measures there are comprehensive and effective policies and processes in place to ensure that users and administrators of University information are aware of their obligations and responsibilities for the data they have access to. By default, people are only granted access to the information they require to perform their duties. Training is provided to new staff joining the University and existing staff have training and expert advice available if needed.

Retention

Under the GDPR and DPA personal data collected for research purposes can be kept indefinitely, providing there is no impact to you outside the parameters of the study you have consented to take part in.

Having stated the above, the length of time for which we keep your data will depend on a number of factors including the importance of the data, the funding requirements,

the nature of the study, and the requirements of the publisher. Details will be given in the information sheet for each project.

Contact us

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9. LED CPD outline

Unit Title	LED CPD programme		
Learning Outcomes	Assessment Criteria	exercises	Example evidence
1. Understand LED standards	1a. Outline the range of LED lighting standards and their specifications and advantages/differences		written/verbal discussion.
5. Understand the necessity for accurate colour data and control	Delivering test shots without accurate colour information to illustrate inaccurate colour information artefacts including unwanted colour shift in recorded image	A range of test shots	Recorded footage.
Understand colour accuracy and apply to measuring colour from an LED against its supplied data	Use a colour meter or colour meter app to assess light quality and shoot a test shot to examine interaction with colour settings on camera.	Test shots using colour meter	Footage and stills of process
Understand how to use LED information in production	Work with LEDs using the supplied information to deliver colour accurately controlled in coordination with the camera setup.		
Understand and utilise LED control systems	Deliver a shot using a single LED and remote control using an LED control system. Add a multiple light setup using a remote-control LED system such as LiOs or Sidus Link	Range of shots using single and multiple LEDs	Stills of process including apps

10. CPD training plan / Education guidelines

Unit Title	Hybrid Image production programme outline	Hybrid Image and Lighting	
Learning Outcomes	Assessment Criteria	evidence	exercises
Understand still and moving image gathering and differences. Understand where they can be treated similarly.	Describing theory and implementation of still and moving image creation / recording and delivery.	written/verbal discussion.	
<p>1 Set camera for still shots</p> <p>1 Set camera for video shots</p> <p>1 Set camera for still images from video</p> <p>2a. Attach external storage for additional recording options – recorders or monitor/recorders</p>	<p>1a. Set up camera menus optimised for</p> <p>1b. Carry out necessary preparations of the camera before use - insert battery, check battery is charged, insert appropriate memory storage (card or ssd), check viewfinder/monitor.</p>	Stills of process	Setup cameras
2. Understand connections to other equipment.	Demonstrate connecting to strobes, monitors, external storage, and microphones.		
3. Recognise basic visual grammar involved with filming the still and moving image	<p>3a. Describe/use the meaning of some basic filmic terms/photography terms, e.g., close-up, medium shot, long shot, pan, tilt.</p> <p>3b. Frame a shot to concentrate on the centre of interest. Offer frames suitable for still and moving image use.</p>	A range of test shots	Illustrate close-up, medium shot, long shot, pan, tilt for still and moving image use.
4 Understand still and moving image similarities	Demonstrate scenarios where still and moving images need to be gathered separately	A range of test shots	Shoot separate scenarios

Unit Title	Hybrid Image production programme outline		Hybrid Image and Lighting	
5 Understand still and moving image differences	Demonstrate scenarios where still and moving images can be gathered together/simultaneously	A range of test shots	Shoot hybrid scenarios	
6. Understand continuous and strobe lighting basics	Record and shoot successfully using continuous light for moving image and still image. Record a shot using strobe lighting in the same setup.	A range of test shots	Shoot lit scenarios	
7. Recognise the colour differences between different light sources.	4a. Describe the colour differences between daylight and tungsten sources and LED functionality to deliver exact lighting output	A range of test shots	Shoot lit scenarios with mixed lighting	
8. Understand relevant Health and Safety practice.		Before shoot outline health and safety preparations		
9. Describe/Demonstrate holding the camera safely, e.g. use of safety straps, balanced and stable body stance. Safe use of tripod, gimbals and other mounts.				

11. Research Timeline:

DPROF

