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**Digital visual effects in contemporary Hollywood cinema aesthetics, networks and transnational practice**

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**DIGITAL VISUAL EFFECTS IN  
CONTEMPORARY HOLLYWOOD CINEMA  
AESTHETICS, NETWORKS AND  
TRANSNATIONAL PRACTICE**



**Muqun Niu**

A dissertation submitted to the University of Bristol in accordance with the requirements for award of the degree of PhD in the Faculty of Arts, School of Arts.

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72,907 words

## Abstract

This research aims to provide new knowledge about the aesthetics of digital visual effects in contemporary Hollywood cinema in the context of national, transnational and global compositing practices. Combining contextual research, fieldwork and film analysis, this research reveals that the aesthetics of digital visual effects in Hollywood film is the manifestation of complex factors such as technological innovation, time and invisible labour, global business model of Hollywood film industry, and the conditions of creative autonomy of digital visual effects artists. Furthermore it examines the causes and effects of the involvement of multiple globally located digital visual effects companies in single Hollywood films. Research into this area is underpinned by comparing digital visual effects in films from Hollywood and China, as well as systematic studies of the Hollywood digital visual effects company Pixomondo and the Chinese film industry. It reveals that the transnational digital visual effects practice is informed by several factors, which include: the fixed bidding process in the Hollywood digital visual effects industry, tax subsidies offered by governments such as the UK, the lower labour costs in countries such as India; as well as emerging markets in world cinema. This thesis also argues that transnational digital visual effects practice leads to the adoption of Hollywood aesthetics of digital visual effects to world popular cinema.

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Last but by no means least, I would like to thank my family and friends. Thanks to my parents for financing my research and their love; my husband Andrew Franks for being so understanding and supportive; and Dr Martin Crossley Evans for his encouragement.

## Author's Declaration

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's *Regulations and Code of Practice for Research Degree Programmes* and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

SIGNED: .......... DATE: ....21-05-2020.....

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## Chapter 1: Introduction

### 1.1 Background

Comparing films produced by Hollywood and China, this study aims to identify the connections between the aesthetics of digital visual effects in contemporary cinema and transnational multi-production networks. Digital visual effects are widely utilised in contemporary Hollywood cinema to combine computer-generated imagery with live action footage to achieve what I call an aesthetics of photorealism. For example, *Star Wars Episode I: The Phantom Menace* (1999, George Lucas) tells the story of Anakin Skywalker's adventures in a fictional galaxy, which involves the production of intergalactic trade routes, aliens and pod races that comply with our more earthly 21st-century realism. This photorealism relies on digital imaging to convey reality effects. Live action footage is composited with computer-generated landscapes and technologies to persuade the audience that the character himself inhabits this computer-generated environment, which obeys the laws of Newtonian physics. The seamless interaction and coherent aesthetics seen on the screen are produced through a largely invisible, globalised labour force working in digital visual effects (VFX) and post-production companies. The highly complex, transnational post-production network involves a large, distributed workforce, uniform software and hardware platforms, centrally controlled workflows, and the influence of markets, as well as database and communication tools facilitated by information technology. Despite this highly distributed, diverse workforce, the cinematic forms to which they contribute express a coherently Hollywood aesthetic. This thesis therefore asks: in what ways do transnational networks influence the aesthetics of digital visual effects in contemporary Hollywood cinema?

To contextualise this question further, I examine *Life of Pi* (Ang Lee, 2012), a story of a boy named Pi in the Pacific Ocean with a Bengal tiger after a shipwreck. In the film, large numbers of computer-generated images - including the tiger, a whale, jellyfish, the sinking ship, the ocean, the sky as well as lightning and storms - are composited smoothly and coherently with live action footage. In what the compositing company involved – The Moving Picture Company – describes as ‘the God storm scene’ (1:00:00) the live action footage of Pi and his small lifeboat was captured first in a swimming pool with blue screen (Figure 1). Digital compositing replaced the swimming pool with computer-simulated sea and storm, which attempted to achieve the effect that Pi and the lifeboat were filmed in the ocean. Through

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compositing, the vertical and horizontal movements of Pi and the lifeboat are matched with the dynamic of the waves. The colour of the ocean and the movement of the waves are graded to match the stormy weather. In another scene (approx. 1:30:00), the tiger lays his head on the boy's lap. The interaction between the boy and the tiger was achieved through the composition of a computer-generated Bengal tiger and captured footage of the boy, Pi, holding a toy tiger covered with blue screen (Figure 2). The details in the composition, such as the muscles of the tiger's face relaxing and contracting, the texture of his fur and the dry pink skin near his nose, are designed to photorealistically express the tiger's illness as a consequence of long term thirst and dehydration.

However, what is meant here by photorealism? It is casually and frequently cited in the trade journals as the holy grail of digital visual effects such as the article 'Photorealism – An Exciting New Trend in the VFX Industry' published by Toolbox Studio<sup>1</sup>. It is uncritically allied to a range of other terms that require unpacking. In order to situate the reader in this study, it is therefore important that I set out the key terms used in this thesis and attempt to critically define them.

### 1.1.1 Photorealism

In this thesis, photorealism refers to a key aesthetic style of digital visual effects. The main characteristics of it include the attempt to reproduce the impression of reality in cinema through computer-generated imagery; the coherence between the computer-generated elements and live action footage of a scene; as well as the invisibility of digital manipulation taking place to achieve certain effects. This particular aesthetic style is most evident in contemporary Hollywood cinema. There are numerous Hollywood films such as *Star Wars Episode I: The Phantom Menace* and *Life of Pi*, that employ this aesthetic style in terms of constructing scenes set in outer-space, and the animal kingdoms. These scenes propose aesthetic values to their views via depicting certain settings and performances, which are considered difficult or impossible to film, to appear as if they are filmed. For example the close interaction between a tiger and human could be considered difficult to be filmed. Although the notion of photorealism in digital visual effects is closely associated with imitating the impression of reality in cinema,

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<sup>1</sup> Available online at : <https://www.toolbox-studio.com/blog/photorealism-an-exciting-new-trend-in-the-vfx-industry/>

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it differs however from cinematic realism. Realism is considered as a mechanical reproduction of reality. Due to the indexical relationship cinematic imagery has with reality (Bazin, 2005), the impression of reality in film is created through an automatic process. However, such an indexical relationship does not exist for computer generated imagery, in the Hollywood industry, the invisible digital visual effects is rendered through a much more complex process, which involves the use of packaging software (and associated hardware), computer algorithms, a large number of globally located digital visual effects artists and the design of workflows. The complex industrial and production context will be further discussed in this thesis.

### 1.1.2 Reality

Reality, if we assume it exists, is a term with a great deal of complexity. What I am trying to do here is to discuss its meaning in relation to photorealism and film realism. Within this particular context, reality refers to an existence, which has various elements such as colour, shape, texture, and movement, prior to its representation in different media and perception by human senses. It is important to understand that despite film having an indexical relationship with reality, it still has certain differences to the way the world is perceived by human eyes. For example, film has grains, and could appear less clear and less bright compared to how humans see the world. The sense of photorealism is a result of creative choices, where the artists could intentionally use documentary film as reference or their own perception of reality as reference. According to the digital visual effects artists I interviewed, who worked on the 'the God storm scene' in *Life of Pi*, film documentaries were used as reference for designing the look of the tiger. The digital visual effects team also went to the zoo to observe real tigers for producing digital visual effects shots in this film. As reflected by Rob Legato in an audio interview with trade journal *FX-Guide*<sup>2</sup>, who was the digital visual effects supervisor of many Hollywood film such as *The Jungle Book* and *Hugo*, what the digital visual effects team often do is try to recreate what they imaged film would look like. They could also add a degree of enhancement, so digital visual effects scenes appear brighter and more saturated than our perception of reality. For example, the fur of the tiger in this film has a stronger shade of orange tone than what a human would be able to see in a real tiger.

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<sup>2</sup> The audio record of this interview is available at

<https://www.fxguide.com/fxpodcasts/fxpodcast-302-the-jungle-book/>

## Introduction

### 1.1.3 Remediation

Remediation is a concept introduced by Bolter and Grusin (1999) in order to understand the nature and aesthetics of the digital media forms such as CGI films, video game and virtual reality. As stated by Bolter and Grusin, remediation refers to a tendency that newer media forms tend to borrow and refurbish the various techniques previous media used to represent reality. In terms of digital visual effects, remediation takes place when computer generated and manipulated scenes try to imitate the look of film.

### 1.1.4 Believability

Despite the fluid and subjective nature of this term, believability is considered by professionals in the contemporary digital visual effects industry as the basis of photorealism. The achievement of believability is a highly complex matter. According to Prince (1996), computer-generated-imageries appear real or believable as they correspond to the visual perception of the audience. According to the professionals in the Hollywood film industries I interviewed, digital visual effects are generally as minimum aimed to be sufficient to be considered believable by everyday audiences. A case in point is Baloo in *The Jungle Book* (Jon Favreau, 2016). *The Jungle Book* is another film that uses digital visual effects to depict the close interaction between human character and wild animals. In this film, Baloo is a bear who acts as a close friend with the protagonist Mowgli. According to the digital visual effects artists who worked on this film, they intentionally added a greater volume of fur for the bear. However the aim was still for the bear to be considered believable by audiences. As stated by one of the artists, “we like the bear to look more fluffy but not too fluffy to look fake”. The believability aspects of digital visual effects also acts as a foundation for the narrative. For example, in *Star Wars: The Rise of Skywalker* (J.J. Abrams, 2019), the unfolding of the plots is surrounding the self-doubting and exploration of the protagonist, Rey, through her journey to different planets and encounters with different alien species. The construction of those planets and alien characters are heavily reliant on digital visual effects, which seamlessly blend with the live-action performance of Rey. The progression of the plot is dependent on the believability of the digital visual effects. In order to follow the narrative of the film, the audience would believe Rey, her environment and the aliens are interacting with each other at where the story is set, rather than acting in front of a green screen.

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As I demonstrate, above, there is a need to avoid uncritical descriptions of visual effects as photo-real. This thesis approaches photorealism in digital visual effects as a concept with a degree of complexity, flexibility and subjectivity. It is neither a mechanical copy of the impression of reality in film, nor an exact correspondence to the visual perception of humans. The photorealistic look is evolving through a fluid process involving complex workflows where a myriad of technologies and techniques were used. For example Digital compositing is the final stage of the digital visual effects workflow. It refers to the process of digitally assembling multiple image sources in order to generate blended images (Brinkmann, 2008). Other stages involved in the workflow include digital modelling, texturing, animating, and lighting, which are aimed at producing the computer-generated imagery of digital visual effects shots. More importantly, creative decisions need to be made throughout the workflows regarding what would be considered to be real, these decisions tend to be guided by film footage, still photography as reference, as well as the creative professionals' own visual perception and consideration of what is believable to audiences. When making decisions for Hollywood films such as *The Jungle Book* in terms of the look and movement of computer generated animal characters, there is a trade-off between what is tolerable and what is more visually appealing to audiences. Therefore, in the following chapters of this thesis, I will have a close examination of the degree and complexity of photorealism in visual effects films such as *The Jungle Book* (Jon Favreau, 2016), *Life of Pi* (Ang Lee, 2012), and *Hugo* (Martin Scorsese, 2011).

In both the *Star Wars Episode I: The Phantom Menace* and *Life of Pi* discussed earlier in this chapter, photorealism is also aligned with narrative immersion, which has become the goal of moving image media, particularly expressed in the collaborations between cinema and the vision-based tech sector. The term 'photorealism' was first coined by Louis K Meisel in 1969 in the context of pop art and its concerns with both problematising and conveying the 'lifelike' through painting. It is frequently used in trade journals when discussing digital visual effects with three main focus areas: tools, workflow and labour. For example, the article 'Photorealism – An Exciting New Trend in the VFX Industry' published by Toolbox Studio describes photorealism as including all of the creative artistic tools available. Another publication Seymour (2013) on trade publication FX-Guide highlights the talented crew and teamwork made the photorealistic look in the film *Gravity* available. The importance of workflow is highlighted in Seymour (2016) for delivering the digital visual effects in *The Jungle Book*. The academic critics of photorealism also have a different focus. Scholars such as Prince (1996)

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believes photorealism is more of a correspondence to visual perception, while the analysis of Bolter and Grunsin (1999) tend to focus on the connections between photorealism in digital visual effects and the impression of reality in film. The emerging research in the field of cognitive research such as Hinde, Smith and Gilchrist (2018) sheds light on the relationship between narrative, the engagement of human eyes with a certain visual object; as well as viewers' immersive experiences. This study aims to address the complexity of photorealism in order to further the theoretical understanding of this concept, as well as bridging it with contemporary practice in the field of digital visual effects. Therefore, it is the relationship between the technologies and working practices of digital visual effects producers, the elevation of photorealism as the key criterion for cinematic success and conventional Hollywood narrative that guides the focus of this thesis.



*Figure 1 The making of Life of Pi (2012)*

## Introduction



*Figure 2 The making of Life of Pi (2012)*

The digital visual effects in *Star Wars Episode I: The Phantom Menace* (1999) were produced by two companies, Industrial Light and Magic and Gentle Giant in the USA<sup>3</sup>. However, more than six companies contributed to the digital visual effects in *Life of Pi* (2012), including Legacy Effects, Rhythm and Hues, Moving Picture Company, Lola Visual Effects and Crazy Horse Effects. These companies (Figure 3) are located in countries such as India, China, the USA, the UK, Germany and Canada and they also co-operated with production companies in the USA, China and the UK for this film. Even the visual elements within a single composition, for example, the composition of the interaction sequence between Richard Parker and Pi discussed above, can be produced within multiple studios in different locations. The live-action footage of Pi and his boat was captured in Taiwan, while visual effects companies such as Rhythm and Hues, which have teams in Mumbai, Los Angeles, and Vancouver simulated the CGI tiger. Moreover, Rhythm and Hues contributed mainly to compositing the Pacific Ocean

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<sup>3</sup> The information is from the IMDb website:

[http://www.imdb.com/title/tt0120915/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt0120915/companycredits?ref=tt_dt_co)



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on sunny days in the film while the Moving Picture Company in London was responsible for compositing the ocean in the storm scenes mentioned above<sup>4</sup>.



*Figure 3 Digital visual effects companies for Life of Pi on a map*

In this thesis, I am defining these examples of multiple digital visual effects facilities and production companies in different countries collaborating to produce films as 'transnational multi-production networks'. This is a phenomenon particularly associated with the Hollywood film industry, especially over the last decade. For example, visual effects companies Weta Digital in New Zealand, Industrial Light & Magic in the USA, Framestore in the UK, Canada and USA, Prime Focus World in the UK, India, China, Canada and the USA, Lola Visual

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<sup>4</sup> The information about the compositing companies of Life of Pi is according to the following source: the first one is the company credits page on IMDb: [http://www.imdb.com/title/tt0454876/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt0454876/companycredits?ref=tt_dt_co)

The second one is the associated text of this film on the visual effects trade magazine FX-Guide: <http://www.fxguide.com/featured/life-of-pi/>

## Introduction

Effects in the USA and LOOK! Effects in Germany, Canada and the USA all contributed to the digital compositing and other stages of digital visual effects workflow in *Avatar* (James Cameron, 2009)<sup>5</sup>. And in *Hugo* (Martin Scorsese, 2011), Pixomondo in Germany, China, the USA and Canada, Lola Visual Effects, Uncharted Territory in the USA, Industrial Light & Magic (ILM), Matte World Digital in the USA, New Deal Studios in the USA and With A Twist Studio in the USA were all involved in the film's digital visual effects.

This thesis aims to provide a systematic understanding of the multiplication of digital visual effects companies in a single film, with a specific focus on identifying the connections between digital technologies, transnational digital visual effects practice and aesthetics of contemporary Hollywood cinema, and the global audience of Hollywood. It contains the following two related research questions:

- 1) What are the factors that inform the transnational digital visual effects practice for the contemporary film industry?
- 2) In what ways and to what extent do transnational digital visual effects practices influence the aesthetics of contemporary Hollywood cinema?

To answer these questions, I argue first that research into transnational digital visual effects practice and the links between aesthetics, technologies and the economics of production is under-explored. To address this, I undertake a series of close textual analyses, analyses of business models, and qualitative research into the working practices of various VFX companies worldwide. Clearly, the choice of films using digital visual effects is endless. My choice of films in the chapters that follow has been governed primarily by the richness of material that they offer the research intending to engage with both aesthetic and production practice concerns. Chapter 2 uses close textual analysis of *Jungle Book* in order to explore questions of time, invisible labour and photorealism in Hollywood cinema. Chapter 3 widens the focus in order to open up questions about global creativity workers and their engagement with the aesthetics of photorealism and its relationships with time. I do this by discussing *Star Wars* and *Hugo*. Chapter 4 then moves to a discussion of global business models and how they impact

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<sup>5</sup> According to the website of IMDb:

[http://www.imdb.com/title/tt0499549/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt0499549/companycredits?ref=tt_dt_co)

## Introduction

on the choices made by creativity workers in different settings. Chapter 5 moves to look very specifically at the case of China to explore how the themes and questions raised in the thesis are experienced on the ground. In the following sections of this Introduction, I turn to a literature review, in order to survey the current state of visual effects scholarship. I end the introduction with a discussion of method.

### 1.2 Literature Review

The paragraphs above briefly introduce the phenomenon of transnational digital visual effects practice in the contemporary Hollywood film industry and the research questions this study focuses on, while the following part of this chapter reviews the relevant literature. Firstly, it discusses key research into digital cinema, with a specific focus on the relationship between digital visual effects and film aesthetics (Manovich, 2001; Rodowick, 2007 and Wood 2007, 2008, 2012). Furthermore, it reviews the research into the influences of various factors such as audience and market on the aesthetics of contemporary Hollywood cinema as well as the forms of co-operation and interaction between Hollywood and film industry across the world (Miller, 2005). In addition, it discusses the relevance of writings on transnational cinema by Ezra and Rowden (2006), and Castells' studies of increasingly networked society (1996 and 2004) for the understanding of transnational networks of digital visual effects. Such a wide-ranging review of the literature is critical for this study because existing research into digital visual effects, except Wood (2012), mainly focus on film text and fail to examine the possible impact of contexts of industry and cinema audiences on its aesthetics. Wood (2012) sheds light on the study of production context for the understanding of computer-generated characters in *Avatar* (2009). This research attempts to explore the more complex contexts of industry and cinema audiences. The literature review aims to identify the theoretical framework for this research and, more importantly, to illustrate that the studying of transnational multi-production network in the contemporary Hollywood film industry will extend the current understanding of digital visual effects.

The literature surrounding digital cinema, in particular the impact of digital technology and visual effects on the aesthetics of cinema, can be divided into two schools of thought. The first is from scholars such as Turnock (2012) and Ross (2012), who suggest that the influence of the utilization of digital technologies and visual effects on film aesthetics is limited. However, the other school, with scholars such as Bolter and Grusin (2000) and Manovich (2001), argue

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that digital technologies, which are available for filmmaking when the medium transformed from analogue to digital, have significant aesthetic and cultural value. The discussion of the different opinions towards digital cinema and visual effects is relevant to this study because it aims to generate a comprehensive understanding of the current research into the aesthetics of digital visual effects and the discussion aims to provide a standing-point for this project to further study digital visual effects and its aesthetic.

There are various reasons scholars such as Belton (2002), Zinman (2012), Turnock (2012) and Ross (2012) provide to deny the aesthetic and cultural significance of digital cinema. Belton (2002) suggests that digital cinema simply generates marketplaces and is a concept completely associated with economics not aesthetics. Technological innovation within the film industry is seen to be driven by directors such as George Lucas in the context of realising his fantasy worlds in the making of science fiction films. Sci-fi films and special effects blockbusters such as *Star Wars Episode I* (1999) “have transformed the motion picture industry” (9) as they “have driven up negative cost” (Belton, 2002:9). The research discussed above identifies that it is necessary to consider economic and financial factors for the understanding of the diffusion of digital technologies in the film industry. It considers the revenue of digital visual effects blockbusters, but has not considered the costs of digital visual effects and audiences who contribute to the box office revenues of these digital visual effects blockbusters. It also fails to answer the question of whether technological innovation creates any new space for the artistic expression of the medium. Therefore, further research needs to be done into the identification of the relationship between technological, economical, aesthetic factors and audience.

Zinman (2012), Turnock (2012) and Ross (2012) claim that from an aesthetic point of view, digital cinema simulates analogue film. The evidence Zinman gives is that experimental filmmakers who first painted on film originally invented techniques, such as motion paintings, subsequently used for digital visual effects and animation. Turnock insists that digital visual effects simply imitate the work of Industrial Light and Magic in the 1970s. Ross suggests that the flight sequences in contemporary cinema such as *Avatar* (2009, James Cameron) used similar cinematographic and editing style as these for silent films such as *Wings* (William Wellman and Harry d'Abbadie d'Arrast, 1927). The research above shares an assumption that as long as digital cinema borrows any technique from the analogue period of filmmaking, the development of its own aesthetic language is impossible. What the assumption ignores, besides

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similarities, are the forms of difference between the digital cinema and analogue film. For example, the flight sequence examined by Ross might share similarities in terms of editing. More specifically, the consistent cutting from dynamic flying shots to medium shots at eye level with the characters, which shows their reactions, appears in both of the flight sequences in *Wings* and *Avatar*. The reaction shots in both films “serve the same basic function of keeping the characters’ experience of flight at the center of attention” (10). However, the comment the writer gives on the digital images in *Avatar* is too general as he simply states, “the film contains no shortage of ‘beauty shots’” (8). However, he does not say why they are beautiful or how the beauty in the shots is achieved. The author’s analysis of *Avatar* focused mainly on shots and the relationship between them but does not consider the construction of digital elements within shot. For example, the texture of the dragon-like animal that Jack is flying with, as well as the match of action between motion captured actors and the CGI flying animals demand an understanding of a distinct digital aesthetic. Ross’ *Avatar* research lacks a specific examination and evaluation of various forms of post-production, such as digital compositing, lighting, shading, modelling, as well as motion capture such as the Facial Action Coding System developed by Weta digital especially for the film. It also ignores the works of artists behind the scenes, which is described by the visual effects supervisor Wayne Stables as “complicated” from story, aesthetic, visual and technical perspectives<sup>6</sup>.

In contrast, scholars such as Bolter and Grusin (1999), Roger (1999), Bolter (2001), Manovich (2001), Rodowick (2007), Wood (2007), Mcclean (2008), Rombes (2009), Prince (1996 and 2011), Giralt (2010) and Davise (2011) expound on the importance of studying the new aesthetic of digital visual effects and post-production in cinema. They argue that the innovation of media technologies might offer artists new approaches to manipulating images and expressing ideas (Roger and Manovich). Furthermore, one of the specificities of digital images is that they are numerically represented in software and thus enable the remix of various forms and techniques of media such as painting, motion graphics and analogue film (Bolter Grusin; Bolter, and Manovich). In addition, the lack of an indexical relationship between CGI and

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<sup>6</sup> The technology used in *Avatar* behind the scene as well as the comments from the visual effects supervisor is according to the article on trade magazine *VF Guide* and the link to the article is as follow: <http://www.fxguide.com/quicktakes/animfxnz-avatar/> and the video about the making of *Avatar* <http://www.youtube.com/watch?v=P2efxouZZB0>

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reality questions film realism theories (Prince 1996, 2011; Giralt and Davise). Finally, digital visual effects impact on cinematic storytelling and narrative structure (Wood and McClean).

In order to explore digital cinema aesthetics, the research mentioned above examines the notion of digital image and visual effects in cinema through different ways which are: the revisiting of film theory such as realism theories, the introduction of new theories such as remediation (Bolter and Grusin) and media hybridity (Manovich, 2006) theory, and the studying of software and hardware. Their opinions differ towards the causes of the aesthetic and cultural significance of digital cinema. The following part of this literature review discusses the current critics of the aesthetic values of digital visual effects in detail, and starts with the group of scholars who approach the topic via the revisiting of classic film theory.

### 1.2.1 Film Theory Revisited

Scholars such as Berton (1990) and Rodowick (2007) propose the revisiting of film theory for the understanding of digital cinema as they assume even though technological and aesthetic differences exist between digital cinema and film facilitated by analogue technology, they are from similar “genealogical roots” (Rodowick, 2007, 185). Berton (1990) points out that as analogue film, digital cinema still belongs to forms of imagery in motion. From this point of view, the works of earlier film theorists such as Vachel Lindsay, Lev Kuleshov and Andre Bazin, who explored the basics of the representation and manipulation of space, movement as well as other visual elements, still have application to digital cinema. Rodowick (2007) further indicates that the aesthetic character that links film and digital media is their ability to reconfigure the “distinctions of spatiality and temporality, visuality and expression, autographicality and notationality” (186). Therefore, the history of film theory remains as a useful source for the understanding of digital cinema.

Berton (1990) specifically indicates that the relevant comment of Vachel Lindsay on cinema is that the objects and human beings as well “must be given new life by the cinema artist when they are included in the work” (3). He interpreted Lindsay’s understanding of cinema as artists having an essential role in creating cinematic meaning and argues that the digital artists still have a large amount of control over the synthesizing of digital imaging. It is evident that digital artists are responsible for manipulation of a noticeable number of visual elements in the contemporary Hollywood cinema. In *Avatar* (2009, James Cameron), as discussed above, such artists designed the colour, shape, texture of the planet, landscape and animals in Pandora.

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However, Berton did not further state what specific objects are handled for digital compositing and other stages of digital visual effects workflow. Do the digital artists approach the objects similarly or differently compared with filmmakers in the time of Lindsay? Another critic on the cinema by Lindsay has particular application to digital cinema: “The people with the proper training to the higher photoplays in hand are not the veteran managers of the vaudeville circuits, but rather painters, sculptures and architectures” (Lindsay, 1922, 7). The knowledge of painting, sculptures and architecture, which is helpful for filmmaking as stated by Lindsay, might remain relevant to the making of digital images. For example, during the making of *Avatar*, artists drew various pictures for the design of the digital characters and Pandora (Creating the World of Pandora, 2012). Moreover, for the opening scene of *Hugo*<sup>7</sup> (2011), digital artists constructed the buildings in Paris, train station and shops in software. However, the research of Berton did not show whether the digital artists and earlier analogue filmmakers required skills such as painting for similar or different reasons. Are they using the skills in similar or different places?

Berton also advocates “both digital cinema and Soviet film theory use the definition and exploration of elemental units as the ground for cinematic meanings” (4). The argument of the author points out a general direction for the links between digital cinema aesthetics and soviet montage theories, such as those of Sergei Eisenstein and Lev Kuleshov. For example, Kuleshov and Eisenstein believe that the material of cinema is organized and structured in a certain way such as “montage” (Kuleshov, 1974: 58). For digital compositors, they might still consider the organization of elemental units within certain space of time. For instance, in the opening scene of *Hugo*, the steam trains, the lights on the ceiling, the passengers walking in various directions, luggage, flower shop as well as news agency are organized and composited within the frame of the shot and reveal an earlier morning in the train station. However, Berton’s research did not show what the elemental units for digital compositing are. Digital compositors might need to organise large numbers of smaller units for the construction of a single digital shot. For example, the compositors for the opening scene of *Hugo* needed to consider the motion of each

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<sup>7</sup> The information of the compositing in *Hugo* is from the articles on the online trade journal *FX-Guide*: <http://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/> and <http://www.fxguide.com/featured/hugo-garners-11-oscar-noms-heres-why/>.

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snowflake in the sky of Paris, the reflection of the clock on one of the eyes of Méliès in the mechanical instrument repair as well as the texture and decoration on the clock tower<sup>8</sup>.

Furthermore, the reliability of the argument of Berton (1990) and Rodowick (2007), which support the relevance of film theory, could be further proved by the fact that the understanding of film theory and aesthetics is one of the skills that the contemporary visual effects industry demands<sup>9</sup>. However, as discussed above, their opinion towards film theory might be too general as they fail to provide more specific evidence to show what the similarities are, as well as the differences between digital cinema and analogue film, and to what extent and how film theories are relevant to the understanding of digital visual effects. Their theoretical approach directs their research to a greater focus on discussion of the influences of the innovation of media technology on criticism of film text. Both of them indicate in research that even through technological changes accrued in the media, it is the creativity, psychology, perception and reception of humans towards elements of visual arts, such as time and space, which leads to the similarity of digital cinema and analogue film. However, they could not further extend their research into the experience of artists in the digital visual effects industry, as well as why the industry demands film theory as one of the expertise of the artists. Berton (1990) simply assumes that digital technologies; “liberate artists from much of the tedious work” (10). However, digital artists who contribute to digital visual effects of films such as *Hugo* (2011), *The Hobbit: An Unexpected Journey* (2012, Peter Jackson), *Star Trek* (J.J. Abrams, 2009) and *Warriors of the Rainbow: Seediq Bale* (2011, Wei Te-sheng) use the words “heavy”, “time-consuming” and “extraordinary amount of work” to describe their experience<sup>10</sup>.

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<sup>8</sup> The information of the compositing in *Hugo* is from the articles on the online trade journal *FX-Guide*: <http://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/> and <http://www.fxguide.com/featured/hugo-garners-11-oscar-noms-heres-why/>

<sup>9</sup> The information is based on the *Creative Skill Set: The Core Skills of VFX handbook*: [http://www.creativeskillset.org/uploads/pdf/asset\\_16673.pdf?2](http://www.creativeskillset.org/uploads/pdf/asset_16673.pdf?2) and the interview I did in September 2012 in Beijing with visual effects company Crystal CG.

<sup>10</sup> The information about the artist’s feeling about compositing work is based on the interview I did in September 2012 in Beijing with visual effects company Crystal CG and another interview I did with head of production in Pixomondo in Beijing in August 2013, and BBC’s coverage about workers in visual effects industry: <http://www.bbc.co.uk/newsbeat/22397980>.



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The concept of the artist in Rodowick (2007) is viewed as the ideal representation of human creativity. However, the primary research into experiences of artists in the industry, shows that they perform their creativity under various working conditions and have various forms of involvement in projects. For example, the artists in the post-production companies Crystal CG believe that low wages, pressure of living as well as overwhelming workload in limited time considerably impact their attitude and passion for creativity<sup>11</sup>. Furthermore, in visual effects studios such as Pixomondo the chances that digital artists can control the artistic aspects of their work also varies with different forms of co-operation between post-production and production companies, as well as visual effects markets in different countries<sup>12</sup>. Therefore, this research will investigate the experience of digital artists and the reasons for the requirement of film theory expertise in post-production networks. It will especially focus on the ways and areas that the digital artists applied film theories, and issues of communication between digital artists with different expertise. It will also consider the workload of digital artists as well as the conditions on the way they perform their creativity in relation to the transnational networks of the industry. The investigation of digital artists' experiences in the post-production networks aims to more specifically understand the application of film theory and the ways it is relevant to digital visual effects in the industry.

### 1.2.2 Reality and Realism

While the research discussed above is concerned with the approach to the revisiting of film theory in general, scholars such as Prince (1996 and 2001), Rodowick (2007), Giralt (2010) and Davies (2012) focus on the extent to which digital imaging practices challenge theories about the nature of cinema, especially that of its relationship with reality. The discussion is necessary because the computer-generated images could be combined with other sources of images through digital compositing to persuade audiences that what they see is photorealistic; however, the illusion of the reality in these effects is no longer by the same “mechanical reproduction” (Bazin, 1967: 12) as analogue film. The revisiting of theories of realism is

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<sup>11</sup> The information is based on the interview I did with the head of rendering department in the visual effects company Crystal CG.

<sup>12</sup> The information is from the interview I did with head of production in Pixomondo in Beijing in August 2013.

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relevant to this research, as I intend to further study the complex workflows of digital visual effects and reveal the connection between photorealism and the network of technological innovation, a significantly large number of workforce, and a considerable amount of time. I also attempt to establish the connection of photorealism in Hollywood digital visual effects with the business model and the global audience of digital visual effects in Hollywood film. The impression of reality is defined by scholars such as Metz (1974) as “the feeling that we are witnessing an almost real spectacle to a much greater extent” (4) from film. The following paragraph discusses the similarity and difference between impression of reality produced by film and photorealism in digital visual effects. Furthermore, it explains why the understanding of the complex and transnational workflows of digital visual effects in the achieving of photorealism is crucial.

In the history of film theory, film is considered by scholars such as Bazin (1967), Metz (1974) and Kracauer (1997), as a media that has its genetic ability for the producing of impressions of reality experienced by the audience. For instance, the theory of Bazin shows that photography and cinema are the discoveries that satisfy “our obsession with realism” (12). Their research provides various reasons to explain why film has this ability. Bazin (1967) associates the impression of reality closely with the notion of “mechanical reproduction” (12), which means the “instrumentality of nonliving agent” lies in between the object and its cinematic reproduction. He further explains the mechanical reproduction process of film that satisfies the desire of the audience to witness, and also concedes credibility and objectivity to film images. Perez (1998) also agrees with Bazin that images produced from the analogue photograph process have greater trustworthiness because they are an “index” (1998: 32) of certain physical existences. Furthermore, the research of Metz (1974) and Kracauer (1997) explains more specifically that film’s ability to record movement contributes to the production of expression of reality. Metz indicates that it is the motion recorded in film, which generates “a higher degree of reality” and “the corporality of the objects”.

In contrast, complex working networks such as teamwork, workflow, and human interventions are demanded for digital images to replicate the impression of reality, especially the reality of

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motion. For example, during the making of *Avatar* (2009)<sup>13</sup>, the teamwork in the production company, which was Lightstorm and digital visual company, Weta digital, were involved in producing the details of Pandora's digital jungle. The specific workflow, which is named by Weta digital as "shrub workflow", was developed by the visual effects company to add the complex plants to the jungle in Pandora. Furthermore, the visual effects supervisor of *Life of Pi*<sup>14</sup> advocates that a significant amount of human intervention such as artistic thinking and specialized skills is required for producing the photorealistic digital visual effects shots. The digital visual effects artists even held a multi-city town hall meeting on the Pi day in 2013 to raise public awareness of their involvement behind the photorealistic scenes in the film<sup>15</sup>. In addition, to generate detailed and convincing movement of the tiger in the film, such as its rolling paws and eye twitches, a particular team from the visual effects company Rhyme and Hues spent two years observing and collecting video footage of real tigers<sup>16</sup>. Therefore, film realism theory fails to understand such complex working networks behind the photorealistic digital visual effects.

Regarding photorealistic digital visual effects, Prince (1996) suggests a new ground for realism critics, which are based on "perceptual and social correspondences, of how the cinema communicates and is intelligible to viewers" (28). Prince (2011) further argues that computer technology equips filmmakers with numerous tools for producing more convincing effects, which are closer to the visual experience of an audience in the real world than what analogue film can achieve. Davies (2012) believes that the lack of indexicality of digital images, which

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<sup>13</sup> The information of the making of the visual effects in *Avatar* is from online journal FX-Guide: <http://www.fxguide.com/quicktakes/animfxnz-avatar/>

<sup>14</sup> The information of the opinion of the visual effects supervisor of *life of pi* is from the article on CG society: [http://www.cgsociety.org/index.php/CGSFeatures/CGSFeatureSpecial/oscar\\_winners](http://www.cgsociety.org/index.php/CGSFeatures/CGSFeatureSpecial/oscar_winners).

<sup>15</sup> The information of the town hall gathering of visual effects professionals on Pi day is from the Hollywood reporter: <http://www.hollywoodreporter.com/news/vfx-artists-ready-pi-day-428589>.

<sup>16</sup> The information of the making of the movement of the tiger and the opinion of the animation director is from the online trade journal FX-Guide: <https://www.fxguide.com/featured/life-of-pi/>

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is an indexical relationship between image and the physical object being captured (Perez, 1998), does not have a significant influence on the concepts of realism and reception of cinema. He explains that these digital images still aim to achieve a photographic reality and generate the same effects and feelings for the audience. Giralt (2010) argues that digital postproduction technology offers more possibilities and potential for filmmakers to produce and visualize the “subjective reality” (14), which is their imagination or interpretation of the real world. As a result, the artistic purpose of visual effect film directors shifts from representing reality to the mastery of using technology. Furthermore, Rodowick (2007) indicates digital compositing covers the natural look of digital images and gives birth to a new imagery, which is the “the composition of elastic reality” (170). It also shifts the object and focus of traditional “perceptual criteria for realism” to “imagination, fantasy, and the counterfactual powers of possible worlds” (170).

Like film realism theories, the work of Prince (1996 and 2001), Rodowick (2007) and Davies (2012) still fails to account for the complex working networks in the producing of photorealism digital visual effects. Prince and Davies’s approach mainly focused on the final composition, in which the labour, time and technologies involved in the producing of digital visual effects shots in film mean to be invisible; for example, the first scene of visual effects breakdown (The Hobbit FVX Breakdown, 2013) of *The Hobbit: An Unexpected Journey* (2012, Peter Jackson). The final composition as the outcome of digital compositing is the character Gandalf’s seamless interaction with the Hobbits in Bilbo Baggins’ Hobbit hole. Prince is concerned with the relationship between the look of the final composition and the perception of the audience, while the findings of Davies are focused on the reception of final compositions. However digital visual effects are a practice, during which the images of the characters and different backgrounds of the scene in the Hobbit were being manipulated and put together seamlessly (The Hobbit VFX Breakdown<sup>17</sup>). Although the research of Rodowick and Giralt acknowledge the involvement of human and technologies in digital visual effects production, they still did not provide a systematic studying of the transnational teamwork and other efforts discussed with the film realism theory, especially relating to the current industrial workflow, for the delivery of digital visual effects in Hollywood cinema.

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<sup>17</sup> Available online: <https://www.youtube.com/watch?v=HFzRR5LJgjs>

### 1.2.3 Formal Remediation

Scholars such as Bolter and Grusin (1999), Manovich (2001, 2007 and 2008), Rodowick (2007) and Wood (2007 and 2012) believe digital cinema is a mixture of various media forms and techniques. Historically, digital cinema remediates previous media such as painting and analogue film, which means it borrows techniques from these media (Bolter and Grusin). The utilization of film technique is discussed in the film theory revisited section. The remediation of painting in digital cinema could be evident by the role of concept artists in the digital visual effects industry, who provide creative documents to support the VFX Supervisor's artistic vision. Visual Effects houses such as MPC demand concept artists with education or experience in traditional arts<sup>18</sup>. Consequently, the combination and remixing of various techniques informs a new hybrid aesthetic language of digital cinema (Manovich). From this point of view, digital cinema is a combination of live action material, painting, image processing, compositing, 2D computer animation and 3D computer animation (Manovich, 2001). Therefore, the research of Manovich and Rodowick aims to develop new theories to reveal the emerging aesthetics of digital cinema and visual effects through the remixing of media techniques. The new theories are relevant to this project as photorealism digital visual effects in Hollywood cinema is considered as a key example for understanding born-digital media, such as computer graphics and refurbished film (Bolter and Grusin).

The contribution of Rodowick (2007) is the introduction of new terms to define the creative operations of digital filmmaking, which are capturing, synthesizing and compositing. He laid the foundation for studying the “smoothness”, “continuity” and “seamless” (170) aesthetics of digital compositing. As discussed in the background section, digital compositing is one of the major stages of digital visual effects pipeline. The author also introduces specific aesthetic criteria such as “invisibility of layers” and “continuity of movements” for the project to analyse digital compositing and photorealistic visual effects in film. Bolter and Grusin (1999) further identify two strategies that digital media implement to remediate other media, which could be used for this project to analyse the effects of photorealism digital visual effects on audiences. The first strategy is “transparent immediacy” (19), which means that media tries to erase themselves from the audience and the space it represents. The photorealistic digital visual effects in *Star Wars Episode I: The Phantom Menace* (1999) is an example of transparent

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<sup>18</sup> The information is from the website of MPC: <http://www.moving-picture.com/concept-artist>

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immediate visual effects as the computer graphics in it intend to appear believable to the audience and hide the fact that they were produced through digital compositing and other stages in digital visual effects pipeline. The other strategy is “hypermediacy” (19), which refers to the feeling that the audience is aware of the existence of media. For example, in a film such as *Terminator 2* (James Cameron, 1991), the audience is meant to notice the computer graphics that permit the evil robot to change shape (Bolter and Grusion).

### 1.2.4 Time and Space

Manovich (2001) and Wood (2007) discover the new space that digital image creates. Manovich points out that digital compositing creates four new spaces for moving images, which are “spatial order of layers in a composite”; “virtual space constructed through compositing”; “2D movement of layers in relation to the image frame”; and “the relationship between moving image and the linked information in the adjusted window” (147). Wood further defines the relationship between the spatial issue of digital visual effects and film narrative and argues that digital visual effects generate a new spatial-temporal dimension in narrative. Wood defines this dimension as “timespace” (55) and advocates the dynamic spatial organisations not only facilitate narrative, but provide an alternative element for viewers’ attention. For example, “timespace” as created by digital visual effects can “act as more active narrating [...], distributing attention between character and effects-based elements” (63). This study aims to extend the argument concerning cinema space and time by examining these issues in relation to the production context. For example, Chapter 2 will discuss the relationship between computer generated visual elements in *The Jungle Book*, which communicating time with viewer and the real time spent on producing them. An example of these visual elements is the coherence of the movement of computer generated imagery with live action movements. Chapter 5 will explore the relationship between visually please aspect of the timespace (Wood) and the emerging market for digital visual effects in the Chinese film industry.

### 1.2.5 Aesthetics

The research of Manovich (2001, 2007 and 2008), Bolter and Grusin (1999), and Wood (2007) is valuable for this project as they introduce frameworks for further research into aesthetics of digital visual effects. However, their research aims to have a wide application for digital media as a broad concept, which includes computer games, graphics, and virtual reality. They

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consider digital cinema as one of the forms of these media and attempt to define the aesthetics of media facilitated by digital technology in general. However, when they drew their aesthetic argument, they did not consider various contexts such as the context of the contemporary Hollywood industry. Further research of Wood (2008 and 2012) reveals the importance of discussing the Hollywood production context, which will be reviewed later in this chapter. Therefore, Rodowick and others, fail to consider the process of delivering digital visual effects in the industry, which is shown by this primary research as a complex process. The professionals in this field describe the complexity of digital visual effects workflow as a “pipeline”, which includes operations such as conceptual design, previsualization, character and set modelling, textual creation, shade and lighting, rendering and compositing. The design of pipeline, for example in Pixomondo, even varies with specific projects and can be influenced by clients<sup>19</sup>. Furthermore, the style design of digital visual effects in the Hollywood film industry is also complex. The look of the scene could be influenced by various factors such as the style, mood, narrative of the films and directors’ opinions.

The research into the new aesthetics of digital cinema reviewed in the section above also has different opinions on how digital cinema achieves its aesthetic significance and, accordingly, suggests diverse approaches for future research in the area. Manovich (2001, 2007 and 2008) suggests it is digital technology; in particular software in media production that significantly impacts the aesthetics of digital cinema. Therefore, Manovich, as well as scholars such as Malina (1990) and Fuller (2008), suggest that in order to truly understand digital media scholars need to move from media studies to software studies. Although specialized software such as Nuke and the skills of operating it are part of the digital compositing networks in post-production companies, software studies may overstate the functions of software. Moreover, they ignore other factors that may influence the aesthetics of digital cinema, such as that of the artist. For example, in claims that software is becoming the media and even the culture, Manovich dubs the term “software culture” (2008). This a result of the ever-updating media production software such as Nuke, After Effect and Final Cut Pro bringing more choice for artists to edit, simulate and manipulate images for digital cinema. It is a simple fact that, until

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<sup>19</sup> The information of post-production pipeline and Pixomondo is based on the interview I did with Pixomondo in Beijing August 2013. The information of the tasks involved in the post-production pipeline is also based on the interview I did with Crystal CG in September 2013.

now, no matter how advanced and user-friendly digital visual effects production software is, there are still complex entanglements of human and non-human factors to fulfil the tasks in the delivery of digital visual effects.

### 1.2.6 Practices: Human and Technological Connections

Prince, Manovich, Rodowick and Davies also fail to discuss the involvement of digital visual effects artists in relation to a complex transnational production network. More specifically, the contemporary film industry requires cross-national cooperation between multiple visual effects companies, production companies and different facilities of one digital effects company. For example, digital visual effects artists in three different companies worked on the same scene in *Amazing Spider Man* (Marc Webb, 2012)<sup>20</sup>. Another case in point is the digital visual effects practice for *Hugo* (2011)<sup>21</sup>. It is a combination of the contributions of visual effects companies such as Lola VFX in California, who completed around thirty-five or forty shots, and Uncharted Territory in California whose contribution included the creation of about twenty exterior Paris environments. Moreover, three production companies - Paramount Pictures, GK Films and Infinitum Nihil – produced live action footage on multiple sets for the scene in *Hugo* in which the protagonist went down the clock tower, which eventually contained 1230 compositing frames. Moreover, it also includes the participation of artists who have particular tasks such as compositors, visual effects supervisors from both production companies and post-

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<sup>20</sup> According to the associated text of *Amazing Spider Man* published on Creative Cow: <http://magazine.creativecow.net/article/vfx-supervisor-jerome-chen-talks-about-amazing-spiderman>.

<sup>21</sup> The information of *Hugo* discussed in the following sentence in this paragraph is based on the associated text of *Hugo* published by FX-Guide:

<http://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/> and article on online visual effects trade magazine Creative Cow: [http://library.creativecow.net/legato\\_rob/magazine\\_30\\_HUGO/1](http://library.creativecow.net/legato_rob/magazine_30_HUGO/1).

It is also based on the information from the website of Pixomondo: <http://www.pixomondo.com/wp/?lang=en>.

Furthermore, the source of the information is also from the interview I did with the head of production of Pixomondo Beijing who is the visual effects producer of *Hugo* in their Beijing facility.



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production companies, and visual effects producers who may be from various countries, have diverse language and education as well as cultural backgrounds.

The interview with the visual effects producer in Pixomondo Beijing reveals that human influences on digital visual effects even take place prior to the actual tasks. During the pre-production period, artists such as concept artists and art directors work together with the director and scriptwriter to imagine and decide the style of the look of the digital visual effects scene. In order to finalize the look of the film before its release, time-management and problem solving skills of visual effects producers are essential. Consequently, it is impossible to assume the primacy of human action and intentionality. Therefore, the consideration of the entanglement of software and artists in relation to the production context of visual effects industries, is necessary for the understanding of the aesthetics of digital visual effects. This study is not a conventional actor-network analysis (Latour, 2005), but broadly guided by the concept that it is important to consider both technological and human factors for the understanding of digital visual effects practice.

Recent development in the field of software study, such as the research of Aylish Wood (2015) has begun to shed light on the involvement of human creativity in digital animation production. To illustrate, Wood (2015) studies the use of software Autodesk Maya in digital animation production, and argues that digital animation involves both “the creative skills of animators and the complexities of the software they are using” (3). Wood (2015) shares similar contexts of this research, as it intends to study the involvement of artists besides software. However, this study has a different focus and aims. Wood’s approach puts software “in the middle of things as encountered through a neighbour of relations (6) and aim to have a greater understanding of Autodesk Maya”. This study aims to understand the digital visual effects practice in the current industry through studying links across factors such as the technologies, aesthetics, economics and audiences. Packaging software for media production is considered as part of the myriad and ever-innovating technologies involved in the complex production network I intend to explore. In other words, I do not attempt to put any of these factors at the middle of things, instead studying their connections, in order to further understand digital visual effects as a social practice. I decided to focus on digital visual effects practice, as the digital visual effects industry is growing as a global business over the past 20 years, which involves a large number of professionals. Through conducting interviews with professionals in the current industry, I realised they are facing the problems of poor working conditions and

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low profit margins. I therefore, intend to further explore those problems and point out a direction for finding solutions.

Bolter and Grusin (1999) provide a new perspective to examine the aesthetics of digital visual effects, which is looking at the connections between digital visual effects and previous media techniques. Furthermore, the reason that Bolter and Grusin (1999) have a difference of views with the traditional approach software studies such as Manovich (2001, 2007 and 2008) is because they believe it is a “dynamic relationship among materials, techniques, genres and cultural attitudes and uses” (Bolter, 2001: 21). They indicate that technological change does not impact the art or culture itself but influences them through the dynamic relationship. In relating to the digital visual effects practice more specific questions are generated such as: what is the dynamic of the relationship between digital visual effects production technologies, the needs of the industry, and the cultural atmosphere around it?

Wood (2008 and 2012) broadens the way technology can be examined, which is the connection between “humans and objects” (2012:310). By exploring the viability of an ecological approach for researching digital cinema, Wood points out one of the important ways to look at the connections, is through studying the relationship between film and its associated text. She refers the associated text to magazine articles and website material revealing the production process of digital cinema. This research applies Wood’s approach of analysing associated text in researching transnational network of digital visual effects. I will further explain the study of associated texts such as visual effects trade magazines in the research method section.

Wood (2008) also defines a useful framework for studying the networks of factors such as technologies and human practices for understanding digital cinema. For example, Luhmann’s theory of systems, which argues that it is essential to study factors in a highly complex environment for understanding the process of communication practice that gives meaning. Wood (2008 and 2012) mainly explores the networks of technological and human factors in motion capture and animation practice with the example of *Avatar* (2009). Wood (2012) also indicates the importance of the study of the production context of this film for the understanding of the digital animation. This study aims to further extend the notion of context into a more complex context of transnational digital visual effects production network. Within the network the delivery of digital visual effects involves both technological innovation and human practice. Detailed discussion of this point will be provided at Chapter 2. This thesis will

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also examine the digital visual effects practice of a large number of artists in the current industry in relation to various factors such as the aesthetics of digital visual effects, forms of collaboration between globally located digital visual companies and Hollywood studios, the global business model of Hollywood and emerging market in world popular cinema.

### 1.2.7 Approaches to and Theories of Practice

The literature reviewed in the paragraphs above approach the aesthetics of digital cinema and visual effects through various avenues, such as the revisiting of the history of film theory as well as the introduction of new theories. They provide useful theoretical framework such as remediation and digital time-space for this research to critique the aesthetics of digital visual effects in film. However, the current research into digital visual effects lacks a systematic examination of the process of delivering digital visual effects in the current industry. This research utilises the approach Wood (2012) has developed and intends to further study the complex contexts of digital visual effects. Therefore, the following part of the literature review will discuss relevant research into Hollywood film industry and transnational cinema. Research into the Hollywood film industry, such as that done by Wasko (2005) and Maltby (2003), shows the various factors that are associated with the context of Hollywood cinema and how it impacts its aesthetics. More specifically, Veny (2004) argues that the information of the market and revenue are part of the most important source for decision-making in Hollywood (Veny, 2004).

The key theorist of practice who informs this work is Pierre Bourdieu (1993). Bourdieu argues it is necessary to understand the complex network of social relations and institutional frameworks in producing the texts of literature and art. As stated by Bourdieu “literature, art and their respective producers do not exist independently of a complex institutional framework which authorises, enables, empowers and legitimizes them” (10). In relation to digital visual effects production, their photorealism aesthetics serves the long established commercial aesthetics of Hollywood studios, who finance these works. In films such as the *Star Wars* series and *Life of Pi*, digital visual effects evidentially add visually pleasing interests to the scenes and are therefore appealing to the audience. To illustrate, as in *Life of Pi* the close interactions between human and a tiger, as well as the scene depicting Pi in the middle of the Pacific Ocean at night with the ocean lit up by jellyfish and a giant whale jumping out of the water clearly provides visual pleasure for the audience.

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Another argument of Bourdieu in relation to the position-taking in the artistic field is relevant for the study of digital visual effects and its industrial context. According to Bourdieu “the space of literary or artistic position-taking . . . is inseparable from the space of literary or artistic positions defined by possession of a determinate quantity of specific capital (recognition) and, at the same time, by occupation of a determinate position in the structure of the distribution of this specific capital (30)”. In terms of digital visual effects practice, this thesis considers the photorealism aesthetic is the manifestation of the position-taking strategy of Hollywood cinema. There is a clear tendency of Hollywood movie studios to brand their digital visual effects films as high-tech, cutting edge and epic. Their creative decision in deciding which projects to undertake is influenced by the technology and techniques that are currently available for delivering photorealistic digital visual effects. For example, one of the reasons for Ang Lee to make *Life of Pi* was to challenge the existing technology and techniques of making photorealistic animals. Compared to previously computer-generated animals such as the lion, Aslan, in the *Narnia* series, the tiger, Richard Parker in *Life of Pi*, would be expected to act as similar as possible to a real-life tiger. After technology and techniques were developed to make Richard Parker possible for the film *The Jungle Book* was produced to make a greater number of different animals such as a panther, bear, tiger, wolves and elephants. Further development in digital animals attempting to be photorealistic is evident in *The Lion King* (2019) with computer-generated lion, Simba, taking the leading role. As stated in Chapter 4, this tendency is sustained by the conglomerate structure of Hollywood studios, budget availability and the global distribution network. On the other hand a high level of photorealism and complexity of digital visual effects, which requires significantly high budgets that are not available to other film-makers increases the uniqueness of the Hollywood business model. More discussion will be provided in Chapter 4 in relation to the global business model of digital visual effects.

Pierre Bourdieu’s theories of practice clearly relate to Hollywood cinema as “a capitalist industrial structure” (Wasko, 2005, 10). As Wasko argues, “the process of concentration, commodification, and commercialization” (19) is another factor that governs the current Hollywood industry. As part of the capitalist structure, the content of Hollywood cinema is influenced by “the growing trend of consumerism that dominates Western societies” (19). Audiences and markets are also the factors that need to be considered for analysing the aesthetics of Hollywood cinema (Kerr, 1986; Maltby and Moul, 2005). From a business perspective, Hollywood needs to “entertain its audience, producing the maximum pleasure for

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the maximum number for the maximum profit” (Maltby: 15). Over the history of Hollywood, it develops its “commercial aesthetics” (14) for the purpose of attracting audiences and its economical motivation. The research discussed above shows that Hollywood cinema has its specific aesthetic characters, the development of which are closely associated with factors such as audience, market and the social and economic role the industry as a mass media plays. Therefore, it is worthwhile to consider whether the relationship among the aesthetic of Hollywood cinema and its audience and market could also influence the use of digital visual effects and the process of doing it.

In the contemporary digital visual effects industry, factors such as market and time still shape the process of delivery of visual effects. Digital visual effects are a service provided by profit-driven organizations, which have specialized expertise as well as facilities. Examples include Moving Picture Company which was sold to Thomson from ITV in 2004<sup>22</sup>, Pixomondo which is run under private ownership<sup>23</sup> as well as Rhythm and Hues, which is owned by Prana Studios Affiliate<sup>24</sup>. These particular kinds of companies in the film industry provide digital visual effects services to clients such as Hollywood studios<sup>25</sup>. They employ and maintain contractual relationships with professionals such as composers who are the conductors of digital compositing, as well as other professionals in the industry that influence the decision making of digital visual effects such as digital visual effects supervisors and producers<sup>26</sup>. As creative workers in the media industry, they have a specific skill, whose work requires creativity and influences the content of media (Deuze, 2007). The pursuit of profit is key to these companies

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<sup>22</sup> Sources of the information: the article in the CG society:

[http://www.cgsociety.org/index.php/CGSFeatures/FeaturePrintable/the\\_moving\\_picture\\_company\\_sold](http://www.cgsociety.org/index.php/CGSFeatures/FeaturePrintable/the_moving_picture_company_sold)

<sup>23</sup> Sources of information the website of Pixomondo:

[http://www.pixomondo.com/wp/?page\\_id=5009](http://www.pixomondo.com/wp/?page_id=5009)

<sup>24</sup> Sources of information the Hollywood Report: <http://www.hollywoodreporter.com/thr-esq/prana-studios-winning-bid-rhythm-431790>

<sup>25</sup> Sources of information: the official website of these visual effects companies such as Double Negative <http://www.dneg.com> , MPC <http://www.moving-picture.com/film/> and ILM <http://www.ilm.com>

<sup>26</sup> Sources of information the two interviews I did with Pixomondo in Beijing and Crystal CG.

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as they face bankruptcy if they fail to maintain a financial balance or profitable contracts. For example, the post-production studio Rhythm and Hues who are one of the major compositing companies for *Life of Pi* (2012), filed for Chapter 11 bankruptcy protection due to a financial crisis and were sold to Prana Studios Affiliate at auction in February, 2013<sup>27</sup>.

Issues such as time; client related issues and labour influence the process of digital visual effects. The length of the post-production period, especially the time available for visual effects companies according to their contract, could be influential on the quality of their work, specifically how much detail the digital visual effects scene could have or how photorealistic it could be. Furthermore, the satisfaction of clients from Hollywood studios largely influences the way artists in digital visual effects companies approach their creativity. The advice that digital visual effects supervisor gives on the design of visual effects and where digital compositing shots take place in their films could also depend on the budget that is available from clients<sup>28</sup>. The length of the contracts and forms of cooperation with clients also decides whether digital visual companies could start from the pre-production period and be involved in designing of the style of digital visual effects shots<sup>29</sup>. However, the current understanding of the digital visual effects companies and employees as the conductor of digital visual effects is limited. Bizony (2001) researched one visual effects company, Digital Domain, but he did not further examine other companies and cooperation between them. Moreover, Cram (2012) aims to understand the role a visual effects supervisor plays in post-production but not any other professionals.

Research into contemporary Hollywood cinema, such as that of Thompson (1985) and Cooke (2007), also show its connections with world popular film industries. On one hand, Hollywood

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<sup>27</sup> Sources of information the Hollywood Report: <http://www.hollywoodreporter.com/thr-esq/prana-studios-winning-bid-rhythm-431790> and the Wrap covering of Hollywood: <http://www.thewrap.com/movies/article/troubled-visual-effects-company-rhythm-hues-gets-20m-studio-infusion-exclusive-75991>

<sup>28</sup> The information of visual effects companies is according to the interview I did with the visual effects supervisor in September 2012.

<sup>29</sup> According to the interview I did with the visual effects supervisor in September 2012 and the interview Pixomondo in Beijing in August 2013.

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cinema influences the world by playing the dominant role in the global media market (Herman, 2001 and Thompson, 1985). During the contemporary history of Hollywood cinema, it exports media products to the world market as well as seeking partners in other countries (Neal and Smith, 1998 and Miller, 2005). Moreover, Hollywood also establishes its production studios overseas for the pursuit of profit (Finney, 2010). Furthermore, entertainment media companies in other countries borrow the style of Hollywood to attract larger audiences (Maltby, 2003 and Cooke, 2007). On the other hand, the world market also impacts Hollywood. Historically, Hollywood changed not only its business strategy but also produced its content to suit universal audiences for the world market (Neal and Smith, 1998). The local policy of the world market of Hollywood also plays a role in the business of Hollywood cinema (Flew, 2007). In the past ten years Hollywood also faces the competition of the growing media industry in South Korea, Japan and China, which export increasing numbers of entertainment media production overseas (Thussu, 2007). Scholars such as Ezra and Rowden (2006) also think the cultural and economic connections between Hollywood and cinemas in other countries, particularly in the levels of reception and production, form a new concept of cinema, which is transnational cinema.

The research into the connections between Hollywood and world cinema discussed above is relevant because an emergent form of connections between Hollywood cinema and the world cinema might be built through the digital visual effects companies and the transnational digital visual effects process. Geographically, digital visual effects companies are located in Canada, UK, India, South Korea, China, Australia, New Zealand etc. (Figure 4). The globally located visual effects companies could serve both the Hollywood film market and domestic film market. Companies which were originally established outside the USA such as Animal Logic<sup>30</sup> in Australia were working on Hollywood films such as *Harry Potter and the Goblet of Fire* (Mike Newell, 2005) and *The Lord of Rings: the Fellowship of the Ring* (Peter Jackson, 2001), Australia films such as *Australia* (Baz Luhrmann, 2006) and *Crocodile Dreaming* (Darlene Johnson, 2007), and Chinese popular cinema such as *Hero* (Yimou Zhang, 2002) and *House of Flying Daggers* (Yimou Zhang, 2004). The leading facilities such as Industrial Light and Magic, Moving Picture Company and Pixomondo in the digital visual effects industries have been expanding their business with a global version. For example, MPC founded in the USA

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<sup>30</sup> The films that Animal Logic worked on is according to the website of Animal Logic: <http://www.animallogic.com/#Our%20Work,Film>.

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has been developing their facilities in Vancouver, Montreal, Los Angeles, New York, Amsterdam, Bangalore and Mexico<sup>31</sup>. They distributed digital visual effects tasks in their projects with Hollywood cinema into their international facilities. Among those international facilities, Pixomondo Beijing have started to target the domestic market in popular film industries in China. To illustrate, Pixomondo in Beijing have been developing a cooperative relationship with Chinese directors such as Jiang Wen and was working on their films such as *Let the Bullets Fly* (Jiang Wen, 2012)<sup>32</sup>. A case study of Pixomondo Beijing' digital visual effects practice in China is included in Chapter 5. Due to the trans-nationality of the process of digital visual effects, a single Hollywood studio produced film might have its digital visual teams, which includes various forms of companies discussed above. It raises questions for further research such as whether the digital visual effects level of connections, in terms of team and facilities between Hollywood and world cinema, is significant in the aesthetic and conceptual dimensions?



*Figure 4 Worldwide digital visual effects companies*

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<sup>31</sup> According to the website of Pixomondo: [http://www.pixomondo.com/wp/?page\\_id=5009](http://www.pixomondo.com/wp/?page_id=5009).

<sup>32</sup> According to the interview I did with Pixomondo in Beijing in August 2013.



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Another scholar that supports the study of the complex context of digital visual effects is Latour (2005), revealing that the study of networks of factors such as economic, cultural and technological factors is essential for the understanding of social practice. It is important to notice that this study is not intended to be a conventional actor-network analysis which primarily focuses on locating the inter-related relationship between human and non-human actors in a surrounding particular social practice. Instead, it is broadly guided by a particular concept of Latour (2005). This concept illustrates it is fruitful for social research to approach the possible connections between schools of knowledge such as aesthetics, economics, and technology instead of considering them as isolated entities. This approach is valuable for the understanding of contemporary digital visual effects practice as it points out a direction for possible solutions for the biggest problems facing this industry. As explained in Chapters 3 and 4, due to the high costs in producing photorealistic digital visual effects it is difficult for digital visual effects companies to look for alternative clients outside of the Hollywood system who have a comparable budget level. This leads to a lower profit margin for the digital visual effects companies as they are overly-reliant on Hollywood clients. Therefore, adapting to different budget situations is key to solving this problem. As pointed out in Chapter 5 of this research, to integrate the creative aspects of film, such as narrative, the design of computer-generated characters and sets, the budget available and the workflow allows the digital visual effects company Pixomondo to explore the Chinese popular film market. Pixomondo was founded in Germany and has been heavily involved in providing digital visual effects services for Hollywood films such as *Hugo* and the *Fast and Furious* series.

### 1.2.8 Practice Networks

The discussion in the paragraphs above shows that complexity and trans-nationality, as well as the influences of market are the characters of digital visual effects practice in contemporary Hollywood film industry, which demands further research. The following paragraphs discuss network as another organizational nature of the process in relating to the review of relevant framework such as the theories of networked society in the research of Castells (1996). The concept of network society developed from the theories of “information society” (Webster, 2007), which concerns the impact of the diffusion of information technology on social and economic structure and development. Admittedly, the involvement of information and communication technology (ICT) is significant in the process of delivering digital visual effects

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for the facilitating of the transnational cooperation of multi-nationals. For example, in the multi-national digital visual effects company Pixomondo<sup>33</sup> mentioned earlier in this chapter, ICT plays a vital role for the storage and communication of the information for the organizing, progressing and monitoring of production processes. In Pixomondo each member of staff has an online account in a database network built within the company, which contains information such as professional experience and software skills for the distribution of various tasks in the post-production pipeline. It also serves as a platform for the visual effects supervisors and producers to oversee the work in different locations and leave comments. The digital visual effects artists could also access the platform not only for the information of their own tasks but the progress of the whole pipeline in distance.

However, compared with the theory of information societies which emphasizes the power of information technology, network theories developed by scholars such as Castells (1996, 2004 and 2006), Soete (2006) and Zaloom (2004) are concerned with the interaction and connections of complex components such as ICT, culture, market, organizations, labour and policy in the network. Castells (2004) defines the network society as a society whose social structure is made of networks facilitated by “microelectronics-based information and communication technology” (3). In the network society, the “application of knowledge and information to knowledge generation and information processing devices in a cumulative feedback loop between innovation and the uses of innovation” (Castells, 1996: 32) are more significant than the knowledge and information itself. Therefore, the standpoint of the theories related to the network society is the recognition of the notion of networking and interaction as the essential factors for understanding the organization of economy and society (Castells, 1996, 2004 and 2006; Soete, 2006 and Zaloom, 2004). Castells (2004) further argues that a network has no centre but is “a set of interconnected nodes” (3).

The viewpoint of the network theories and the concept of networks and nodes are helpful for understanding the transnational digital visual effects practice. From this point of view, the multi-national post-production companies, which are supported by the information technology as discussed in the above paragraph, could be considered as a node that widely connects with

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<sup>33</sup> The information of the online communication platform of Pixomondo is based on the interview I did with the head of production in Pixomondo Beijing in August 2013.

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other nodes. For example, the possible nodes that interact with Pixomondo<sup>34</sup> in Beijing could be the local visual effects market, Chinese film industry, Hollywood film industry, art and software training, and education services in China and government policy relating to tax and the media industry. Therefore, this research aims to further investigate the connections and networks in the transnational digital visual effects practice. Especially, the possible effects the networks and connections could have on digital visual effects through the industrial process. For example, whether the demands of Hollywood film market and the clients could influence the strategy digital visual effects companies have in terms of developing expertise, facilities and techniques?

### 1.3 Research Methods

The literature review points out that in order to extend the current understanding of digital visual effects, further research needs to be conducted into the process of delivering digital visual effects and the context of the contemporary practice in the Hollywood film industry. At this stage, I need to explore the important questions of how I might approach these themes. This thesis aims to provide a systematic understanding of transnational multi-production network of digital visual effects. It does so through a combination of close textual film analysis, production histories and qualitative research with visual effects companies. Qualitative data includes detailed descriptions of situations, events, people interactions, and direct quotations from people about their experiences (Patton, 1980; Merriam, 2009 and Denzin and Lincoln, 2011). Therefore, in order to obtain data relating to transnational digital visual effects networks, this project explores various sources such as visual effects industry trade publications and interviews with professionals involved in the delivery of digital visual effects for Hollywood cinema. Due to the high workload of these professionals, I also conducted on street survey outside all of the major digital visual effects companies in London, as well as during international conferences and trade shows, which are well attended by professionals in the field. These conferences and trade shows include: the VFX festival in London and SIGGRAPH Asia. I also used the survey as a springboard for conducting follow-up interviews in a more focused and time-efficient manner. In total, there are 50 participants to the survey and 26 participants

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<sup>34</sup> The information of Pixomondo is based on the interview I did with the head of production in Pixomondo Beijing in August 2013.

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to the interview. More discussion of the survey design and follow-up interviews will be provided later in this section.

Another reason for choosing the combination of research methods discussed above for this study is due to their effectiveness in answering the following two main research questions:

- 1) What are the factors that inform the transnational digital visual effects practice for the contemporary film industry?
- 2) In what ways and to what extent do transnational digital visual effects practices influence the aesthetics of contemporary Hollywood cinema?

Traditional research methods in film studies, which are mainly focused on close textual film analysis, is not sufficient to fully address the above research questions. As discussed in the Background (Section 1.1) and Literature Review (Section 1.2) sections, the invisible nature of digital visual effects tends to hide the complex work-flow, technology used and workforce behind the photorealistic look. Therefore, simply analysing what happens on screen would not answer questions such as: where all the digital visual effects shots are made, which digital visual effects company delivered which shots, what forms of collaboration did the digital visual effects companies have, how are creative decisions regarding the aesthetics of digital visual effects made and communicated through the distributed workforce, how did the Hollywood studios choose digital visual effects companies to be involved in a certain film and how much oversight of each digital visual effects company did the Hollywood studio have. In order to shed light on these questions in this research, analysis of trade journal publications and conducting interviews and surveys with professionals in the digital visual effects industry was utilised. The following section will discuss the use of these methods in further detail.

### 1.4 Analysis of Associated Text

In order to shed light on the production context of the digital visual effects industry, this research will analyse associated texts of digital visual effects Hollywood films. Associated text refers to written or audio-visual materials that reveal the process of producing digital visual effects (Wood, 2012). There are various types of associated texts that will be studied in this research, such as trade publications and digital visual effects companies' presentations at trade shows. According to Patton (2002), written documents such as official publications, reports

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and journals are important sources for qualitative data collection. In relating to this research, Visual effects industry trade journals provide critical information to support the study of the transnational digital visual effects practice. Visual effects trade journals such as *Cinefex*, *FX-Guide*, *Animation World Networks* and *Creative Cow* publish articles that include interviews with visual effects supervisors, descriptions of technology and techniques that are used for digital visual effects production, and workflows of visual effects companies. This research also studies relevant presentations of professionals working in the digital visual effects industry that were involved in delivering digital visual effects shots of the films studied in the following chapters. For example, the presentation of the character supervisor of *The Jungle Book* (2016) during VFX festival London 2017 will be studied in Chapter 2 in relation to the analysis of the computer-generated animal characters in this film. This presentation reflected on the complex industrial context of delivering digital visual effects shots in this film and shed light on the technological innovation and teamwork that were involved in this process.

### 1.5 Survey

Two surveys were developed for this study: the first survey contained nine questions (listed in Appendix A) and the second survey contained two parts of ten and six questions (listed in Appendix B and Appendix C). The number of participants for the first survey was 31 and the number of participants for the second survey was 19. The design of these questions aimed to provide insight into the research question and were informed by existing theoretical frameworks in the relevant fields; in particular key publications in digital cinema such as Manovich (2007 and 2008) and Rodowick (2007); as well as that of the Hollywood film industry such as Maltby (2003). The question design was also informed by analysis of trade publications such as *FX-Guide* and *Creative Cow*. To exemplify, the question in the first survey (Appendix A) was asked: How are decisions made to contract transnational visual effects companies for single films?

The participants were given nine options to rank, which were: location, price, time, experience, previous cooperation, software, hardware and creative talent. As shown in the discussion in the Literature Review Section 1.2, software and related digital technologies were considered by Manovich (2007 and 2008) and Rodowick (2007) as the key factors for understanding digital cinema. I added software and hardware as the choices for this question to further test to what extent do industry practitioners consider these aspects important for employing the services of different digital visual effects companies from around the world. Maltby (2003) indicates that

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maximising the profit margin and box office revenue of Hollywood films is important to the decision-making of Hollywood studios. Therefore, the survey considered price as one of the options for the participant to choose.

Experience, creative talent, time and previous collaboration are the emerging themes from the analysis of trade publications when digital visual effects companies that collaborate with Hollywood studios are mentioned. For example, Pixomondo particularly discuss their experience in *Hugo* in trade publication Seymour (2011) on *FX-Guide* to highlight their contribution. In this article the Pixomondo visual effects supervisor, Ben Grossman is said to have worked with Robert Legato, who is the visual effects supervisor from the Hollywood studio side to deliver 800 digital visual effects shots in *Hugo*. This article also devotes a whole section to talking about how time efficient Pixomondo's team are. Based on those discussions, the survey intended to further test to what extent their experience and talent is relevant for obtaining contracts with Hollywood studios. I also intend to assess how important the availability of time and efficiency is for digital visual effects companies.

Apart from that, in order to be more objective the survey also gave 'Not Given' or 'I am not sure' as choices for some of the questions. For example, participants could choose 'I am not sure' for the question: What are the forms of cooperation between compositing and production companies that impact significantly on the final film?

Another question: Which of the following factors related to the location of a digital compositing company influence the aesthetics of the film?

Gave the participant the option to choose 'Other'. This gave the participant the option to give their own input as their expertise and experience might have allowed them to give an answer that I did not initially consider.

The second survey (Appendix B and Appendix C) included sixteen questions in total. Apart from the literature and trade journals discussed above, the design of the second survey was informed by the response obtained from the first survey and studies in organisational behaviour such as that of Buchanan and Huczynski (2010). To illustrate, questions such as Survey 2, Part 2, Q3: To what extent do you agree that the digital visual effects related tax incentive policies are important for how decisions are made to contract different digital visual effects companies for single films?

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This came out of Survey 1, Q5, where the response that considered ‘price’ ranked as number one, with 44% of respondents ranking it as the most important. During the follow-up interviews, participants of the first survey explained that the digital visual effects companies obtained the contracts through bidding. Due to countries such as the UK and New Zealand offering tax incentives allowing them to undercut other countries on pricing for the work.

The design of questions in the second survey was also informed by the organisational theory. As stated by Buchanan and Huczynski (2010), organisational behaviour is concerned with features of their context, environment and evolution underpinned by an interdisciplinary body of knowledge and “behaviour of people within organisations” (6). Key areas of concerns of organisational behaviour include: effectiveness of teamwork, communication and management practice. I chose this theory for the design of the questions because digital visual effects are delivered by complex organisations such as Pixomondo, which has offices in more than three countries. Therefore, what other factors affect the effectiveness of its teamwork and how significant are those factors for the digital visual effects practice of individual artists. Responses to the first survey Q3 suggest that communication was considered important for delivering digital visual effects. 80% of responses believed that communication between the visual effects company and the film director is very important for the quality of digital compositing. This response provoked more questions such as: How do digital visual effects companies such as Pixomondo communicate the director’s vision to their globally-located digital visual effects artists that have worked on a single film; what are the factors that impact the effectiveness of the communication; to what extent is the communication significant for the delivery of digital visual effects.

An example of a question in the second survey informed by organisational behaviour is: What do you think are the factors that impact the effectiveness of communication within the digital visual effects team working for a single Hollywood film?

According to studies in organisational behaviour the professional behaviour of individuals in a given organisation and the communication between those individuals could be affected; a wider context such as cultural differences, the use of different media, languages, places and time. In order to further test what is the relevant context for understanding communication that happens during the digital visual effects production, participants were able to choose multiple options such as: difference in first language within the team, team located in different time zones and video-conferencing technology. Participants were also allowed to add any other factors.

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The survey was also developed as a springboard for follow-up interviews. To illustrate, after participants completed this survey, I also conducted face-to-face follow-up interviews, if the participant allowed this. Questions from the interviews were informed by their response to the survey. To illustrate, follow-up interview questions were asked in relation to the survey question from the first survey which is: In your experience, how are decisions made to contract different transnational visual effects companies for single films?

Examples of these follow-up interview questions include: Why would you consider price as a more important factor than software and hardware?

How are digital visual effects companies paid by the Hollywood studios for their work?

How do digital visual effects companies estimate their project lengths and costs?

Could you give me a particular example of how previous cooperation is affecting the company you work for getting contracts?

I made a written record of those follow-up interviews. I also conducted semi-structured interviews with participants who were willing to offer more time. I further discuss about interviewing as the research method in the following paragraphs.

Interviews are utilized as another data collection method. Interviews are defined by scholars such as Denzin and Lincoln (1998 and 2011) and Patton (1980 and 2002) as an important approach for gathering qualitative data. Studying trade journal articles as described above equipped me with the relevant information and knowledge to bridge the gap between the interviewee and interviewer. Patton (2002), Denzin and Lincoln (1998 and 2005), and Silverman (1997) describe qualitative interviews as an activity that includes the interaction between interviewer and interviewee. The interviewer plays an active part in creating meaning and generating knowledge during interviews (Denzin and Lincoln, 2005). It also has particular advantage in collecting data relating to context and explains why certain behaviours happen (Denzin and Lincoln, 2005). Moreover, research interviews allow an in-depth study of experience, feeling and opinion of participation in social activity, and knowledge from experts in subject fields (Flick, Kardorff and Steinke, 2004). The utilisation of interviews in this study aims to gather the information of contexts of digital visual effects through investigating the experiences of digital artists who are involved in transnational digital visual effects.

Permission from the University of Bristol research ethics committee was obtained for use of interviews as part of the research methods for this study. The following part of this chapter



## Introduction

describes the utilisation of interview research methodology such as participants, the procedure as well as data analysis with the interviews I conducted with visual effects company Crystal CG and Pixomondo Beijing as examples.

Interview participants included professionals in the digital visual effects industry such as composers, animators, visual effects supervisors, and visual effects producers, who have experience in making films that involve digital visual effects, thus influencing the process of digital visual effects. In particular, participants of this research included professionals, who were able to share their experiences of the transnational co-operation between visual effects companies in different locations. For example, one of the participants of the interview is the visual effects supervisor in the film department who supervised digital visual effects in films such as *Red Cliff* (John Woo, 2008) and *Warriors of the Rainbow: Seediq Bale* (Wei Te-sheng, 2011). Crystal CG is a privately owned Chinese digital graphic company, the services of which include visual effects and compositing for feature films. The company has a total employment of 3,000 staff, with facilities in over ten cities such as Beijing, Shanghai, Shenzhen, Nanjing, Tianjin, Hangzhou, Guangzhou, Dalian, Qingdao, Xiamen, Xi'an, Chongqing, Hong Kong, Los Angeles, London, Tokyo, Singapore, etc.

Another example of the participants of the research interview included the head of production in the Pixomondo in Beijing, who has experience as a visual effects producer for the Beijing team in films such as *Hugo*. He also has experience of co-operating with Chinese directors such as Jing Wen for the design of the visual effects in their film such as *Let the Bullets Fly* (2012). Moreover, there are other post-production companies involved in the making of *Hugo* (2011, Martin Scorsese) such as Lola Visual Effects, Uncharted Territory, and Industrial Light & Magic (ILM), which are also considered as suitable participants in the interview. Further examples of participants in this research is digital visual effects artists of *Life of Pi* (2012). This research into trade journals reveals that other films such as *Life of Pi* (2012) also have multiple digital visual effects companies. Professionals interviewed for this research also include those from other major Hollywood digital visual effects studios such as Industrial Light and Magic, Moving Picture Company, Cinesite, Double Negative, BUF Visual Effects, Framestore and Digital Domain, who worked on Hollywood films such as *The Jungle Book* (2016), the *Harry Potter* series (2001 to 2011), *Life of Pi* (2012), *Star Wars Episode VII: The Force Awakens* (2015) and *Rogue One: A Star Wars Story* (2016).

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To recruit interviewees, I sent invitations to key members of global visual effects companies, these were found through web searches and via the trade journals. I briefly introduced this research and included sample interview questions. The form of the interview was semi-structured. The reason for choosing a semi-structured interview for this project was to overcome the limitations of a standardized interview, which consists of a set of questions carefully worded or arranged. The disadvantage of a standardized interview is that it might limit the flexibility of the conversation (Patton, 2002; Silverman, 1997 and Denzin and Lincoln, 1998). The informal conversation interview offers more flexibility but requires a large amount of time (Flick, Kardorff and Steinke, 2004; Denzin and Lincoln, 2011; Patton, 2002).

Firstly, I prepared an interview guide, which contains certain questions and issues to be explored in the course of the interview. The interview questions were based on research into film texts and associated texts (Wood, 2012) such as trade journals, theories in secondary resources and the purpose of the research. Furthermore, it left space for the interviewees to add topics and themes to the conversation and further questions were asked about the topics and themes (Patton). The combined strategy provides the interviewer “flexibility in probing and in determining when it is appropriate to explore certain subjections” (347). The flexibility is important for this research, because understanding of the topic is limited by the sources available to access, for example the editorial policy limiting the content of associated texts and certain gaps might exist between the theories and practice, which is ever-developing.

I conducted the one-to-one in depth interview (Denzin and Lincoln, 2005) semi-structured interviews in two different ways, which were: face-to-face and via video conferencing. I recorded the face-to-face interview data with an audio recorder. As a large part of interviewees of this project are the professionals in the current digital visual effects industry, they were globally located. Therefore, video conferencing technologies allowed me to conduct interviews with those who were outside the UK. For this type of interview, a recording was made of the video conferences using in-built audio/visual recording software on the computer. A written interview was also conducted via email with a professional in Cinesite. She was sent a list of questions to answer and she replied with written responses. The reason for conducting the interview in this way was due to the interviewee’s preference. This interviewee expressed that she was having a very tight schedule. Therefore, she explained that she would respond to the questions when she had the time.

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The data generated via interview referred to the text of interview and the conversation (Denzin and Lincoln, 2005). This research analyses the themes and concepts that are emergent from the responses of interviewees (Patton, 2002 and Silverman, 1997) in relation to digital visual effects and the contexts of industry and audiences. Based on the purpose of this study, the analysis of the themes and concepts focuses on the relationship between them, the digital visual effects, delivery of digital visual effects in the current industry, aesthetics, audience and possible connections between these themes. One of the methods used in this research for identification of the themes and concepts was researching the key words that were used frequently by interviewees (Taylor, C and Gibbs, G R, 2010).

The analysis of the interview with Pixomondo Beijing generated useful themes for this study such as “time”, “market” and “communication” (Figure 5). For example, the word “market” (Figure 5) was used frequently in the responses from the producer in Pixomondo Beijing during the interview I conducted in August 2013. The concept of market also has connections with various ideas that relate to digital visual effects practice of the company. It shows the interdependent relationship between the company and local markets in China. The interviewee said the market in different countries has a relationship with the expertise that Pixomondo’s facilities have. Relating their diverse expertise to their locations was one of the essential reasons for the allocation of the digital visual effects tasks within the whole company. Furthermore, seeking the opportunities from the Chinese film market is one of the reasons that Pixomondo established their Beijing facility and having local employees is one of the strategies that the company is targeting Chinese clients with. The local employees in the company helped with the establishment of trust with the local clients.



effects work but lack the budget for them. Further discussion of this interview is included in Chapter 5.

### 1.6 Conclusion

To conclude, the purpose of this research is to further the understanding of digital cinema visual effects through discussing the transnational production network in the current industry in relation to the aesthetics of contemporary Hollywood cinema. I argue that the transnational digital visual effects practice is informed by several factors, which include: the high cost and large team associated with achieving the complex digital visual effects scenes in Hollywood films; the global business model and fixed bidding process, tax subsidies offered by governments such as the UK, the lower labour costs in countries such as India; as well as the emerging market in China. I also intend to reveal that the transnational digital visual effects practice lead to the adoption of the aesthetics of Hollywood digital visual effects to world popular cinema. This study starts with the analysis of photorealism and other aesthetical aspects of digital visual effects. It then moves to the discussion of the production context of digital visual effects in relation to the aesthetics of Hollywood cinema.

Chapter 2 argues that photorealism in digital visual effects is a complex, fluid, comparable and relative concept. The high level of digital visual effects in complex digital visual effects shots in Hollywood film not only require technological innovation but also the investment in a large amount of labour and time. The next chapter of this thesis reveals that beyond simply trying to be as realistic as possible, there are subjective and directable aspects of digital visual effects, which require creative decision making. Building on the discussion in the chapters above, Chapter 4 points out that under the current fixed bidding business model in the digital visual effects industry, the fluid and spontaneous nature of the creative decision-making process in filmmaking limits the profitability of digital visual effects companies. Facing the high cost in labour and the pressure of staying competitive in the bidding process, digital visual effects companies moved to countries that offer tax incentives and have lower labour costs. Chapter 5 further discusses that facing the low profit margin, digital visual effects companies such as Pixomondo established their international operation in China for the development of a new market. This led to the adoption of the aesthetics of Hollywood digital visual effects to world popular cinema.

## Chapter 2 Rethinking Photorealism in Hollywood Digital Visual Effects: Invisible Labour and Time in Transnational Production Network

### 2.1 Introduction

The delivering of visual effects is one of the well-developed forms of utilising digital technology in the Hollywood film industry. Digital visual effects appear almost ubiquitously across Hollywood films such as the galaxy far, far away in the *Star Wars* series (1977, 1980, 1983, 1999, 2002, 2005, 2015, 2016), the spaceship in *The Passengers* (Morten Tyldum, 2016), the interaction between a little boy and wild animals in the Indian jungle in *The Jungle Book* (2016), and the zero-gravity scenes in *Gravity* (Alfonson Cuarón, 2013). In the current industry, the delivery of digital visual effects involves the combination and composition of computer-generated-imagery and live action footage. A case in point is the opening scene of *Hugo* (2011), an adventure of an orphan named Hugo Cabret, during which he meets the filmmaker George Méliés. In the opening scene the computer-generated imagery includes the cityscape of 1931 Paris, where the story was set, and weather effects such as snow and a cloudy sky. Moreover the composition of live action passengers, their hand luggage and bikes, and CGI elements such as the platform interior, the moving steam train, and the steam resembles the spaces and material of an early twentieth-century European train station, where Hugo Cabret was living<sup>35</sup>. Even though the scene contains visual elements from more than one source and has been digitally manipulated, it aims to achieve the photographic realism (Rodowick, 2007) of analogue films. In other words, the aim is to look as if it is filmed together (Bolter and Grusin, 1999). It is clear that what the film is trying to persuade the audience to see is the train station in Paris rather than the real pre-filmic events (Rodowick), which are passengers walking in front of green screen (Figure 6). Photorealism remains the key aesthetics of Hollywood films containing digital visual effects. However, not only does photorealism invite spectators to suspend disbelief, it actively seeks to erase the complex, material, and global labour networks required to produce these effects. In this chapter, I address specific questions that relate material labour with work of digital visual effects to produce cinematic photorealism.

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<sup>35</sup> According to the visual effects breakdown of *Hugo*, available online at FX-Guide TV: <https://www.fxguide.com/featured/hugo-garners-11-oscar-noms-heres-why/>



*Figure 6 The making of Hugo (2011) Paramount Pictures*

While studying digital visual effects in cinema, I formed a habit of waiting for the list of visual effects crew at the end-credit as it is one of the earliest available sources of information about which visual effects companies were involved in a film. I remember when I was in the cinema watching *Life of Pi* (2012) for the first time in 2012. After Richard Parker, the digitally synthesised and composited Bengal tiger (Failes, 2012), fades into the jungle in the last scene of the film, most of the audience began to gather their bags, coats and other belongings. “Could we wait for the end-credits,” I asked my friend who accompanied me to the cinema. My friend nodded yes when the end-credits started to roll on the screen accompanied by Indian style music. When the names of the digital visual effects crew finally appeared on screen, I noticed more than two thirds of the audience had already left. The credits for digital visual effects crew came after the dailies colourist under the names of several visual effects companies such as Rhythm and Hues, Moving Picture Company, and BUF. The whole screen was densely occupied by different names to its full capacity and the credits ran for almost five minutes. In a later interview with a former employee of Rhythm and Hues, he revealed that more than 300 professionals worked on *Life of Pi* in this single visual effects company. Rhythm and Hues is a visual effects company originally established in the United States, which also has offices and studios in Taiwan and Vancouver. Rhythm and Hues has been involved in the delivery of a large number of Hollywood films such as *Harry Potter and the Philosopher’s Stone* (Chris Columbus, 2001) and *The Chronicles of Narnia: The Lion, the Witch and the Wardrobe*

(Andrew Adamson, 2005)<sup>36</sup>. When the credits of visual effects crews finished I realised that my friend and I were the only two people remaining in the cinema. While making our way back, my friend asked me: “what were you looking for?” I said: “I am looking for the companies that did the digital visual effects for the films. You know, like the tiger we saw.” “You mean Richard Parker was not a real tiger?” my friend looked at me with a facial expression of surprise and almost a bit hurt.

As discussed in the introduction chapter of this thesis, the seamless interaction between Richard Parker and the live action character Pi in *Life of Pi* (Ang Lee, 2012) is one of the examples of how photorealism operates in digital visual effects heavy films. From *Life of Pi* (2012) to *The Jungle Book* (2016), the credits for visual effects crews of every film contains photorealism visual effects that I watched in cinema remains as a noticeably long list of names and comes last in the whole credits. This primary research also shows that the actual number of crew might even be larger than what can be seen in the end credits. For example, there are nearly 900 artists in a single visual effects company Double Negative, who worked for the film *Star Trek: Beyond* (Justin Lin, 2016). However, only 300 of them are given credit at the end of the film. Double Negative is a visual effects company, which was originally established in London, UK and has its international facilities in Mumbai, India; and Vancouver, Canada<sup>37</sup>. It has been involved in a large number of Hollywood films such as *Godzilla* (Gareth Edwards, 2014), *Skyfall* (Sam Mendes, 2012), and *Inception* (Christopher Nolan, 2012). Other companies involved in these films include Atomic Fiction and Proof<sup>38</sup> (IMDB). Furthermore, of the over 600 crew at Double Negative, who worked on *Fantastic Beasts and Where to Find Them* (David Yates, 2016), fewer than half were credited (VFX Forum, 2016)<sup>39</sup>. This is “after shoving all 277 credited names into a big block to fit as many people as possible on the roll” (VFX Forum, 2016). Apart from, Double Negative the digital visual effects team of *Fantastic Beasts and Where to find*

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<sup>36</sup> According to IMDb Rhythm and Hues filmography

<http://www.imdb.com/company/co0075252/>

<sup>37</sup> According to information on the Double Negative website:

<http://www.dneg.com/home/double-negative-about-us/>

<sup>38</sup> IMDb *Life of Pi* Companies Credits:

[http://www.imdb.com/title/tt0454876/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt0454876/companycredits?ref=tt_dt_co)

<sup>39</sup> VFX Forum is an online publication of the UK’s media and entertainment union



*them* also includes companies such as Framestore, Method Studio and Moving Picture Company<sup>40</sup>.

What I have just sketched is a complex interweaving of individuals, companies, technologies and global capital. To what extent and how do the large numbers of individual professionals connect with the photorealism of digital visual effects in contemporary Hollywood cinema? To address that question, this chapter will study the notion of photorealism in digital visual effects and its connections with a large invisible labour market.

This chapter will also discuss the connections between photorealism and time. Time emerged as a key concern during an interview I conducted in Beijing with the visual effects supervisor of *Warriors of the Rainbow: Seediq Bale* (Te Sheng-Wei, 2011) from Crystal CG. Crystal CG is a digital visual effects company based in Beijing, China, which has experience in producing digital visual effects for films from the Chinese film industry such as *Crazy Stone* (Ning Hao, 2006). *Warriors of the Rainbow: Seediq Bale* focuses on the struggle of the aboriginal people of Taiwan to protect their cultural identity and natural habitat during the Japanese rules of Taiwan. While discussing the digital visual effects in this film, which involves tasks such as generating the photorealistic landscape of Taiwan, the interviewee mentioned that the work was time consuming. The visual effects team worked extremely hard and some of them were even sent to hospital due to stress and the long working hours. “Some viewers still criticize our work is not real enough,” says the interviewee, “one of the reasons they need to consider is the fact that we do not have as much time as these Hollywood films”. He also emphasized that the digital visual effects in films such as *Avatar* (2009) takes a considerably longer time to produce. This chapter, therefore attempts to connect the relationship between cinema time of digital visual effects shots and the lived time spent on delivering them.

To conclude, this chapter intends to examine the notion of photorealism in digital visual effects through the analysis of key digital visual effects elements and shots in film *The Jungle Book*. (2016). More specifically, it will compare the depiction of the animal characters and the jungle landscape and vegetation in the sequences that involved digital visual effects in this film with

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<sup>40</sup> IMDb *Fantastic Beasts* Companies Credits:

[http://www.imdb.com/title/tt3183660/companycredits?ref\\_=tt\\_dt\\_co](http://www.imdb.com/title/tt3183660/companycredits?ref_=tt_dt_co)

the analogue animation of *The Jungle Book* (Wolfgang Reitherman, 1967) and digital animation TV version of *Jungle Book* (2010-). Through the analysis, I argue that compared with the impression of reality in cinematic image, photorealism has a more complex, subjective and fluid nature. In other words, the notion is a comparable and relative concept. Based on this argument, the second section in this chapter will focus on examining factors within the transnational production network that have impact on the level of photorealism. It will point out that the level of photorealism in Hollywood cinema is not only enabled by digital technology but also a large invisible labour and the investment in time. I will discuss these factors through the studies of films such as *The Jungle Book* (2016), and *Gravity* (2013).

### 2.2 Understanding Photorealism in Hollywood Digital Visual Effects: A Study of *The Jungle Book* (2016)

*The Jungle Book* (2016) is Disney's latest adaptation of English author Rudyard Kipling's collective stories of Mowgli. The film depicts the adventure of a boy named Mowgli who is raised by a pack of wolves in a jungle located in India. The narrative of this film is dominated by animal characters. For example, Shere Khan, the tiger, is the main enemy of the main characters, while panther Bagheera and bear Baloo are Mowgli's best friends. Digital visual effects play a vital role in this film. The live action footage of this film includes the actor, who played Mowgli as well as a few visual objects, which are close to Mowgli on screen<sup>41</sup>. The rest of the jungle landscape and animal characters are CGI (Seymour, 2016). A case in point is the 'Bare Necessities' scene. What can be seen in the scene is Baloo swimming in the river in the jungle with diverse vegetation and singing the famous song, while Mowgli sits on his belly. As illustrated in the picture below this paragraph, it was filmed in a swimming pool covered by blue screen with the actor sitting on a prop, which stood in as the belly of Baloo. The rest of the visual elements in the scene are computer synthesised and composited together with the live action footage (Figure 7).

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<sup>41</sup> According to the presentation delivered by the character supervisor of *The Jungle Book* (Jon Favreau, 2016) from visual effects company MPC at the VFX festival London 2017



Figure 7 *The Jungle Book* (2016) digital visual effects breakdown

The theoretical frameworks supporting an analysis of photorealistic aspects of the digital visual effects in *The Jungle Book* includes Stephen Prince's "perceptual realism" (1996) and Jay Bolter and Richard Grusin's theory of "transparent immediacy" (1999). As discussed in the Literature Review Section 1.2, Stephen Prince is one of the scholars, who focuses on utilising of digital imaging technology in post-production and film realism theories. Prince's perceptual realism theory closely analyse how cinematic representations are perceived and seen as 'real' by viewers. That is, he explores the correspondence of cinematic representations to viewers' audio-visual experiences of their real world counterparts. As Prince notes, "a perceptually realistic image is one which structurally corresponds to the viewer's audio-visual experience of three-dimensional space" (32). Bolter and Grusin's transparent immediacy (1999) on the other hand refers to a style of visual representation whose goal is to make viewers forget the presence of the medium and believe that they are in the presence of the objects of representation. The following section, therefore, will examine aspects of digital visual effects in *The Jungle Book* (2016) to explore the extent to which these effects correspond to viewer's impression of reality; and the extent to which these effects invites viewers to identify cinematic objects as present, real-world objects.

The purpose of the study is to further understand the notion of photorealism. First, this study will reveal that the photorealistic look in the digital visual effects scenes in Hollywood cinema is not the ontological and generic look of the digitally synthesised and composited moving images. There is a notion of degree or level regarding photorealism in digital visual effects. Second, I will argue that what makes a cinematic fiction with digital visual effects believable

or what makes the viewers forget the presence of the medium is also a complex matter. In order to fulfil these aims, I will compare the digital visual effects scenes in *The Jungle Book* (2016) with Disney's animation version of *The Jungle Book* (Wolfgang Reitherman, 1967), and digital animation TV version of *Jungle Book* (2010-). In particular, it will compare the difference of the animal characters such as the bear and tiger, their movement, and the depiction of jungle landscape in the above versions of the films in relation to the viewer's impression of their real world counterparts. The analysis of the 2016 and the 1967 adaptation of *The Jungle Book* will focus on whether these differences affect their aims of telling a fictional story that is credible for the audience or has an immediate relationship with the viewers. Furthermore, the focus of the 2016 and the TV (2010-)' adaptation of *The Jungle Book*, which both utilise digital imaging technology is to shed light on whether there is an ontological and generic look of the digitally synthesised and composited moving images.

### 2.2.1 The Animal Characters of *The Jungle Book*

#### 2.2.1.1 Shere Khan

Shere Khan is a Bengal tiger. Actual Bengal tigers live primarily in forest habitats in India, with smaller populations in Bangladesh, Nepal, Bhutan, China and Myanmar<sup>42</sup>. In Disney's 1967 and 2016 adaptation as well as BBC's TV series of *Jungle Book* (2010-), Shere Khan acts as the antagonist in the narrative. He is portrayed as a man-eating tiger who threatens the life of Mowgli in the Jungle. Shere Khan's key characteristics are his terrifying and blood-thirsty nature. In the 2016 adaptation, he attacks and kills Mowgli's father, which is the main reason that we find the boy growing up in the jungle. Moreover, he also bit the neck of Akela, who is Mowgli's adapted father in the wolf pack, and killed him. In 1967's adaptation he bit Baloo the bear, who is one of the most important supporting characters of the film and almost killed him. The following paragraphs in this section will explore how Shere Khan with similar narrative function and characteristics is depicted and mediated across the three different versions of *The Jungle Book*.

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<sup>42</sup> According to WWF Bengal Tiger Species: <https://www.worldwildlife.org/species/bengal-tiger>



*Figure 8 Shere Khan in The Jungle Book (2016)*

Shere Khan in *The Jungle Book* (2016) closely corresponds (Prince, 1996) with viewers' perceptions of other media representations of tigers. Those other media include TV documentaries, other live action films and in zoos. To clarify, the notion of the tiger Shere Khan in this film is trying to correspond with what is a cultural tiger that the majority of the audiences could see in everyday life, not a tiger in its natural habitat. To illustrate, the high level of realism and accuracy could be seen in the proportion of the body of the tiger and the shape of the muscle in different parts of the tiger (Figure 8). The look of his fur also shows a significant amount of detail and diversity. More specifically, the difference in the texture, length, and colour of the fur on his back, on his face, inside and outside his ears, under the chin, on the chest, on the belly, on the back of the legs, and between the toes is visible. Furthermore, attention to detail can be seen in the texture of the tiger's whiskers, nose, nails, eyelids and eyes. A close look at Shere Khan reveals that like a real tiger, he has three sets of whiskers which are located on his eyebrows, on the back of his cheeks and both side of his muzzle. The almost transparent, hard and water-resilient texture of a tiger's whiskers could be seen on his three sets of whiskers. The amount of moisture and jelly-like texture of Shere Khan's eye suggests a high likeness of what can be seen in a tiger's eyes. One of his eyes is portrayed in the film as blind, which is one of the features in his appearance that reflects his character. He lost the sight in that eye while attacking Mowgli's father. In addition, the tension in his muscle, which could normally be seen in tigers when they are alert or about to attack, and the scars on

his face also facilitate the building of his character. The scars on his face indicate that he has been involved in more than one fight as the degree of the dryness and the other conditions of his scars are different. It can be seen on the tiger's face that he has some fresher scars, which look less dry and covered in dark red clotted blood. He also has a scar that is drier and in a much paler shade of pink. Moreover, one of the scars on his nose has a visible older appearance, which has white coloured infection areas. These details increase the sense of photorealism because they correspond with viewers' impression of scars in real life on pets and other human beings.



*Figure 9 Shere Khan in The Jungle Book (1967)*

The look of Shere Khan in *The Jungle Book* (1967) aims to achieve 'tigerness'. It can be clearly seen from the film that Shere Khan has been drawn and yet there are enough characteristics to suggest to the viewer that he is indeed, a tiger (Figure 9). In other words, the level of likeness of Shere Khan to a real tiger is very close to a boundary that beyond which he might not be distinguished as a tiger. For example, the visual aspects that make him different to any other animals include the orange colour of his body, the stripes, the shape of his head and mouth, and the size of his body. As a result, there is a relatively large space for modification and exaggeration (Thomas and Johnston, 1981) for artistic purpose. For instance, the tiger appears in a solid-line drawing with no shading and very limited sense of fur on his body. There is only simplified illustration of limited amount of fur on the cheeks. What is more, the tiger is

coloured in a fashion that shows no diversity and shades of colour. To be specific, the colour of the tiger on most of his body is a single shade of orange. The same tendency in terms of using colour can also be seen in his belly, paws, face and stripes. He has a markedly smaller and thinner face in comparison to the impression of the real tiger. A noticeable exaggeration (Thomas and Johnston) can be observed in the length of his chin. Furthermore, it is evident that the features of his face demonstrate a notion of the forsaking of accurate representation and a desire to achieve a human-like characteristic. The figure of his nose and chin has more straight and angular lines in comparison with a real tiger. His longer, thinner and more pointed eyes and the position of his pupils appear to be more human like than tiger like. More specifically, a large amount of white can be seen at the edge of his eyes. In this way, the direction he is looking towards becomes more visible to the viewer, which might indicate what he is thinking.



*Figure 10 Shere Khan in Jungle Book TV series (2010-)*

In comparison with the tiger in *The Jungle Book* (2016), Shere Khan in *Jungle Book* TV series (2010-) shows a significantly simplified correspondence (Prince, 1999) to photographic perceptions of tigers in real life. The case in point to illustrate the simplified approach is the fur of the tiger. The attempt to represent a certain degree of the texture of fur could be seen especially on the side of the tiger (Figure 10). However, almost all of his hairs are the same length, and lacks detailed information. The specific looks of different layers of a tiger's hair

for example, the longer and coarse hairs on the outer layer and the fineness of the under coats could not be seen at all. Another example is Shere Khan's musculature. A limited sense of muscle is visible on the leg, joint, chest and head of the tiger. However, the position and the shape of his muscle lacks accuracy and complexity. In addition, the paws, the body portion, the eyes, the whiskers, the chin and the nose of this version of Shere Khan demonstrate a significant amount of simplicity and difference to a real tiger. In particular, only one of the three sets of whiskers of a tiger is portrayed on Shere Khan's face, in a manner of three whiskers each on both side of his muzzle. The texture of the whiskers is harder and with the amount of strength and thickness that is more similar to fish bone. The colour and the shape of the eyeballs show some likeness with a tiger, however, the hardness and dryness in his eyeballs resulted in a more glass-like look.

### 2.2.1.2 Shere Khan on the move

The above paragraphs discuss the spatial resemblance of Shere Khan, while the next few paragraphs will examine his movement. The notion of pursuing transparent immediacy (Bolter and Grusin, 1999) and imitating the photographic perceptions of a real tiger is evidently visible in Shere Khan's movement in *The Jungle Book* (2016). Even though the film has a certain level of anthropomorphism (Pick and Narraway, 2013), it is trying to create a sense that it is the viewer's projection of real animals. As noted by the character supervisor that the team used, human facial expression, for example sadness, was the first element animated in animal characters. However, the comment they give on the outcome of this approach was "it does not work" because it seems that a real tiger would never do such a facial expression. Then they developed another approach, which is to collect and watch wild life documentaries and find the facial expression of animals that "looks sad" to inspire the animation in this film. As explained by him that these animals might not be sad, "but for some reason, we feel it looks sad". The character supervisor describes<sup>43</sup> their approach to the movement of the animal characters as "natural approach". The words he used to describe this approach "is trying to be subtle" and making it "feel natural". Apart from the facial expression regarding their supposed emotions, another case in point to illustrate this approach is that specific efforts are made to depict the facial expression while the animal characters are talking to achieve a more "natural"

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<sup>43</sup> According to the presentation of the character supervisor from MPC at VFX festival London 2017



look. As explained by the character supervisor of this film, “Enunciated human facial shape and mouth shapes are not realistic on animals”. Therefore, the animal characters need to skip certain mouth shapes while speaking. “When you really study people speaking they often do not make an ‘oo’ shape when they say ‘oo’. You just skip over it. Using some of that is the real key thing. You do not need to make single mouth shape”. Otherwise “it feels over acted” and “over enunciated”.

Another case in point is the body movement of Shere Khan in the water truce scene, where the tiger makes his debut. About five minutes into the film, a water truce is called where all the jungle animals will gather in peace and share the very limited source of water, as the driest season has arrived in the Jungle. Mowgli and the animals, including the other members of the wolf pack and the panther Bagheera, come together around a drying up pond. In this scene, Shere Khan first appeared on the top of rocks and then threatens the members of the wolf pack to withdraw their protection for Mowgli. The efforts to imitate the complexity of the movement of a tiger, such as that of joints and muscle are exemplified in the way Shere Khan jumps down and climbs up the rock, lowers his head to drink water, walks, and the occasional intensity in his tail in this scene. More specifically, while Shere Khan was patrolling on the bank of the pond, his front paws were curling inwards and then stretching slightly upwards before forwards. In contrast, his back paws were moving straight forwards in coherence with the intensity of the muscle in his leg. Detailed movement such as the level and pace of the inflation and deflation of the belly could be seen while he was more obviously breathing.

The movement of Shere Khan in *The Jungle Book* (1967) displayed a great deal of exaggeration (Thomas and Johnston, 1981), which refers to the notion of making the ideal or the essence of the action more apparent or impressive (Thomas and Johnston). For example, in about 54 minutes into the film, Shere Khan is interrogating Kaa the snake as he suspects Kaa has hidden Mowgli. In this scene, his eyebrows are rising visibly higher to emphasize his suspicion. His paw looks much bigger and his claws appeared longer when he shows them to Kaa to threaten him at the start of his interrogation. Moreover, his chin drops much lower, while he was scratching his face with his claw. When he is talking with Kaa, he displays a more emphasized and exaggerated chin and mouth movement. During the conversation, Mowgli who is hypnotized to sleep on the top of a tree by Kaa before the tiger’s arrival, makes a snoring sound. Shere Khan’s reaction, when he detects the sound, such as the rising of one of his eyes is also more apparent. Furthermore, Shere Khan is allowed to act in a way that is obviously beyond

the restriction of animal behaviours. Near the end of the film Mowgli finally encounters Shere Khan. While he is preparing an attack, Baloo the bear comes to rescue Mowgli. Therefore, the tiger and the bear are having a fight. A great deal of their performance in this scene would hardly have been seen in a real tiger and bear fight scenario. For example, Baloo is holding the tail of Shere Khan, while he is running around him in a circle. Shere Khan is also dragging the arms of the bear and throws him to the ground over the shoulder.

Shere Khan in *Jungle Book* (2010-) TV series also moves in a fashion that is outside the restriction of a tiger's behaviour. For instance, in the second episode of season two, the main storyline features Mowgli helping a tiger-cub find his mother. Shere Khan who is on the mission of hunting Mowgli appeared at about 4 minutes into this episode. He is walking into this scene from the right hand corner of the screen in a wide shot. This shot displays simplified and less flexible joints movement of Shere Khan, for example in his front legs. While walking, he meets Tabaqui the Indian Jackal, who reports to the tiger that Mowgli finds a tiger-cub. More apparent anger and shock can be seen from the facial expression of the tiger in a close-up shot of his face reacting to the fact that another tiger has appeared in his territory. In this shot his eyes are wide open, while his upper eyelids raise and move frequently. His mouth also shows a more apparent movement while talking to the fox. In order to emphasize his anger, Shere Khan performs some actions, which would hardly be seen from a real tiger. For example, he jumps straight up, biting into a tree branch and then falling to the ground. Then Shere Khan starts chasing Mowgli, who is found hiding on top of the tree. The tiger is running in a wide shot, which is attempting to show a certain level of muscle movement. However, he has much fewer numbers of muscles, for example in each of his front leg, there are four visible curving lines to show four pieces of muscles. While running, the contraction and other forms of movement of his muscles are much less complex.

2.2.1.3 Baloo



*Figure 11 Baloo in The Jungle Book (2016)*

In *The Jungle Book* (2016) the look of Baloo displays a high level of similarity with photographic perceptions of bears in real life. An analysis of the physical appearance of Baloo such as his nose, hair, paw and claw reveals that a great deal of detailed and complex visual information is provided to create the look and the sense of texture that is close to a brown bear. For example, the scene where Baloo and Mowgli first met starts with a close-up shot of the

bear's nose. In this shot, Baloo has a black wet nose with the texture that closely imitates that of a real bear (Figure 11). Moreover, detailed looks such as the lines and the small areas of pink soft skin that add individuality to Baloo can be found from a close look at the bear's nose. The amount of complexity and diversity could also be found from the look of Baloo's hair. To be specific, the film has delivered a mixed sense of density, dryness and the level of thickness on the bear's body coat. It can be seen that his fur on the outer-coat is thicker and rougher on the ends that are near the skin while the other ends of the hair appear thinner and softer. He also has some clumps of hair on places such as his front legs, which helps to create a sense that the bear has a large amount of fine, short and thin hairs on the inner coats. Moreover, the hair on the bear's face is diverse in length and texture. For example, the hair on the bear's nose is much shorter and harder than the hair on his cheek. A layer of short waterproof hair is added at the bear's muzzle. Another case in point is his claw. Baloo shows his claw in scenes such as where he was paddling and singing with Mowgli in the river. Details and variation of colour can be found at the very small part of the bear, which is each of his long and thin claws. The sharp end of his claw is white and thinner. However, the other end is thicker and in a dark shade of red.



*Figure 12 Baloo in The Jungle Book (1967)*

Baloo in *The Jungle Book* (1967) however has different aesthetics. As the way Shere Khan the tiger was portrayed, the look of Baloo in the film reassembles certain key features of a bear

such as the belly, head, ears and paws (Figure 12). However, its approach to the look of the bear did not include the attempt to produce a close representation of viewers' impression of a real bear. For example, it can be seen that there was not that much sense of texture in the look of the bear such as his nose, claw, and paws. Moreover, the back, legs and a large part of the face of the bear are in a single shade of grey. Instead of the pursuit of a truthful representation, this version of *The Jungle Book* employs the strategy of exaggeration (Thomas and Johnston) and demonstrates a clear notion of having a very visible embodiment of the characters of the bear in the design of his look. For instance, the belly of the bear is much bigger and in contrast his head is much smaller. The shape of his body, which includes significant numbers of curves, and the way his eyes and nose look, embodied the warm and laid-back character of the bear.

Baloo in *Jungle Book* (2010-) attempts to achieve a certain level of correspondence to photographic perceptions of a bear in reality. The way he looks reveals visual information that constructs the impression of a bear especially the sense of muscle and fat under the fur, and the texture of hair and eyes. However, the representation of the visual information is in a simplified notion in comparison with the 2016 version. For example, there is variation in the colour of the bear's hair on different parts of his body. Moreover, differences in colour saturation are visible on the bear's belly to show the existence of hair and shade. However, the representation of the shape and thickness of individual hairs, the texture of the bear's coat, the variation in length and colour, as well as other forms of the physical appearance the hair are noticeably simplified. The notion of simplicity is also visible in the representation of the texture and layers of fat, as well as the strength and numbers of muscle groups. The look of the bear also demonstrates a high degree of human characteristics. For example, he wears a pair of glasses at one point. In addition, his front paws, which lack the number of pads on the end of his claw, have an appearance closer to human hands than a bear's paw.

### 2.2.1.4 Baloo on the move

The focus of the above discussion of the animal character Baloo is on his appearance, the next few paragraphs will analyse his movement. The discussion of the 2016 and the 1967's adaptation of *The Jungle Book* will focus on illustrating the following two points: first, it will show that the movement of the digital synthesised and composited animals in *The Jungle Book* (2016) tend to look like the live action film rather than the much visible exaggeration (Thomas and Johnston and Thomas) in the animation film. Second, it will also aim to reveal that even

though the animal characters in both the 2016 and 1967's adaptation of *The Jungle Book* are anthropomorphic, the performance of animal characters in the 2016's adaptation of the film are significantly within the constraint of photographic perceptions of animal behaviour.

The movement of Baloo in *The Jungle Book* (2016) displays a great deal of effort to replicate the behaviour of a bear represented in other live action films and TV documentaries. A case in point is the simulation of the bear walking in the film. At about 39 minutes into the film, Baloo is walking with Mowgli towards the man village. The action of the bear in this scene reveals a noticeable attempt to resemble the complexity of the rotation of joints and the contraction of muscle while a bear is walking. The rotation of his joints also maintains coherence with the movement of his plantigrade feet and his shoulder hump. What is more, the attention to detail movement such as his fur and paws are visible in this scene. For example, a slight movement of fur on the bear's front legs is observable when the bear is striding forward. His paws also stretched slightly before he pushed them down on the ground. The downward movement of his paws also maintains a speed that is coherent with the force of gravity due to the bear's weight.

Although Baloo shows the highest level of anthropomorphism (Pick and Narraway, 2013) among the other animal characters, the notion of being "natural" and "believable" still play a vital role in his performance. In other words, the consideration of the behaviour and ability of real animals is visible in the design of his actions. In order to illustrate this point, the following paragraph will compare the movement of Baloo in this film and *The Jungle Book* (1967), in which the bear's performance is clearly beyond an animal's behaviour. First, in *The Jungle Book* (2016) the bear was walking on his four feet. However, in the 1967 version of the film Baloo was jumping and dancing around on his two back feet or a greater percentage of time. Another example is the scene where Baloo taught Mowgli to sing the song 'Bare Necessities', which appeared in both of the films. In *The Jungle Book* (1967) Baloo was allowed to act in a style that is clearly beyond what a bear could possibly do. For example, the scene starts in the jungle, where the bear was dancing on his two back feet, while performing shoulder, legs and waist movements with the rhythm of this music, picking up and playing with fruits and interacting with Mowgli. Then it moves to the river where the bear easily mastered diverse swimming styles and also sliding down a waterfall smoothly. However, *The Jungle Book* (2016) skipped the dancing in the jungle sequence, which involves a great deal of human-like performance for the bear. The scene starts from Baloo and Mowgli swimming in the river, which also did not include the waterfall. In this scene, Baloo was swimming backstroke with

Mowgli sitting on his belly. In order to be able to float above the water, Baloo made the following efforts: alternating his two front legs to stroke the water, slightly bending and straightening his two back legs to stabilize his body, as well as stretching his paws. Moreover, in this scene the bear was even slightly struggling with his neck when he was trying to manage singing and keeping his head above the water at the same time.

The *Jungle Book* (2010-) took the similar approach to animate the performance of Baloo as *The Jungle Book* (1967) in terms of anthropomorphism (Pick and Narraway, 2013). For example, Baloo walked on his two back feet with his two front legs free to function like human arms in a significantly larger number of scenes in this version of *The Jungle Book* (1967). More specifically, in the opening scene of the ninth episode of the first season under the title “Fish Out”, which was set near a river where Baloo the bear and Bagheera the panther taught Mowgli fishing, Baloo was walking on the path to the river bank in a slow path on his two back feet with his two “arms” free doing different postures. Then he was jumping on the rocks on the bank of the river and the back of turtles in the river, all on his two back legs with his two “arms” pointing to diverse directions. What’s more, in comparison with *The Jungle Book* (2016) the movement of the bear’s body is simplified. For instance, in the third episode of the second season of *Jungle Book* (2010-), the bear appeared at around two minutes into this episode. In this scene the bear displayed simplified joint and muscle movements when he lifts his arms, stepping forwards as well as rubbing his belly. The characteristic of the movement of Baloo also includes exaggeration (Thomas and Johnston and Thomas). For example, in the same scene discussed above, Baloo shows much more apparent tummy rumbling when he is hungry.

Analysis of animal characters in *The Jungle Book* (2016) intends to reveal the complexity of photorealism in digital visual effects. There is a notion of to what extent photorealism is achieved. For example, animal characters in both *The Jungle Book* (2016) and *Jungle Book* (2010-) are computer-generated imagery. Those animals such as Baloo, the bear and Shere Khan, the tiger in *The Jungle Book* (2016), display a higher degree of photorealism in terms of physical appearance and movements compared to those animals in *Jungle Book* (2010-). Although achieving a high level of photorealism, there are still differences between those animals in *The Jungle Book* (2016) and the impression of reality represented in photographic media. According to the digital artists in MPC, considering the complexity of real animal movements, the exact representation of them in computer-generated imagery was currently still not achievable. I also intend to point out that the notion of immediacy is also a complex matter.

According to Bolter and Grusin (2000), the notion of immediacy refers to the audience having full engagement with what they are watching and being immersed in the story. What I attempt to suggest is that being photo-real is not the only way of achieving this type of reception. To illustrate, even though the animal characters in *The Jungle Book* (1967) are far from being photorealistic in both physical appearance and movement, this film still intends to have emotional engagement with the audience and inviting them to be immersed in this fantasy world. When studying in a coffee shop with *The Jungle Book* (1967) playing without audio on my screen, there were several occasions when I noticed that people walking past were also paying attention to my screen. In order to understand their reactions, I initiated conversations with them. Through these conversations some of them told me that they went to see *The Jungle Book* (2016) in the cinema because they had fond memories of the 1967 version. The bear Baloo was mentioned as a childhood best friend. Some of them said that they were laughing a lot when they saw Baloo dancing. One of them also mentioned that she believed that Baloo was going to die after he was bitten by Shere Khan. After this, she was very worried and sad. However, Baloo did in fact make a quick recovery and got up so she felt relieved that there was a happy ending.

### 2.2.2 The Jungle: Landscape and Vegetation

To further understand the complex nature of photorealism in digital visual effects this section discusses the different levels of photorealism in the landscape and vegetation of *The Jungle Book* (2016) and *Jungle Book* (2010-). The discussion of photorealism in the depiction of the landscape and vegetation in *The Jungle Book* (2016) will start from the analysis of the Mowgli leaving the wolf pack scene. The scene begins at approximately 15 minutes into the film after Mowgli's farewell with his wolf family and embarking on his journey back to the man village with the company of Bagheera the panther. Their encounter with Shere Khan the tiger marks the end of the scene. There are diverse reasons for the relevance of this scene for this study. First, as both of the characters were travelling, the scene reveals different types of landscapes and plants, for example the grassland where the tiger appeared and the forest with diverse vegetation. Furthermore, the two characters were in conversation in the scene and accordingly the camera movement remained at a slow speed, which permits a close look at the leaves of the plants and the branches of the trees. Apart from that, Mowgli leaving the wolf pack scene was set in a cloudy weather condition. As it is safe to assume that the majority of the audience have seen the visual elements in the scene such as trees and soil on a cloudy day, the analysis



of the scene will also focus on the discussion of the notion of photorealism in the depiction of the jungle under specific weather conditions.

As exemplified by Mowgli leaving the wolf pack scene, *The Jungle Book* (2016) intends to achieve a highly transparent (Bolter and Grusin, 1999) representation of the complexity of the landscape and vegetation of the jungle with attention to details. Mowgli left the wolf's den at night in the long gaze of his adopted mother as there was torrential rain. The following morning, the next shot is a wide shot of Mowgli and Bagheera crossing stepping stones with a waterfall above. The computer-generated imageries of this scene, in particular the stones in the rocky landscaping in the foreground of the shot, display a high degree of likeness with their real world counterparts. For example, the consideration of the level of the moisture contained in the air due to the existence of the waterfall has been included in the scene as moss and fungi can clearly be spotted on the surface of the rocks such as on the left side of the frame. Even though for the small-sized plants like moss, the scene contains visual information that communicates the variation of the length of their stems and the carpet-like texture of their leaves. The moss is also in diverse shades of green, which indicates the difference in the amount of water they have absorbed.

The rocks in *The Jungle Book* reveal detailed geological characteristics in relation to a variety of rock formations. To illustrate, there were two different types of rocks involved in the waterfall shot. More specifically, the stones on the left of the frame closely resemble the shape, surface texture and the density of metamorphic rock formations. The irregular and angular shapes of the rocks suggest they have been broken up from the larger harder rock formations up-stream and carried down by the river and over the waterfall in high flow rate flood situations over many thousands of years. The non-uniform colour of rock indicates their high level of mineral contents. The formation of metamorphic rock is subject to high temperature and pressure, which aids crystallization (Erickson, 2001). The crystallization process facilitates the formation of the mineral contents in the rocks (Erickson, 2001). Moreover, the rocks displayed high density and hardness in their texture, which is another distinguishing characteristic of metamorphic rock (Erickson, 2001). In contrast, the appearance of the small cliffs of softer rock on the right side of the frame, in particular the stratified nature both horizontally and vertically, is coherent with the look of sedimentary rock. In reality stratification can be seen in sedimentary rock as it is formed from layers of sediment being deposited on top of each other over hundreds of thousands of years (Erickson, 2001).

After passing the waterfall, Mowgli and Bagheera cross a heavily vegetated canyon via a tree trunk. This part of the journey is depicted in two shots. With the camera movement of the first shot the film gradually revealed the ancient tree trunk that the two characters were walking on. The irregular indentation and the amount of roughness in the surface texture of the tree bark displayed high levels of accuracy in replicating photographic perceptions of a well-aged tree trunk. In the next shot, the intention of pursuing of a great degree of photorealism could be seen in the variation of the shape of the jagged edge of the tree trunk. The trunk could be interpreted as having previously been extended further but became detached at some point falling to the canyon below, leaving the three jagged shapes at the lower hinge of the trunk, part of the bark on the top still attached and some of the lighter colour core exposed. Compared with the level of photorealism in digital visual effects in *The Jungle Book* (2016) the computer animation version of *Jungle Book* (2010-) has a lower level of correspondence with photographic perceptions of landscape and vegetation. For example, in the opening scene of *Jungle Book* Season 2 Episode 3, the leaves have a lower level of texture and colour variation. The rocks in the foreground were all very similar oval-shaped and lacked a sense of geological information. Moss on rocks had less detail and was mostly in a similar shade of green. The river water was much bluer than the photographic perception of rivers in India, which contain a high level of sediment and therefore it would appear darker.

The discussion of the landscape and vegetation in the above paragraphs further illustrates the complexity of the notion of photorealism in computer-generated imagery. I attempt to argue that photorealism in digital visual effects is a complex, fluid, comparable and relative concept. Different levels of photorealism can be observed in the depiction of animal characters, jungle landscapes and vegetation in *The Jungle Book* (2016) and *Jungle Book* (2010-).

### 2.3 Photorealism, Invisible Labour and Time in the Digital Visual Effects of *The Jungle Book* (Jon Favreau, 2016) and *Gravity* (Alfonso Cuarón, 2013)

The discussion in the above section reveals that the notion of photorealism in digital visual effects of Hollywood cinema such as *The Jungle Book* is a comparable and relative concept. For example, the texture and the location of Shere Khan's whiskers in *The Jungle Book* (Jon Favreau, 2016) are closer to the viewers' photographic perceptions of reality than in the TV

version even though they are both digital images which can be accessed and manipulated via software and other means of programming (Manovich, 2010). Therefore, does the degree or the level of photorealism in digital visual effects have connections with any other factors within the transnational production networks? In terms of *The Jungle Book* (2016), is there any factor that is related to how close the look of the tiger or the bear corresponds to the audience impression of their real world counterpart; how coherent are their movements; and the amount of details and complexity in the jungle landscape?

In order to answer these questions, the following section will examine Hollywood films that contain photorealistic digital visual effects such as *The Jungle Book* (2016), and *Gravity* (2013) in relation to their industrial and production context. Studies of this contextual material is supported by theories of practice, such as that of Boudieu (1993). Discussions in the literature review of this thesis shows that this theoretical framework supports the study of a wider economic and institutional context for the understanding of artworks. Theories supporting the study of production context in this section also includes Wood (2012). Wood points out that it is significant to study the various entities associated with the production of a film such as software, actors, designers and filmmakers in relation to the computer-generated imagery in films such as *Avatar* (2009). This section argues that apart from the involvement of digital technology, the level of photorealism in Hollywood cinema is enabled by a large number of invisible labour and their investment in time.

Therefore, the source for the discussion in this section includes associated texts (Wood, 2007) and my own research interviews with professionals in the field, which shed light on the production context of *The Jungle Book* (2016) and *Gravity* (2013). These associated texts listed above includes trade publications and presentations at visual effects industry trade shows by the professionals from visual effects companies who have been involved in creating digital visual effects for the relevant films.

These associated text listed above are relevant to explore the factors within the production context that have impact on the level of photorealism in Hollywood cinema. In particular, they shed light on the involvement of diverse factors such as invisible labour in the delivering of digital visual effects in the current industry. For example, VFX festival London in one of the trade shows in the visual effects industry, the participations of which includes the major visual effects companies in London working for Hollywood studios such as MPC, Double Negative

and Frame Store; other visual effects companies mainly working on advertisements and high end TV production; organisations such as Creative Skillset; visual effects related software companies such as Houdini; and visual effects software training providers such as Escape Studio. Apart from various forms of digital technology, time is a key theme emerging from the analysis of the presentation delivered by the character supervisor of *The Jungle Book* from MPC at the VFX festival London 2017.

During the presentation, the character supervisor not only discussed the involvement of digital technology such as packaging software, as well as the specially developed software by MPC for this film but also emphasised the effort of digital artists with diverse skillsets. He noted, “computer makes visual effects like Microsoft makes novels. It does not. It is the artists that do it.” Furthermore, the analysis of the presentation also shows the requests of a considerably large number of digital visual effects crews as well as a noticeably long time for the digital visual effects in *The Jungle Book* (2016). According to the presentation, around 800 artists from MPC alone worked on the film over two years. As discussed above, MPC is one of the digital visual effects companies involved in the delivery of digital visual effects for the film. To what extent does these factors such as technology, human agent, as well as time connect with the level of photorealism in digital visual effects in Hollywood films? In order to understand these factors, it is necessary to study the process of delivering digital visual effects in the current industry. As it is hard to see these efforts in terms of technological innovation, artists and time by looking at the visual effects scenes in the film itself. Especially, human agent as it is understood as absent from the impression of reality in film theories such as Bazin (2005).

### 2.3.1 *The Jungle Book* (2016)

The aim of this section is to reveal that highly photorealistic digital visual effects in *The Jungle Book* not only requires technological innovation but also has relation to labour and time. In order to illustrate the above point, I discuss the computer-generated jungle with specific examples such as the ‘Bare Necessities’ scene, the computer-generated animal characters such as Shere Khan the tiger and Baloo the bear, and the animation of these characters such as their facial expression and other aspects of their movements.

The degree of photorealism in the jungle as analysed in the section above is related to aspects such as how close the physical appearance of individual elements in the landscape such as the texture of the trees and rocks “corresponds” (Prince, 1996:32) to the audience is photographic perceptions of their real world counterpart; the complexity of the jungle environment and the amount of details in it. As well as the coherence of the lighting and shading of the vegetation. An analysis of the diverse professionals working on this film’s discussion of the process of synthesising and compositing the jungle landscape and vegetation shows that these aspects are made possible with the teamwork of a significant number of artists and hours of labour, besides technological innovations.

In the current industry, the delivery of digital visual effects involves a complex workflow, which is recognised as a “pipeline” by professionals in the field. Specific stages in the digital visual effects pipeline are different from film to film. Overall, it consists of the following major stages: modelling, texturing, shading, lighting, animation, and compositing, which are accomplished by different groups of artists with relevant skills<sup>44</sup>. The aim of the modelling stage is to accomplish the shape and outline of computer-generated elements of a scene. For example, as shown in the following picture (Figure 13), the CG elements of the opening scene of *The Jungle Book* (2016), where Mowgli is walking on the tree in the Jungle includes the tree leaves and branches in the background of the scene and most of the trees and branches in the middle ground and foreground. The modelling stage of this scene contributes to the outline and shapes of these trees, their leaves and branches (Figure 14). The specific texture of different CG elements are added to a scene during the texturing stage, for example, the texture of the green leaves and the woody branches in the scene above. On the stage of shading and lighting, the visual elements of a scene are modified to indicate the existence of light and the shades of individual items are also added according to the direction of lighting. For instance, in the water truce scene, where Shere Khan, the tiger, is speaking to the wolf pack on top of the rock, the saturation of the left side of the fur on the back of the tiger is higher than the right hand side, which indicates the sunlight is from the right. The task for the animation stage is to add

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<sup>44</sup> The description in the paragraph regarding the name of the major workflow and the tasks involved in each stage of it is a summary of multiple interviews I conducted with professionals from the industry, the trade articles discussing digital visual effects as well as the presentations from the VFX festival London 2017.

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movements to the CG elements, for example, the movement of tree branches and animal characters in *The Jungle Book*. The stages of the visual effects workflow also include compositing, the aim of which is to combine images from different sources such as computer-generated images and live action footage to achieve a final scene. In the opening scene of *The Jungle Book*, the live action performance of Mowgli, which is filmed against a blue green, is seamlessly assembled with CG trees and animals. Unwanted elements such as the reflectors have been removed (Figure 15).



*Figure 13 The Jungle Book (2016) visual effects breakdown final composition*



*Figure 14 The Jungle Book (2016) digital visual effects breakdown blue screen and modelling*



*Figure 15 The Jungle Book (2016) digital visual effects breakdown compositing in progress: moving unwanted items*

However, the stages involved in the visual effects pipeline and in order may vary from film to film. Or even from task to task. In terms of the workflow for the jungle landscape and vegetation, it starts from reference building stage, which takes place before the modelling of a plant or rock based on their different references<sup>45</sup>. The involvement of labour and working time starts from this stage. A specific group of professionals spend their time building references for the vegetation and landscape of the jungle in the film. These references consist of a large number of photos of plants and rocks taken by professionals in visual effects companies such as MPC in India. More specifically, a team of professionals in the Bangalore facility of digital visual effects company MPC undertook photo survey of “over 40 locations” across India, “generating hundreds of thousands of photos in the process” (Seymour, 2016). These photos

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<sup>45</sup> The discussion in the paragraph regarding the reference building stage is based on the presentation of character supervisor of *The Jungle Book* (2016) at VFX festival London 2017 and the FX-Guide’s article based interviews with the digital visual effects supervisor from studio side and digital visual effects supervisor from MPC.

include visual elements such as “trees, rocks, plants, individual leaves and twigs for all the detritus, debris all over the ground”, according to the digital visual effects from MPC.

These professionals and their time devoted to this stage of workflow has a connection with the notion of photorealism. Even though the vegetation and landscape in the jungle are computer-generated images, they have connections with reality as the artists studied the real life reference of the diverse visual elements of the jungle scene prior to modelling and texturing them with computer software such as Autodesk Maya<sup>46</sup>. Operations such as modelling and texturing involve the entanglement of human and computer actors (Latour, 2005 and Turner, 2016). On one hand, the software interface allows the artists to input, access and manipulate the data constructing those images. On the other hand, it is the artists that need to decide on things such as: which part of the software to be operated; what data to enter and how to manipulate them. The reference photos inform and inspire digital visual effects artists in making these decisions. Therefore, the labour involved in the reference building stage has connections with the notion of photorealism. For example, in a scene which includes rocky landscape, the individual reference photo of a real life wall of rocks could provide the artists with information for a certain aspect of the look of the landscape. More specifically artists could get inspired by the shape of the landscape from one reference photo and the texture of the rocks from another (Seymour, 2016).

Apart from technologies in terms of software and specially designed tools, a large number of artists and labour are heavily involved in the modelling and texturing of individual plants in the jungle, which is named as “library building” stage for the jungle workflow<sup>47</sup>. According to the character supervisor, the professionals from MPC spent time on constructing a library of CG plants of the jungle such as trees and flowers prior to digitally distributing them in the scenes. The modelling and texturing of these plants is based on the information provided by

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<sup>46</sup> According to the presentation of character supervisor of *The Jungle Book* (2016) at VFX festival London 2017.

<sup>47</sup> Information about the library building stage is from the presentation of character supervisor of *The Jungle Book* (2016) at VFX festival London 2017 and the FX-Guide’s article based interviews with the digital visual effects supervisor from studio side and digital visual effects supervisor from MPC.



the reference photos. A considerable amount of time is required as the library of a single plant consists of several versions such as the same plants from different angles, and under different weather and lighting conditions. Therefore, it could provide details for the digital visual effects scene in the film. A great number of different types of plant such as trees, flowers, ferns, grasses are needed in order to achieve the natural and complex look of the scene.

The pipeline for the jungle also involves the amalgamation of the different objects like plants built in the library and the other visual elements of the scene such as the landscape. This stage includes tasks such as distributing the model of the plants from the library asset discussed above to the scene. As described by the MPC visual effects supervisor, “our set lead in London would use initial set sketches, flesh them out, add hero modelling, like a hero tree and piece them together bit by bit.” In this stage, the level of photorealism, such as the amount of details in the scene and how complex the jungle environment could be, have connections with technological innovation, in particular, the development of a new scatter tool<sup>48</sup>. This scatter tool is especially developed by visual effects company MPC for this film. The main function of this tool is to distribute the computer modelling of small visual elements from the library asset such as plants, pebbles and rocks and dead leaves to the jungle scene. This tool was used in over 800 shots and offers more flexibility in terms of creative control and manual adjustment during the distribution process. These functions enable the distribution of different scatters such as trees and dirt in a more diverse approach (Muraca, Schuwank, Preti and Micilotta, 2016). This approach is connected with the notion of photorealism as “plant and tree growth is shaped by a set of biotic and abiotic factors, which are radically different from those determining the distribution and accumulation patterns for dirt or debris” (3).

The analysis of the character supervisors’ presentation shows a connection between the new scatter tool and the details and complexity of the jungle in scenes such as the ‘Bare Necessities’ scene. According to him, artists are able to scatter “millions and billions of objects over the

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<sup>48</sup> Information about the library building stage is from the presentation of character supervisor of *The Jungle Book* (2016) at VFX festival London 2017 and the FX-Guide’s article based interviews with the digital visual effects supervisor from studio side and digital visual effects supervisor from MPC.

environment in the way that really allows them to add those extra little details”, for example, in the wide shot in the scene that depicts the river where Mowgli and Baloo are floating on and the plants on the river banks. These details, such as the small debris at the shallow ends of the water connecting with the land, grass in the water, shrubs between the trees, as well as leaves on the trees, adds complexity to the look of the jungle environment (Muraca, Schuwank, Preti and Micilotta,2016). Furthermore, artists can also adjust the look of the individual objects, as revealed in the shot in which, for example, some of the shrubs under the taller trees look darker than the others (Muraca, Schuwank, Preti and Micilotta). This small difference adds detailed visual information to communicate the sense of light as the lighting conditions for the shrubs under the taller tree varieties according to the density of the leaves above.

A large number of artists, considerable amount of time, and technological innovation are also involved in the lighting stage of the jungle workflow. According to the visual effects supervisor Robert Legato, a new lighting tool named “RenderMan RIS” is involved in the lighting of the jungle, the operation of which helps remediate “the real world (or movie world) lighting”<sup>49</sup>. It allows artists to put “bounce and fill cards and all you want as a real cameraman would, and get the same kind of effect”. In addition, the coherence of the lighting in CG elements of the jungle scene and the live action part of it has a connection with human efforts. According to the MPC’s visual effects supervisor Adam Valdes (Seymour, 2016), they have a special team in Los Angeles to work with the director of photography of this film, Bill Pope. For example, the MPC’s lighting lead from London has sat with Bill Pope and communicated the lighting for scenes they were involved in with the assistance of lighting software “PRMAN 19” prior to shooting. This stage is called “pre-lighting phase” by Valdes <sup>50</sup>who explains that, “we would sit with Bill and pre-light several key angles in the set but in this case using domes and soft boxes as key lights to present sky and reflections cards and the sun. They would establish in a precise way the time of day, the angles, the ratios of all the lighting”.

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<sup>49</sup> According to an audio recorded interview with the digital visual effects supervisor Robert Legato published by *FX-Guide* available online:

<https://www.fxguide.com/fxpodcasts/fxpodcast-302-the-jungle-book/>

<sup>50</sup> According to *FX-Guide*: <https://www.fxguide.com/featured/out-of-the-pages-and-into-the-jungle-book/>

As discussed in the paragraphs above, the notion of photorealism in the look of the jungle landscape and vegetation has connections with factors, in particular invisible labour, time and technological innovation. To further understand the connections of these factors with photorealism in digital visual effects, this section will further explore the physical appearance of the animal characters. If the degree of photorealism of the animal characters such as Shere Khan the tiger and Baloo the bear is related to aspects such as the details of their fur texture, accuracy of their body proportions, as well as the complexity of their muscles, the following paragraph will analyse actors associated with these aspects in relation to the workflow for generating these animals. According to the MPC character supervisor, the synthesising of each of the animal characters has a complex workflow associated with a large number of artists, time and technology. More specifically, the pipeline for making each of the animal characters is named as “anatomical”<sup>51</sup> workflow, which includes four major stages: the modelling of skeletons, the modelling of muscles, the modelling and texturing of skin, as well as fur and grooming. For example, in order to achieve the look of Shere Khan in the film, the visual effects artists first built the skeleton of the tiger (Figure 17). Secondly, they added the different groups of muscles in the tiger (Figure 18). Thirdly, the skin was built on top of the muscles (Figure 19). Lastly, the aim of the fur and grooming stage was to accomplish the look and texture of Shere Khan’s coat for the final composition (Figure 16).

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<sup>51</sup> The information of the workflow for building these animal characters in this paragraph and the paragraph next is from the presentation of the character supervisor and the presentation of another digital artist working for MPC who worked on the animal characters in John Lewis’s Christmas advertisement (2016) at the VFX festival London 2017.



*Figure 16 The Jungle Book (2016) digital visual effects breakdown Shere Khan final composition*



*Figure 17 The Jungle Book (2016) digital visual effects breakdown Shere Khan skeleton*



*Figure 18 The Jungle Book (2016) digital visual effects breakdown Shere Khan muscles*



*Figure 19 The Jungle Book (2016) digital visual effects breakdown Shere Khan skin*

A considerable amount of labour and time are involved in each of the stages of this multi-stage workflow, the effort of which has connections with the level of the photorealism of the physical appearance of the animal characters. As an example, artists working in visual effects companies such as MPC studied the anatomy of the animals while researching and building the references for them at the beginning of each of the four stages. The references for this film include wild life documentaries. As noted by the character supervisor, the making of CG animals, in

particular such as the tiger and the bear, which the viewers have seen previously in person or through media such as on TV or in a film is “challenging”. He explains that the artists working on these animals do not have the freedom of completing a task like building an alien which nobody can compare with in reality. That is to say, the replication of which the viewers already have photographic perceptions is a hard task. Viewers are likely to have a perception of the look of these animals, therefore the artists need to consider spending time on understanding how the fur of a tiger looks and how the joints of a bear function prior to working on them on a computer, in order to produce a work that “corresponds” (Prince: 32) to the photographic perception of viewers. Besides, the visual elements relating to the look of these animals such as the outline of a certain bone and the location of it are numerically represented (Manovich, 2001). Consequently, artists need to input and manipulate these data in software such as Autodesk Maya. More specifically, they need to input and manipulate data that relate to the shape of the bone, the outline of the muscles, their locations, as well as the look and texture of the fur of these animals. As said by the character supervisor, if you do not put it in, you do not get it for free. Therefore, the amount of details and complexity in the look of the animals has connections with the labour and time involved in these stages.

Technologies such as software also play their role in this workflow. Both packaging software such as Autodesk Maya and Houdini are specialised in 3D modelling, texturing and animation, as well as the in-house software such as a grooming tool developed by MPC involved in completing the tasks in the “anatomical” based workflow discussed above. As the software gives artists access to and control of data relating to the look of the muscles, and fur of these animal characters, their involvement in the workflow has connection with the notion of photorealism. To demonstrate, MPC has developed an in-house grooming tool (Seymour, 2016) for the fur of the animals such as the tiger and the bear. It allows the artists to control the “complexity and variation along the length of hairs, how they clump, their direction and variation in width” (Frei, 2016) of different animal characters. Furthermore, it also allows artists to control the lighting and shading aspects of the fur<sup>52</sup>.

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<sup>52</sup> The source of the information of the grooming tool also includes the character supervisor’s presentation.

It has been established in the above discussion that the notion of photorealism of the spatial resemblance of the computer-generated jungle and animal characters in *The Jungle Book* have connections with a large number of invisible labour, a considerable amount of time, and technological innovations. This section will now examine the movement of the jungle and the animal characters. That is to say, if any factors have a relationship with how close the movements of these objects in the film correspond to the audience's impressions of how things normally move in reality. The movement of the animal characters and the jungle is a constituent part of the visual information that communicates the sense of duration in this film. To exemplify, in the 'Bare Necessities' scene, the movement of the visual components of that given space where the bear and boy are floating on the river in the Indian jungle, such as the beating of the bird's wings, the springs of the branch due to the landing of the bird, the stretching of the bear's arms and the waves of water in the river help to create a sense of time passing by. As noted by Rodowick (2007), it is difficult for digital media to communicate duration. This argument raises questions such as why it is difficult for digital media to represent duration?

In terms of this film, one approach to answering this question is to understand that the attempt to animate the digital elements in a realistic or believable way is associated with a significant amount of time, and labour. Even though the character supervisor of this film noting that overall a great deal of artists contributed their time and skills to the digital visual effects in *The Jungle Book*, he emphasized that the animation of the animal characters is "especially" time consuming for the visual effects crews. As an example, it is necessary that the team research wild life documentaries in order to identify relevant references for animating these characters. They also conducted a close study of these references to understand the movement of the specific body parts involved in a certain gesture of the animal characters. In particular, according to the visual effects supervisor Robert Legato<sup>53</sup>, the visual effects artists studied a number of wild life documentaries depicting a tiger walking for animating Shere Khan pacing along the pond in the water truce scene.

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<sup>53</sup> According to an audio recorded interview with the digital visual effects supervisor Robert Legato published by FX-Guide available online:

<https://www.fxguide.com/fxpodcasts/fxpodcast-302-the-jungle-book/>

Apart from this, the animation in this film is the practice hand key-frame animation techniques. It means that the visual effects artists need to manually arrange the objects in the key frames of a scene in animation software (Kerlow, 2009) such as Autodesk Maya. The term key-frames refers to the points in time, which transform the position, rotation, scale or any other parameter of an element (Kuperberg, 2012). Due to the decision of applying this animation technique, the film director used the word “hand-crafted” to describe this film to the members of the visual effects teams<sup>54</sup>. A significant number of elements need to be manually arranged on each key-frame, for example the places on the skeleton, the muscles, hair and skin of the different parts of the body of the animal characters, any type of the parameter which needs to be different on the next key-frame. A case in point is the scene where Mowgli was having a conversation with Raksha his adoptive mother in the wolf pack after the water truce scene. As shown in the picture below a number of places on the skin alone need to be adjusted for a one second facial movement of the wolf when she turned her head (Figure 20).



*Figure 20 The Jungle Book (2016) digital visual effects breakdown Raksha facial animation*

The character supervisor also explains that the character animation in this film is time and labour consuming because in order to try to represent the complexity of the movement of real life animals, the visual effects team not only need to deal with the primary animation which means the overall movement of a character but also secondary animation. He said the team

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<sup>54</sup> According to the character supervisor’s presentation.



spent a large amount of time on secondary animation, which addresses more subtle, smaller movements that are added on top of the primary movements. For example, he explained that the team spent “a lot of time trying to get the fur, the muscle and the skin to work especially with things like tigers”, which is like a bag of flesh. Because the tiger “moves in such complex ways” in the real world, therefore the primary animation alone needs to be “naturalistic”. He also said, “But the secondary animation sells it. Puts it in the real world”. Apart from the animation of animal characters, the team also needed to arrange the elements that related to the movement of the larger number of the plants in the jungle, which also requires time and labour. In order to be “believable” and communicate the sense of fluidity in the way time passes by, the trees, grass and other plants in the jungle are seldom static<sup>55</sup>. These plants react accordingly with the weather conditions such as the wind and the contacts with the characters in the film. Besides labour and time, the factors that affects the notion of photorealism of the movement of the animal characters and the jungle includes technologies, for example, the groom tool mentioned before in this section. According to the character supervisor, on average there are approximately 12 million hairs that need to be dealt with on every animal character in this film<sup>56</sup>. This grooming tool gives artists creative control of the movement of hairs and their interaction with the characters.

To conclude, the analysis of digital visual effects in *The Jungle Book* illustrates that the level of photorealism has connections with the involvement of technologies, time and invisible labour in the transnational production network.

### 2.3.2 *Gravity* (Alfonso Cuarón, 2013)

*Gravity* (2013) is another example that illustrates the connection between photorealism in digital visual effects and the involvement of technologies, time and invisible labour. Digital visual effects play an important role in this film, which depicts the journey of Astronaut Dr Ryan Stone in orbit around Earth from the disaster of her space shuttle being destroyed to her uncertain but safe return to Earth. To illustrate, shots where the characters were wearing space suits occupied a considerable amount of the screen time, as this film was depicting a fictional

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<sup>55</sup> According to the character supervisor’s presentation.

<sup>56</sup> The source of information of the grooming tool and the hair of the animals is the character supervisor’s presentation.

contemporary situation. These shots were the digital composition of the live action visual elements such as faces of the characters; and computer-generated imagery, which include bodies of the characters, suits, hands, limbs and the space environments<sup>57</sup>. A transnational team and multiple digital visual effects companies were involved in the delivery of those digital visual effects. Those companies include: Framestore, which is a London-based digital visual effects company and has operations in the USA and Canada, Prime Focus that has facilities in the USA, UK, Canada and four in India, Rising Sun Pictures in Australia and Nhance in London<sup>58</sup>.

A clear intention to achieve photorealism can be seen in the diverse digital visual effects shots such as those in the opening scene. The scene begins with a long take which reveals the Space Shuttle Explorer approaching the camera with the Earth in the background and two Astronauts, Dr Ryan Stone and Matt Kowalski who are servicing the Hubble Space Telescope. The computer-generated Earth in the background attempted to have a close correspondence with the photographic perceptions of the physical appearance of the earth's surface, for example, the variations and depths of colours on the Earth's surface as well as the reflecting of sunlight on the geographic features. The smooth movements of the characters were seamlessly interacting with their facial expressions. A great amount of detail and variations can also be observed in the textures of the space suits and the different components of the space shuttle. The following paragraph will discuss the photorealism in the digital visual effects scenes of this film in relation to a particular digital visual element which is the breath on the visors of the main characters. It also attempted to reveal the photorealism in depicting the breath on the visors and the investment in labour, time and technological innovation. The reason for studying the breath is that the time and efforts from digital compositors was mentioned by the digital visual effects supervisor of this film, Tim Webber, in relation to the breath in an interview published on *FX-Guide*<sup>59</sup>.

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<sup>57</sup> According to FX-Guide: <https://www.fxguide.com/featured/gravity/>

<sup>58</sup> According to IMDb: <http://www.imdb.com/title/tt1454468/>

<sup>59</sup> Interview with Tim Webber studied in this section is available at *FX-Guide*: <https://www.fxguide.com/featured/gravity/>

## Rethinking Photorealism in Hollywood Digital Visual Effects

An analysis of the movement and variation of the breath on the visors of the astronauts demonstrates the digital imagery's attempt to remediate the way analogue film mediates duration. As stated by scholars such as Bazin (2005) and Rodowick (2007) the ability to preserve and represent an authentic "spatial and temporal moulding of the originating event" (Rodowick: 11) is considered as the key characteristic of cinematic media. As seen in analogue films such as *Roman Holiday* (William Wyler, 1953) the authentic sense of time passing by was communicated by the visual information in relation to the coherent and coordinated movements of objects and characters in a scene. For example, in the scene where the main character Princess Ann was riding a scooter through the streets of Rome the movement of shadows on her arm was coherent with her body movements. As it was her first time riding a scooter the princess was causing chaos on the streets with her erratic riding. The movements of the falling table, chairs, and painting were coordinated with the action of Princess Ann and the scooter riding through a market. The intention to achieve a realistic representation of the sense of time passing by could be seen from the way the computer-generated breath on the visors was composited in scenes such as where Dr Ryan Stone was tumbling in space. At approximately thirteen minutes into the film Dr Stone has to detach herself from the robotic arm of the space shuttle as it is spinning uncontrollably after being hit by space debris. After being detached she was spinning and disorientated in space due to the micro gravity environment which caused her to have a panic attack. In this scene, which has close-up shots of Dr Stone, a detailed variation and movement of the breath on the visor can be observed. Those variations and movement contribute to the communication of a smooth sense of time passing by as they were closely coherent with the movement and performance of Dr Stone in that particular situation. The direction of the breath on the visor was moving from the middle to the left and then to the right side of the helmet when the character was saying, "no, no, no" to her colleague Matt Kowalski while moving her head from side to side to try and get a visual location on him. The time that the breath appears on the visor was also coordinated to when the character spoke. As she failed to locate her colleague and was continually spinning in space Dr Stone started to experience a panic attack. It can be seen that the density of the breath was increasing while she was breathing heavily. Then it gradually disappeared when she went into the panic attack for about fifteen seconds with her eyes wide open and her head still.

Another case in point is the scene where Matt Kowalski detached himself from Dr Ryan Stone at approximately thirty-two minutes to save her life and thereby sacrificing his own life. He was in a Manned Manoeuvring Unit, towing Dr Stone to the International Space Station to seek

refuge, but his fuel ran out as they got there. They crashed into the structure and in the confusion Dr Stone ended up tangled in an emergency parachute rope holding onto the detached rope that helped Kowalski save her when she was tumbling through space earlier in the film. There is a slight difference in terms of the density of breath on the visors of the two astronauts. The density of the breath on the visor of Dr Stone was heavier than that of Kowalski. The differences in the density of breath on the visors was coherent with the performance and voice of these two characters, which added a sense of realism to the scene. To illustrate, Dr Stone was breathing heavier while trying to persuade her colleague not to detach himself, which is the result of a complex emotion and a sense of panic. As portrayed in the film the two characters began to build a bond while sharing their life experience during their journey heading towards the International Space Station. Apart from that, losing Kowalski meant Dr Stone would be facing the expanse of space with no other humans. However, Kowalski was calmer and more accepting of his fate as he was determined to save his colleague. He continued to offer instructions over the radio even after they had separated. This was also coherent with his character in this film, as explained in the opening scene he was a very experienced astronaut and this was his last trip to space.

This sense of coordination and coherence between the movement of the breath on the visors and the other audio/visual elements in the scene has a connection with the network of time, human agency and technology. Those movements and variations of the breath on the visors were added by the composers of this film through the operation of compositing software such as Nuke, by The Foundry and Houdini. However as well as involvement of software and other forms of digital technology the efforts of composers and the time devoted in this task was particularly mentioned by the digital visual effects supervisor, Tim Webber. As he explained, “As with all visual effects shows, what it really comes down to is a talented crew. A huge amount comes down to craft, more than technology”. He also mentioned the time spent by the composers putting breath on the visors. As the composers were spending time “listening to the breathing and looking at the head movement, putting every single little breath on by hand. A lot of all of that goes in to making a difference.”

To sum up, this chapter discussed the complexity of photorealism of digital visual effects. It reveals that the notion of photorealism is a comparable concept through the study of digital visual effects shots in *The Jungle Book*. This chapter further analysed the digital visual effects

## Rethinking Photorealism in Hollywood Digital Visual Effects

in *The Jungle Book* and *Gravity* and points out that apart from technological innovation, the level of photorealism is related to a considerable amount of labour and time.

## **Chapter 3 Digital Visual Effects in Contemporary Hollywood Cinema: Aesthetics Beyond Photorealism and Global Creativity Workers**

### 3.1 The Director's Vision and Subjectivity of Digital Visual Effects in Hollywood Cinema: Aesthetics Beyond Photorealism

In order to gain insight into the process of delivering digital visual effects as well as the current visual effects industry, I attended one of the open days organised by Escape Studios which is a software training provider in London for the industry. The main reason for my participation in this event was that the programme included a presentation given by a professional who worked in one of the major visual effects companies in London regarding his career experience in the industry. During the presentation, the speaker displayed two pictures to describe his life in the industry. Both of the pictures were black and white cartoon drawings. The first one depicted a human skeleton operating a computer and the second was the same skeleton who had finished his operation on the computer and was being showered with cash. The speaker explained that the skeletons in the pictures represent him as an employee of visual effects companies working on Hollywood projects. Because it takes a long time for his work to be approved, he feels like he has been waiting for a life time and therefore turned into a skeleton. Due to the fixed bidding model discussed in Chapter 2, payment from studios to the visual effects companies is subject to their approval of the work completed. The speaker added that he once worked on an explosion scene. In order to gain approval, his work had to go through an approval chain, which included diverse professionals such as modelling leads, animation leads, compositing leads, sequence leads, the visual effects supervisor from the visual effects company, visual effects supervisor from the studio side and the director. He emphasised that he had done countless versions of the same scene until they finally said it looked photorealistic. Moreover, in his opinion, most of these versions had the same level of photorealism for him anyway. The description he gave suggests that the sense of “reality” or “being real” in the current visual effects industry is dependent on the decision of more senior professionals in the approval chain. Why does it take so long for the work to be approved? Why are so many versions required during this process, which seem to have a similar level of photorealism for the people actually working on them? Does the director or the visual effects supervisor have other considerations for the work besides looking real?

Analysis of a trade article based on an interview with Ben Grossman, who was the visual effects supervisor for *Life of Pi* (2012), and part of the research interview I conducted with the visual effects supervisor of Crystal CG, which is a digital visual effects company in Beijing, sheds light on the possible directions to approach these questions above. In response to my question regarding the difference of digital visual effects and special effects, the visual effects supervisor from Crystal CG explained that digital visual effects offer more “control” to filmmakers in general. For example, as he noted in an explosion scene, the filmmakers can control or direct aspects such as where to put the camera, where and when the explosion happens, if utilising special effects. In terms of digital visual effects, however, the filmmakers have a greater opportunity to decide on details such as the colour and dynamics of the flames, its position in the frame, visualisation and movement of debris, as well as the position of the camera depends on what look they want. The visual effects supervisor Ben Grossman also noted that there are elements beyond trying to look real in visual effects scenes which are subjective and need to be “directed”. For example, he said, “in physical explosions, it’s rare for a director to direct the nuanced details of an explosion. However, in digital production, because you can, and because ‘what’s real’ becomes a subjective debate, a director can transform ‘what he wants’ into ‘what’s real’ for the purposes of keeping the work going until time runs out.”<sup>60</sup> The above discussion indicates that the aesthetics of digital visual effects are not only associated with the notion of photorealism but also a sense of subjectivity and aspects that need creative decisions to be made and a director’s vision. In order to illustrate this point, the following part of the section will analyse the digital visual effects scene in *Hugo* (2011), *Star Wars: Rogue One* (2016) and *The Jungle Book* (2016).

### 3.1.1 Rogue One: A Star Wars Story (Gareth Edwards, 2016)

This section will discuss the sense of subjectivity of digital visual effects in Hollywood cinema and aspects that need creative decisions and the director’s vision through the analysis of *Rogue One: A Star Wars Story* (2016), in particular the scene set on a planet named Jedha in the *Star Wars* Universe. *Rogue One: A Star Wars Story* is the latest film of the *Star Wars Series*, which is a franchise including eight films of the main series so far plus this one in the expanded ‘Star Wars Story’. The *Star Wars Series* depicts the intergalactic power struggle between factions

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<sup>60</sup> Interview with Ben Grossman is available at FX-Guide:

<https://www.fxguide.com/featured/a-way-forward-for-the-vfx-industry/>

evolving through the series such as the Galactic Empire, which rules much of the galaxy by fear and intimidation from episode three to six, and the Rebel Alliance which seeks freedom from this. *Rogue One* is set 11 years after the events of episode three and immediately before episode four, when the Galactic Empire forced a scientist called Galen Erso to complete the mission of constructing their weapon of mass destruction, the Death Star. The story follows Jyn Erso, daughter of Galen Erso, on her mission to steal the plans to The Death Star on behalf of the Rebel Alliance. Digital visual effects are included in this film in scenes that have computer-generated visual elements such as planets, landscapes, and spaceships and the human facial performance of a few of the characters. For example, the commander of the Death Star, Grand Moff Tarkin, the original actor of which died in 1994 (FX-Guide, 2016). A transnational team of visual effects companies were involved in the delivery of these digital visual effects scenes such as the London, Vancouver, and Los Angeles facilities of Industrial Light and Magic (ILM), The Third Floor and Jelly Fish Pictures in London, and Atomic Fiction, which has international operations in Oakland, Los Angeles, and Montreal<sup>61</sup>.

The main reason for choosing to study the digital visual effects scenes set on Jedha is informed by analysis of the presentation given by the computer graphic supervisor and compositing supervisor for this scene from ILM's London facility at the VFX Festival London in 2017. Analysis of this indicates that the team had aesthetical considerations for the construction of Jedha besides the photorealism target. Although the story is set in the fictional "galaxy far, far away", pursuing the notion of photorealism is essential for the look of the digital visual effects scenes in this film according to the members of the visual effects team in ILM. For example, reference photos of real life buildings have been studied for the construction of cities on alien planets such as Jedha. The pursuit of photorealism can also be exemplified by the complexity of structures in computer-generated visual elements such as the spaceships, details in texture of the computer-generated elements such as the Death Star, the fluidity of the movements of these elements and their seamless interaction with the performances of live action characters.

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<sup>61</sup> According to the presentation of the compositing supervisor at the VFX festival London 2017 and the IMDb company credits for *Rogue One*:

[http://www.imdb.com/title/tt3748528/companycredits?ref\\_=tt\\_dt\\_co](http://www.imdb.com/title/tt3748528/companycredits?ref_=tt_dt_co)



Apart from this, analysis of the presentation delivered by the professionals in ILM London revealed that the look of the digital visual effects scene, in particular the city located on the planet Jedha, is targeted to feature certain characteristics that not only to facilitate the narrative in this film but also to embody feelings. At approximately 24 minutes into the film, the main character, Jyn Erso, was travelling to Jedha city to search for a pilot who carried a secret message from her Dad. Delivery of the digital visual effects in this scene enabled the depiction of the majority of Jedha city located on the sandy and rocky landscape of this alien planet<sup>62</sup>. As a part of computer-generated visual elements in the scene, the fit, form and function of every aspect of the architecture of the city can be manipulated by the digital visual effects team. That is to say, for example, the buildings in this city could have flat, gable or multi-pitched roofs that all have possibilities to seek photorealism. Moreover, the texture of the buildings could be wood texture or stone texture, which greatly resembles their respective physical appearances in reality. Why does the city have that particular look in the film? An analysis of the film and the compositing supervisor's presentation shows that the design of Jedha city conveys visual information that reveals links and chronological order of events in this film which is noted by scholars such as Bordwell (1985) as one of the essential aspects of storytelling. More specifically, the design of the city facilitates the construction of a sense of chronological connections between the events in *Rogue One* (2016) and the other stories in the *Star Wars* series as a whole, and an understanding of the consequence of the main events in this film, which are the expansion of the power of the Galactic Empire.

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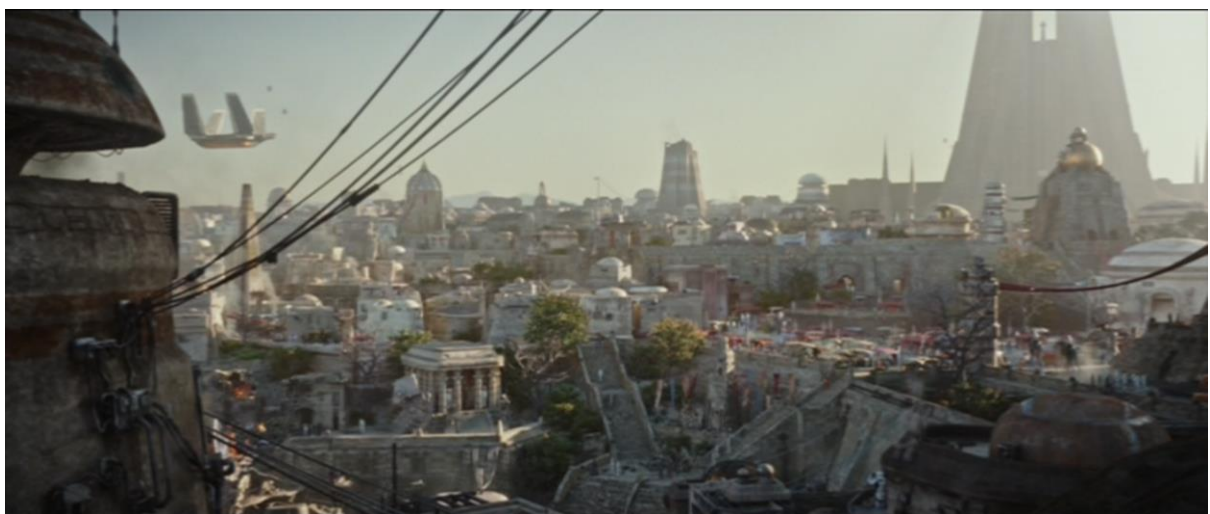
<sup>62</sup> According to the presentations of the compositing supervisor and the computer graphics at the VFX festival London 2017.



*Figure 21 Jedha City and Star Destroyer in Rogue One: A Star Wars Story (2016)*



*Figure 22 Jedha City in Rogue One: A Star Wars Story (2016)*



*Figure 23 A closer look at Jedha City in Rogue One: A Star Wars Story (2016)*

The story in *Rogue One* begins after *Star Wars Episode III: Revenge of the Sith* (George Lucas, 2015), which tells the story of Chancellor Palpatine taking full control of the democratic government of the galaxy and reforming it into the Galactic Empire, proclaiming himself Emperor. Moreover, at the end of *Star Wars Episode III* (2015), Emperor Palpatine ordered his military forces across the galaxy to destroy all of the Jedi. The Jedi were a spiritual monastic-like order that also had diplomatic skills and functioned in a way equivalent to military peacekeeping forces in conflict areas in the *Star Wars* universe. In *Rogue One: A Star Wars Story* (2016) the city of Jedha was introduced as one of the holy cities of the ancient Jedi Order, however it was under the Galactic Empire's occupation. Therefore, the appearance of the city needed to amplify its characteristics as a holy site for pilgrims from throughout the galaxy. As explained by the compositing supervisor of the scene, on one hand the visual effects team took inspiration from real world architecture, especially from the Middle East, for the design of Jedha city as a place with historical importance. On the other hand, the team also needed to balance the design with another aesthetical consideration, which was not being "too terrestrial and medieval", according to the compositing supervisor. It can be seen from the film that the city has buildings that have a Middle Eastern inspired structure such as dome-shaped roofs and towers, however blended with alien characteristics, for example, the material and patterns of the tiles on the dome-shaped roofs and alien language writing on the buildings in the street.

Furthermore, the digital visual effects scenes set in the city helped explain the consequences of the growth of the dictator-led Galactic Empire and the destruction of the peace-keeping Jedi. At the beginning of the scene when Jyn Erso's spaceship is arriving at Jedha, it can be seen that there are remains of ancient architecture such as a dome-shaped building and a gate as tall as a canyon (Figure 24), which are examples of the computer-generated elements in the scene<sup>63</sup>, which were abundant on the flat sandy plain with large rocky crags. As Jyn's spacecraft landed, the film depicts the city in a wide shot where a Star Destroyer from the Galactic Empire, which is the equivalent of aircraft carrier in space, is looming menacingly above this ancient city. Transport spacecraft are flying between the city and the Star Destroyer to collect resources from the planet for the Galactic Empire (Figure 22 and Figure 23). The intimidating rule of the Galactic Empire can also be exemplified by the building with a damaged roof (Figure 26), the patrolling Stormtroopers and the tank moving into a residential area of the city (Figure 25).

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<sup>63</sup> According to the compositing supervisor from ILM London.

## Aesthetics Beyond Photorealism and Global Creativity Workers

Under the circumstances above, according to the compositing supervisor, the visual elements in the digital visual effects in this scene also had a tendency of expressing the “cold and imposing” feelings. A case in point is the composition of the wide shot of the city. It can be seen in the film that the city is a fortress-like structure with high walls almost carved out of the rock and perched on top of a plateau on the sandy plain, with a Star Destroyer almost the same size as the city above it. The imposing feeling of the scene can also be exemplified by the look of the computer-generated temple. The temple is significantly higher than all the other buildings in the city, which also has a very pointed top and sharp outline (Figure 21).



*Figure 24 Jedha in Rogue One: A Star Wars Story (2016)*



*Figure 25 Streets in Jedha City in Rogue One: A Star Wars Story (2016)*



*Figure 26 Buildings in Jedha City in Rogue One: A Star Wars Story (2016)*

According to the presentation, city planning is another controllable aspect of digital visual effects in the Jedha city scene<sup>64</sup>. The visual effects team also had the intention of conveying a sense of “life” existing in this city under military occupation. For example, the team added a marketplace with street furniture such as cables, stalls, tarpaulins, a bridge connecting different areas of the city together and crowds in the background while planning the layout of the city<sup>65</sup>. As noted by the compositing supervisor, the purpose of adding the above visual elements was to portray the city as a living, breathing place. Apart from this, the intention of the digital visual effects team also included the addition to the scene of smoke in motion, which also aimed to add a sense of life to the city. The sense of life plays an important role in establishing the cause and effects links between events, which is one of the key aspects of narrative (Bordwell, 1985) in the film. More specifically, it helps to understand the reason why Jyn was determined to steal the plan to destroy the Death Star after visiting the city, which is the main story of this film. The mission to destroy the Death Star itself was not that important for Jyn, as a character brought up by the leader of an underground organisation, and who early in her life witnesses the murder of her mother and is then forced to be away from her father as he is taken away by the Galactic Empire to work on the Death Star. The main motivation for her to come to Jedha

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<sup>64</sup> The information regarding the city design is from the presentations of the graphic supervisor and compositing supervisor.

<sup>65</sup> Based on the analysis of the presentations of the graphic supervisor and the compositing supervisor from ILM.

was a chance that could lead to being reunited with her father. To illustrate, while the spaceship was approaching the planet, the member of Rebel Alliance, who accompanied Jyn, has to turn his face to the opposite direction to the planet after telling her that Jedha was quite damaged by the Galactic Empire's forces. In contrast, Jyn was gazing at the planet with an almost invisible smile as they came to the city to search for her father's messenger. However, the visit is brought to an abrupt end with the commander of the Death Star ordering it to fire on the city of Jedha once the Star Destroyer was recalled. The powerful laser cannon immediately destroyed the city and all the lives discussed above. After witnessing its power, Jyn was determined to stop the further operation of the Death Star. To further understand the destruction of life and Jyn's change of mind, it is necessary to discuss the film's depiction of the other layer of Jyn's character which is kindness to people that are vulnerable. A case in point is the scene when Jyn encountered a street fight between a group of warriors from an underground organisation and the Galactic Empire's forces during her time on Jedha. During the battle scene in the city, she was willing to sacrifice her own safety for a child on the street. Therefore, it is not hard to understand what impact the destruction of the living and breathing city has on her.

The incorporation of certain distinguishing visual styles of the franchise is another aesthetical consideration for creating the look of buildings in Jedha. As noted by the compositing supervisor, the design of the city required certain aesthetics that "belongs to *Star Wars*". In other words, by looking at these aspects of design, the viewers would recognize *Star Wars*. He also pointed out a particular example for this type of aesthetical consideration which is the angular design of the battlements of the city walls. An analysis of the *Star Wars* series also reveals that this type of angular design is characteristic for the look of *Star Wars* as it appears in the design of a large number of objects such as spacecraft and vehicles in all episodes of the series. For example, wedge-shaped ships appeared in the earlier episodes of the *Star Wars* series such as Episode I, on the design of the profile for the Sith Infiltrator, which is a transporting spacecraft. This type of design is continuously revealed in the shape of the wings of Jedi Starfighters, which is a military spacecraft in Episode II and the structure of the Acclamator Class troop assault ship which has similar functions as the Star Destroyer in Episodes II and III. Furthermore, the wedge-shape can be seen on the deadly space battlecruisers called Star Destroyers that plough through space destroying obstacles in their path in *Rogue One* and Episodes IV, V and VI. In addition, angular designs are used on the body armour and plating of various all terrain walkers, which are offensive weapons and troop transportation. For example, the design appeared on the All-Terrain Tactical Enforcer (AT-

TE), which is one of the types of all-terrain walkers in Episode II. Another type of all-terrain walker which employs the angular design is the main body structure of the All-Terrain Attack (AT-AT) walkers in *Rogue One* and Episodes V and VI.

### 3.1.2 *Hugo* (Martin Scorsese, 2011)

As mentioned in the previous chapters, *Hugo* (2011) depicts the twelve-year-old orphan Hugo Cabret's journey of discovery of the secrets and hidden history behind a broken automaton, which leads to his encounter with the earlier filmmaker George Méliés. Digital visual effects play an important role in this film. For example, the seamless composition of computer-generated visual elements such as buildings and streets with live action elements such as Hugo and other characters in this film contributes to the construction of the scenes set in 1931 Paris, where Hugo's journey of discovery take place. The delivery of digital visual effects also enables the depiction of the train station in this film, where he lived after losing his father and uncle, and also met George Méliés, who ran a toy booth in the train station, when the film began. The following paragraphs study the digital visual effects scenes such as the opening scene, which shows the Paris skyline as well as the exterior and interior of the train station. The study of the digital visual effects scenes in this film focuses on discussion of the utilisation of colour palette in these scenes. In particular, it will examine any emerging patterns in the utilisation of the colour palette and the role it plays in the development of the visual style and the conveyance of meaning in this film. Discussion in this section also focuses on the relevant trade publications such as *FX-Guide's* coverage of this film as well as the research interview I conducted with the visual effects producer of *Hugo* (2011) in Pixomondo Beijing, which was involved in delivering digital visual effects in this film. They were responsible for the opening scene and other tasks such as digital compositing in scenes revealing the Paris city landscape.

One of the reasons to support the relevance of *Hugo* (2011) to this study is the involvement of the transnational network in delivering digital visual effects, which is the main focus of this research as discussed in Chapter 1. Delivery of digital visuals in this film is achieved by the process that involves multiple digital visual effects companies and the cooperation of transnational teams. For example, digital visual companies such as the international company, Pixomondo, has facilities in Germany, China and Canada; the U.S. based digital visual effects company New Deal Studios; Industrial Light and Magic which has international operations in countries such as China and Canada; and Lola visual effects with facilities in the U.S., Canada,

and the UK participating in the delivery of digital visual effects for this film. Another reason for studying *Hugo* (2011) is that analysis of the interview I conducted with the visual effects producer from Pixomondo Beijing, who is involved in the digital visual effects tasks of this film, reveals that the choice of colour palette for digital visual effects scene is intended to achieve a certain visual style. In the current digital visual effects industry, colour palette refers to “the range of available colours used on a computer platform” (Goulekas, 2001:88). As noted by the digital visual effects producer, *Hugo* contains a limited colour palette. This was a creative decision made by professionals such as the film director and the visual effects supervisor through the discussion of the picture style of this film. From the technical perspective, availability of the range of colour palette for digital artists to choose for production is considerably large and subject to the devices such as a computer that is capable of transferring eight bits of data at the same time and will contain a palette with over 6 million colours (Goulekas, 2001).

Colour is also one of the visual elements in digital visual effects scenes that has the capability of being changed and manipulated. This particular aspect could be selected and adjusted via multiple software that is utilised in the current industry, such as Autodesk Maya and Nuke, by The Foundry, by digital artists. For instance,<sup>66</sup> the interface of Autodesk Maya contains a numbers of tools for selecting colour for the whole or part of a model of an element contained in a digital visual effects scene. In particular, there are four different sets of tabs under the colour wheel menu available on the interface of Autodesk Maya for artists to select colours. These four sets of tabs are the ring tabs, the spectrum tabs, the image tabs, and the blend tabs. By using these tools, the artists could choose a colour on a colour ring or a colour spectrum. They could also sample any colour directly from an existing image by utilising the image tabs. The blend tabs have functions such as blending four colours together and the user of this tool is able to choose any shades between them. The artists could also enter the numerical values representing a particular colour into Maya by using the numeric input tool on the interface. Furthermore, the compositing software Nuke also offers tools for manipulating a number of

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<sup>66</sup> The information relating to the colour selection tools on Autodesk Maya is from Maya help website: <http://help.autodesk.com/view/MAYAUL/2017/ENU/?guid=GUID-0D684939-43C1-4DDC-88B3-8CC43378C9C3>



aspects of colour such as the contrast and saturation as well as tools for matching the colour of visual elements from different sources (Lanier, 2012).

Apart from this, the depth of the colour is evolving through the process of delivering digital visual effects. More specifically, the colour of a digital visual effects scene is related to and could be affected by diverse stages of post-production in the workflow such as texturing, lighting, shading, and compositing. During the texturing stage of digital visual effects production, artists added the visual information that communicate the characteristics of a surface of a digital model, which could either be objects such as a spaceship or a building, or creatures such as aliens and animals in a scene (Goulekas, 2001 and Okun and Zwerman, 2010). These characteristics include the colour or appearance of a surface (Goulekas), as well as the conditions of the objects or creatures in a particular scene. These conditions could be whether they are wet or dry, old or new and whether they are moving or not (Okun and Zwerman). As part of the visual information communicates the characteristic of a particular surface, colour is one of the important aspects of texturing. A case in point to illustrate the role of colour in texturing is the scene in *Hugo* (2011) when the inspector chases Hugo. The computer-generated elements of the scene include extension of the platform, the walls, the windows, doors and the ceilings<sup>67</sup>. Their particular colours help define aspects such as the material of the surface. For example, the grey colour of pillars supporting the roof on the walls communicates the metallic texture of these pillars. Furthermore, the colour of the surface could also be adjusted to reflect certain lighting conditions during the lighting and shading stages of the pipeline. For instance, part of the platform floor is covered with brighter colours as light comes from the windows of the station canopy, while greyer colours were added to the other parts of the floor to portray shadows of the pillars and walls in these lighting conditions. In addition, further adjustment of

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<sup>67</sup> Information about where digital visual effects take place in *Hugo* for discussion in this section is from the following sources:

VFX breakdown by Pixomondo:

<https://www.youtube.com/watch?v=pVQ6hiIPkvM>

The making of Hugo by Paramount Pictures:

<https://www.youtube.com/watch?v=pVQ6hiIPkvM>

My interview with Pixomondo's producer

colour could also take place at the compositing stage for purposes such as glueing computer-generated images and live action footage to a complete scene (Lanier, 2012).

Despite the high level of digital colour palette availability from technical perspectives and many opportunities for manipulation, as discussed in the above two paragraphs, why are a limited number of colours selected for the digital visual effects production in *Hugo* (2011) according to the digital visual effects producer? A further analysis of my interview with the digital visual effects producer from Pixomondo Beijing demonstrates that the selection of the colour palette in this film for digital visual effects production is for creating a visual style that pays homage to the look of the illustrated books. In order to further understand the style of the colour palette in *Hugo* (2011), the following part of this section studies the digital visual effects involved in scenes from this film. According to previous discussion, in the opening scene of *Hugo* (2011), digital visual effects facilitated the depiction of Paris in 1931 and the station Hugo lived in. The scene displays a limited number of colours, which are mainly variations of brown, dark green, charcoal grey, blue and red. More specifically, the scene begins with the shifting of computer-generated gears in a clock, which are a combination of different shades of brown and grey. The shape of the gears then dissolves into the computer-generated skyline of Paris in the sunset. Lights on the streets, in buildings and from traffic are in a brighter brown tone, while the lit buildings include the landmark Arc De Triomphe, which reveals a softer shade brown. The sky with a brown sunset was largely in grey due to the snowy weather. The next scene moves to the station and the platform which consists of both computer-generated imagery and live action footage. The computer-generated exterior of the station, such as the metallic frame of the roof and rails were in charcoal grey. Diverse elements inside the station also follow the colour palette. The live action passengers were wearing brown, grey, and red clothes. The computer-generated train station platforms, roofs and the walls were grey and brown. The use of other colours outside the palette were very limited and in a pale shadow. For example, part of the sky above Paris was a pale blue while the upper parts of the body of the steam trains on the platforms were in a pale shade of yellow.

One of the reasons for considering the simple selection of colour exemplified by the opening scene as a style for this film is that this particular way of utilising colour is repeated through the film as a pattern. Film style refers to any distinctive, patterned, developed, meaningful use

of techniques of the film medium<sup>68</sup>. As noted by Bordwell (1999), film style is developing and evolving through the history of film. This pattern can be seen from the look of the train station in different scenes such as Hugo in the clock tower scene and the station inspector's conversation with Lisette scene. The train station first appeared in the opening scene. After revealing the passengers and the platform discussed above, the film depicts Hugo observing activities in the station from the clock tower. The face of the clock tower, which is part of the station interior has a face consisting of a white, dark charcoal and bronze colour. Material inside the clock tower includes light brown coloured concrete walls and metal that resembles the colour on the clock face. Through the eyes of Hugo, who was looking at the station from the tower, the film reveals more details of the station. For example, the first activity in the station Hugo noticed was the station inspector in a blue coat stepping outside his office with his dog which has a mixture of golden brown and black fur. The station inspector then was overlooking the station on the balcony of a second floor building in a wide shot. In this shot, the walls, window frames, pillars, and floor of the building were all in a dark grey tone. The majority of metallic handrails of the staircase and balcony were also in grey with a minor decoration in brown. The loudspeaker and light fixtures in the foreground of this shot were also in the dark grey colour.

Hugo's eyes also glanced over places such as a Café with wooden walls painted in grey and chairs in brown, and a newsstand painted in the same colour as the Café. The pictures in the newspapers and magazines hanging outside the newsstand added yellow and red colour to the scene. Finally, Hugo's eyes fixed at George Méliés' toy booth. The front of the toy booth had a wooden counter in its natural colour, while the walls inside were in a similar light brown tone. Even though there was a large number of items displayed on the toy booth, their colours still follow the pattern. Apart from the toy booth and café, the feature of this station also includes a flower stall owned by a woman called Lisette, whom the station inspector secretly admired. At approximately 25 mins into the film, the inspector finally gathered his courage to initiate the first conversation with Lisette in front of the flower stall. During this scene, Lisette had brown hair and was wearing a brown and yellow outfit. Although a considerable number of flowers

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<sup>68</sup> According to Oxford Dictionary for film studies and is available via the following link: <http://www.oxfordreference.com/view/10.1093/acref/9780199587261.001.0001/acref-9780199587261-e-0298>

were at the stall, it displayed a limited number of colours. Lisette's flowers were mainly in a shade of blue and yellow. There were only a small number of lavenders and irises in purple, which is the colour that is formed by combining red and blue. The rest of the flowers were in white and a very pale shade of pink.

This pattern could also be found in scenes such as the film scholar's visit set at George Méliés' house. Hugo became acquainted with George Méliés' Goddaughter Isabelle on his journey of solving the mystery of the automaton and their shared love of adventure led to their friendship flourishing. Together they discovered the function of the automaton was to draw the poster of the film *A Trip to the Moon* (1902) and Isabelle's Godfather was a filmmaker before running the toy booth. While reading about George Méliés at the film academy library, they met the film scholar who devoted his life to studying Méliés' films. At 55 mins into the film, the film scholar paid a visit to Méliés' home to present him with a collection of his films including *A Trip to the Moon* (1902). The scene starts from the hallway which was covered with grey and red carpet. The walls in this room and the door frame leading to the living room were painted. The picture frames and lamp hanging on the wall were a brown tone, while the main door added blue to the scene. Then Méliés' wife, who was in a red dress and a blue jacket with red collar, led Hugo and Isabelle, who wore a red striped sweater with a blue checked skirt, and the film scholar who was wearing a blue coat, to the living room. The colour combination of the living room, where they screened *A Trip to the Moon* (1902) also followed the pattern of this film. More specifically the walls were grey and red. The furniture in this room such as the sofa, table and chairs, and the console table were in brown. Another case in point to illustrate the patterned use of colour in this film is the colour combination of Hugo's outfits. For the entire duration of this film Hugo has two sets of clothing. From the opening scene to nearly the end of this film when Méliés was screening the copy of his films preserved by the film scholar to the public in a theatre, Hugo was wearing a woollen sweater with blue and red stripes on top of a brown checked shirt. Outside the sweater, he wore a charcoal coloured jacket. Moreover, his outfit also included a pair of brown shorts and socks, and shoes in the same colour of his jacket. His other outfit was a black formal suit which he was wearing with a white shirt when attending George Méliés' screening and celebratory party.

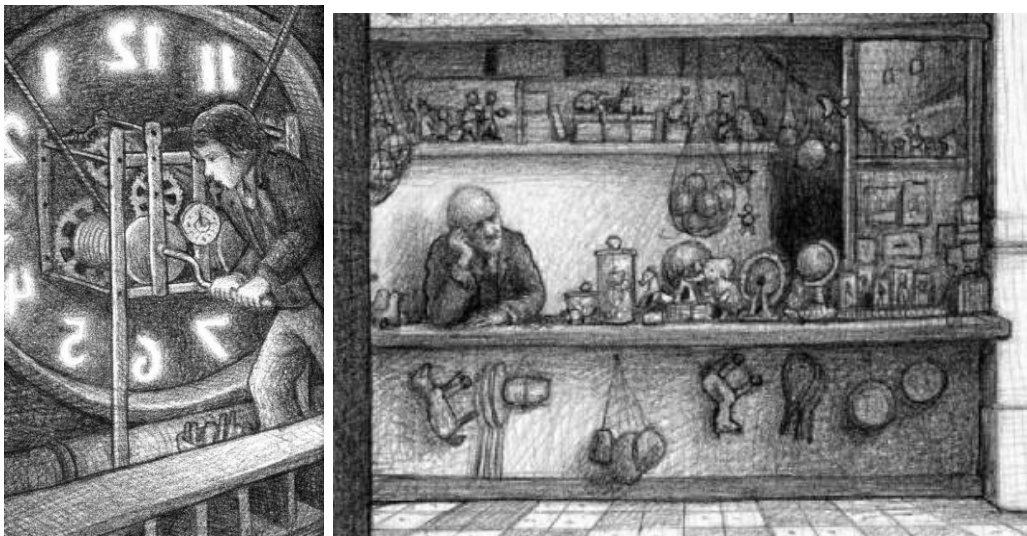
The choice of colour for the visual elements in the digital visual effects scenes, especially the computer-generated elements, intended to create a coherent pattern. A case in point is the scene where Hugo first met Isabelle outside Méliés apartment. Hugo followed Méliés to his

apartment to plead that he would return his notebook, which had important drawings revealing the design of the automaton. The notebook was kept by Méliés after he caught Hugo stealing parts from his toy booth to repair the automaton. After being refused by Méliés, Hugo was pacing along the street around Méliés' place with disappointment on a dark, cold winter night when he saw Isabelle in her window. In this scene, the computer-generated railway bridge above the street leading to Méliés' apartment was in a dark shade of charcoal. A computer-generated steam train in black was passing by, generating steam in a black and grey combination, when Hugo realised Isabelle was watching him from the window. The computer-generated narrow street in the background was covered in a thin layer of snow and surrounded by multi-storeyed apartments. The apartments were largely in dark shadows of night and only a few wall lanterns hanging outside the stores on the first floor slightly revealed the beige colours of the buildings.

Another case in point is the colour combination of the digital visual effects involved shots in the trip to the cinema scene. Isabelle agreed to help Hugo to protect his notebook after their first meeting and the friendship between the two main characters began. At approximately 25 mins into the film Hugo decided to take Isabelle to visit a cinema as she mentioned that she has never seen a film before. The delivery of digital visual effects enables the depiction of the streets and buildings in 1931 Paris for their trip to the cinema scene. For example, during their return journey from the cinema, Hugo pointed out where he was living to Isabelle over a bridge in a wide shot. This shot contained visual elements from live action footage, which is Hugo and Isabelle dressed in natural colour coats, and the bridge they stand on appears in the shade of charcoal. The visual elements in the remaining parts of the shot are computer-generated imagery, the colour combination of which is coherent to the pattern that is examined in the previous paragraphs. More specifically, the computer-generated terraced houses on opposite banks of the river, the train station in the background and the church in the distance were in a beige tone. The computer-generated cloudy sky was in a combination of grey and yellow while the sun was setting, the reflection of which was also visible on the river which was in a silver tone and the windows of buildings on the left side of the river. The computer-generated image on the right bank of the river added a shade of red to the shot.

The patterned use of colour discussed above is meaningful in this film as it created a visual style that was paying homage to the illustration book this film was based on. Analysis of the film illustrates that except red and blue, the colour palette in *Hugo* (2011) is largely occupied

by the variation of charcoal and brown/yellow tones. *The Invention of Hugo Cabret* novel by Brian Selznick is the main inspiration of the film *Hugo* (2011). It is an illustrated story drawn in charcoal pencil. As exemplified by the graphic below in Figure 27, which are the depiction of Hugo in the clock tower and Méliés resting in the toy booth in the original book, the main colour for the illustration in this book are the variation of black and grey. Furthermore, the brown/yellow tones in the colour palette of *Hugo* resemble the look of aged papers. A reference of this type of paper can be found in the film itself at about 40 mins into the film. When Hugo has finally managed to repair the automaton, the paper of the drawing made by the automaton, which was an image from Méliés' *A Trip to the Moon* (1902), was in the shade of brown. Therefore, the charcoal and brown tones in *Hugo*'s colour palette are paying homage to the look of pencil drawing on papers that are browned by age. The rest of the colours in the colour palette, in particular red and blue, are referencing the tones of the covers of old books. The examples of the look of this type of book cover can also be found in this film. At approximately 26 mins into the film, Isabelle introduced Hugo to her favourite period book store, which is occupied by towers of leather bound books. The red and blue covers of these books are visible in the scene.



*Figure 27 Hugo in the clock tower and Méliés resting in the toy booth in The Invention of Hugo Cabret*

The visual style paying homage to the look of the illustrated book is also coherent with the overall style of this film. The intention to pay homage to the look of previous images, film sequences or other forms of visual arts is also reflected in the utilisation of other film techniques

in *Hugo*<sup>69</sup>. For example, the film depicted one of Hugo's dreams after reading about George Méliés in the library. The first dream is of a steam train in the station running towards him. The camera angle of the shot of the train in motion is intended to pay homage to the Lumière brothers' *Arrival of a Train at La Ciotat* (1896). According to the film director, the same lenses were used for the shot to match Lumière's film. Hugo's other dream is about a train crashing out of the window of the station. The appearance of the train, the structure of the station building, as well as the composition of the shot match the images of news coverage of the derailment of the Granville-Paris Express at Gare Montparnasse in 1895. In addition, the modelling of the Paris skyline, especially the roof of computer-generated buildings in this film references the look of *Under The Rooftops of Paris* (René Clair, 1930). Furthermore, at approximately 75 mins into the film, Hugo has to hide outside the face of the clock while the inspector chased him inside the clock tower. The performance of Hugo in the shot, which shows him holding the hand of the clock was a homage to a similar scene in *Safety Last* (1923).

The above discussion demonstrates that the purpose of the selection of colour palette for digital visual effects was for the formation of a style that paid homage to the illustrated story that *Hugo* is based on, and the use of homage also appears in other aspects of filmmaking such as camera angles and shot composition. The following paragraph will examine the function of this established pattern in the construction of meaning. The use of homage as a motif in *Hugo* serves as an encouragement for the exploration of the earlier cinematic history as the understanding of the history *Hugo* is paying homage to increase its depth of interpretation. For example, the understanding of the illustrated book that inspired the making of *Hugo* sheds light on the meaning of the reappearance of charcoal tones in digital visual effects scenes such as the inspector chasing Hugo and the scene where Hugo first met Isabelle. Also, in the scene where the inspector is chasing Hugo, the pillar supporting the roof and the frame of the glass roof appear to be charcoal. This could be interpreted as the soot and smoke from the steam engines, which would have been coming in and out of the poorly ventilated station regularly. In fact, this was because *Hugo* is based on the illustrated book that predominantly uses charcoal tones. As revealed in the opening scene, the station is a terminus and therefore only has an opening on one side. Similarly, the charcoal colour of the railway bridge in the scene where

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<sup>69</sup> Information films and photographs Hugo paying homage to discussed in this section is from: <https://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/>

Hugo first meets Isabelle could be understood from the continuously passing steam trains and the smoke. The reason for the high utilisation of black colour in the buildings that make up the background of the scene could be the dark winter evening when the scene was set and the lighting conditions on the street. However, the knowledge of the illustrated book sheds lights on the meaning of the reappearance of the charcoal colour in paying homage to the book.

Furthermore, Hugo's performance in the scene where he was hanging on the clock arm could be interpreted as the means of escaping from the station inspector's clutches. Familiarity with the film *Safety Last* (1923) will inform the use of homage in Hugo's performance in the scene. More importantly, the chronological order of the scenes in *Hugo* intends to leave clues for the audience to spot the homage. For instance, the scene where Hugo took Isabelle to the cinema happened prior to the scene when Hugo was hanging on the clock arm. The film that they watched was exactly *Safety Last* (1923). This can also be illustrated by the chronological order of the visit to the film academy library scene and Hugo's dream scene. The film depicts Hugo and Isabelle's visit to the film academy library where they read about the earlier film history including the Lumière brothers' *Arrival of a Train at La Ciotat* (1896) before showing the scene where Hugo dreams about the train running towards him. According to previous discussion, this particular dream scene is paying homage to the *Arrival of a Train at La Ciotat* (1896). However, the film does not include all the historical background regarding the use of homage, which encourages further exploration.

The encouragement of the exploration of history is one of the main meanings that *Hugo* intends to construct. The exposition of the plot is representative of earlier cinematic history. Through Hugo's journey of discovery, the film reveals the filmmaking practice of pioneers such as George Méliés, and the earlier history of film exhibitions such as the screening of the Lumière brothers' *Arrival of a Train at La Ciotat* (1896). However, as a fictional film historical accuracy is not the major concern of *Hugo* (2011); instead it focuses on emphasizing the importance of maintaining connections with the past. The idea of personal and family history is a motif in the narrative structure of this film and motivates the actions of characters such as Hugo, Isabelle, George Méliés and the film scholar. As noted by Bordwell (1985), the notion of narrative structure refers to the arrangement of the parts of narrative such as events and actions. To illustrate, Hugo's determination to repair the automaton guides events along the course he took through the film. Hugo's attempt at stealing parts from the toy booth for fixing the automaton leads to his encounter with George Méliés. The friendship between Hugo and Isabelle started



as she promised to protect the notebook kept by Méliés, which contains information about the machine. In order to understand the picture that the automaton drew Hugo began to learn the history of film. His family history serves as the main motivation for him to fix the broken machine. As explained by Hugo to Isabelle during her first visit to the clock tower, he was trying to do so as it was his father's mission before he died.

Isabelle's response here further strengthens the connection between the notion of purpose and family history. As she said maybe she needs to find out what her parents did, therefore she would know her aims for life. At the end of the film, because the history of her original family remains unknown, she decides to write a book, which documented the story of Hugo and herself, who became part of her family. Another case in point is the structure of plots surrounding George Méliés. At the beginning of the film, Méliés' actions are driven by his attempt to disconnect with his past. As revealed in the film, after the bankruptcy of his film factory and the selling of his films to make shoe heels necessary for the First World War, Méliés decided to hide himself in the toy booth. He never mentioned a word of his filmmaking career to others including his own goddaughter Isabelle. He even forbade Isabelle from going to the cinema. The film also intended to relate the notion of disconnecting with personal history to the idea of being broken as Méliés comments at approximately 65 mins into the film that he was trying to escape from his past, like the broken automaton. Apart from that, Hugo mentioned he was sad when seeing a broken machine as "it cannot do what it was meant to do". Once he regained his courage to face his past with help from Hugo and the film scholar who has preserved the copies of his film, Méliés referred to himself as "being fixed". Then the viewer also witnesses a shift in his character. He changes to be a much more approachable character who is delighted with his films being screened to the public. He adopts Hugo as his godson and is far from the bitter and indifferent person portrayed at the beginning of the film. Another example is the film scholar portrayed in the film, who devoted his life to the study of Méliés' films due to the memory of visiting a Méliés film factory in his childhood.

### 3.2 Creativity and Industry Institutional Contexts for Digital Visual Effects Practice

George Méliès is considered as the pioneer in the path of exploiting cinematic technology in the service of self-expression and creating fantasy content by scholars such as Jacobs (1969) and Berton (1990). As noted by Jacobs, Méliès is the very first person who turned the lens of the motion picture camera away "from reality, from mere reporting to fantasy and genuine

creation (8)”. The exploration of means of utilising new technology for artistic expression is still key for the digital visual effects artists in their contemporary practice (Berton). George Méliès is also widely recognized in the field of the current digital visual effects industry as the earliest practitioner for the construction of visual illusion through the development of techniques. The Visual Effects Society, which is a global professional honorary society representing the digital visual effects practitioners in over 30 countries<sup>70</sup>, chose the image from Méliès’ film *Trip to the Moon* (1902) as their symbol. The *Visual Effects Society Handbook*, and other training materials for digital visual effects artists such as Gress (2015) also credit George Méliès’ works, when introducing the earlier practice in the delivery of visual illusion. Jump cut is one of the editing techniques that was first exploited by Méliès (Fairservice, 2001) for the construction of illusions such as a lady vanishing on a chair in *The Vanishing Lady* (1896) and a boy splitting into two in *The Famous Box Trick* (1898). The discovery of the notion of jump cut was considered as a happy accident for Méliès. It happened when he was filming random objects in Paris purely for the purpose of exploring his recently developed camera. While he was filming the traffic in the Place de l’Opéra, the apparatus suddenly jammed (Fairservice). The filming continued after he adjusted the mechanism of the camera. However, “on projecting the result, it appeared that a horse-bus had turned miraculously into a hearse.” (12).

The freedom for conducting exploration and experimentation driven by his artistic impulse gave Méliès the chance to encounter such happy accidents. This type of freedom is accommodated by creative autonomy. The notion of autonomy, which is considered as an essential condition for creative works by scholars such as Holt and Lapenta (2010), has diverse layers of meaning. For example, this concept refers to an ideal social condition for individuals to feel free to make their own rational choices, when it was first introduced in the Age of Enlightenment (Holt and Lapenta, 2010). It is revisited and reconceptualised by research into today’s creative industries, such as by Umney and Kretsos (2013). Creative industries “are organized principally to take advantage of and capture the market value of human creativity”, which is “a process of generating something new by combining elements that already exist” (Jones, Lorenzen, and Sapsed, 2015:3). For example, creative industries include sectors such

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<sup>70</sup> According to Visual Effects Society: <https://www.visualeffectssociety.com>

as advertising and marketing communication; animation; fashion and textiles; games; TV; photo imaging; publishing; radio; and digital visual effects in countries such as the UK<sup>71</sup>. In this field of research, autonomy means the independence and freedom for artists regarding the organizing of their own creative activities (Holt and Lapenta, 2010). It could be affected by the industrial system, commercial pressures, and employment conditions (Holt and Lapenta; and Jones, Lorenzen, and Sapsed, 2015). The recent research of Thompson, Parker and Cox (2016) also points out the importance of studying the industrial contexts for understanding the role creative autonomy plays in the processes of capturing value for firms and workers, based on the investigation of the games industry.

Analysis of trade publications such as *FX-Guide* shows that the practitioners in the current Hollywood digital visual effects industry such as the directors of *The Jungle Book* (2016) and *Star Wars Episode VII: The Force Awakens* (2015) are still seeking the “happy accidents” and chances of being “spontaneous” during their creative process. As explained by J.J. Abrams, having the flexibility for spontaneous discovery on set plays an important role for the creative decision-making on how to approach shots for *Star Wars Episode VII: The Force Awakens* (2015). Despite the great deal of technical involvements, “finding a happy accident and being spontaneous” are also highly valued by Jon Favreau for the making of *The Jungle Book* (2016). However, from George Méliès’ filmmaking to today’s digital visual effects practice, the past century witnesses a great deal of institutional changes (Popple and Kember, 2004) such as the establishment of cinema as a “commercially important institution in its own right” (5) and the industrialisation of film production, which results in the progression of standardisation (Keil, 2001). To what extent do these changes and the current industry institutional contexts of digital visual effects production affect the conditions for the creative autonomy of artists? In order to shed light on the creative autonomy of the professionals in the Hollywood digital visual effects industry, the following section discusses how the creative activities of digital visual effects artists of *Hugo* (2011) are organized in comparison to the practice of George Méliès. *Hugo* as studied in the section above is a film that paid tribute to George Méliès through the delivery of photorealistic digital visual effects. More importantly it exemplified the creative process of digital visual effects in a wide variety of Hollywood films such as *Star Wars Episode VII: The Force Awakens* (2015), *The Jungle Book* (2016), and *Life of Pi* (2012) that involved a complex

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<sup>71</sup> According to Creative Skillset: [http://creativeskillset.org/creative\\_industries](http://creativeskillset.org/creative_industries)

pipeline, multiple institutions with diverse locations, decision making hierarchy, as well as transnational teamwork.

The operation of George Méliès' film production in his Star film factory was primarily in the mode of a one-man band (Robinson, 1993). In other words, Méliès was equipped with multiple skills such as filmmaking and craft that was required for his creative process. Moreover, he had a great deal of independence and control over his filmmaking activities. As described by Lucien Astaix, who was one of his cameramen, "he is an individualist... a lot of talent, an oddball do-it-yourself. He had a strong sense of cinema. He had the instinct of how to put together a script. We could never figure out what kind of film we were going to make. He had everything in his head, no written script...He was preparing the story all by himself...He was building the props and scenery by himself. He was also very good at using a hammer and pliers." (Robinson, 1993) In contrast, an analysis of digital visual effects company Pixomondo's sample schedule<sup>72</sup> in the production of *Hugo*, as well as interviews with professionals in the field including the producers in Pixomondo Beijing, reveal the complexity, collectiveness and segmentation of the workflow for their digital visual effects practice. The workflow for delivering digital visual effects in Hollywood film has been frequently described as a pipeline during interviews I conducted with professionals in the current industry, which have a highly specialized workforce. The whole post-production pipeline is divided into very detailed tasks, which come together in the final composition.

The first stage of the visual effects pipelines<sup>73</sup> for Hollywood films such as *Hugo* takes place during the pre-production period of the film, which refers to a phase of film production before principal photography. The targets of this stage of the pipeline include decision making on where digital visual effects will take place in the film based on the aesthetic goals and the budget. For example, according to my interview with the digital visual effects producer from Pixomondo Beijing, the director of *Hugo* (2011), the digital visual effects supervisor and the

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<sup>72</sup> The sample schedule studied in this section is available at:

<https://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/>

<sup>73</sup> The discussion of digital visual effects pipeline in the section is based on my interview with professionals in the current industry, Creative Skillset, tutorials from Escape Studio, and other online tutorials such as: <https://www.youtube.com/watch?v=hh97SpNz56s>

digital visual effects producer on the film studios' side, held a meeting at this stage. During this meeting, the film director discussed his creative aims for the film. The digital visual effects supervisor then went through the script and marked all the shots that required digital visual effects based on the director's vision. Apart from that, at this stage the digital visual effects supervisor will suggest possible techniques for achieving these visual effects and the approximate costs. Once the agreement on where digital visual effects will take place in a film is reached, the digital visual effects supervisor and digital visual effects producer will choose digital visual effects companies to deliver these effects through the bidding process.

Once the decision has been made, the appointed companies will start to prepare for the digital visual effects shots they are responsible for before principal photography begins. Specific tasks such as research and development, reference collection and pre-visualisation will take place during the preparation stage. To exemplify, the digital visual effects companies such as Weta Digital conducted research into the relevance of existing software packages, and identified needs for developing any particular software or plug-in at this stage of the pipeline for the digital visual effects in *Avatar* (2009). To further illustrate, digital visual effects companies such as MPC built a collection of photos of plants and landscapes in India which functioned as the references for the digital visual effects in *The Jungle Book* (2016). Another case in point is that a process, which is named as pre-visualisation in the industry, was involved in the digital visual effects pipeline of films such as *Hugo* (2011) in pre-production. During this process a set of artists with specific roles, for instance animators and modellers, produced a computer animated version of the actual digital visual effects shots, which have less detail and a lower level of photorealism. The function of these animations was to illustrate how the director intended to approach these shots.

After the preparation stage, the pipeline moves to the delivery of the digital visual effects. As discussed in Chapter 2, the workflow for the delivery of digital visual effects in general includes five main stages, which include: modelling, texturing, animation, shading and lighting, as well as compositing. The five main stages of the digital visual effects pipeline could also contain sub-stages. In particular, the main compositing stage is further divided into sub-stages such as rotoscoping and match moving. Rotoscoping is a process of creating clear areas within the frame of live action footage to allow all elements of the scene to be layered convincingly

by the compositors<sup>74</sup>. The key tasks of match moving are translating and imitating the camera movements in live action shots; and matching those movements in 3D computer animations. The completion of these tasks enables the computer-generated elements of a shot to fit accurately and coherently into the live action footage, when the various elements are composited by the compositors<sup>75</sup>. These stages and sub-stages are completed by a group of highly divided and specialised labour equipped with relevant skills. For example, roto artists with skills in operating software such as Nuke and Fusion are in charge of rotoscoping. Modellers who have skills in utilizing the set of modelling tools on the interface of software such as Maya work on modelling tasks. Specialists such as riggers, whose expertise includes the modelling of the skeletons of computer-generated characters, may also get involved in the modelling stage. An example of a Hollywood film that required this type of specialism is *The Jungle Book* (2016). Areas they were working on include the skeletons of the animal characters such as the tiger and the bear.

The division of labour could also occur during a single stage of the pipeline. For instance, different types of animators such as effects animators and character animators are involved in the animation stage of the digital visual effects pipeline of *Hugo*. Animators in the industry are the professionals that are responsible for creating the illusion of movement of computer-generated imagery in digital visual effects sequences through the operation of the set of animation tools in software such as Autodesk Maya. The effects animators are specialised in the motion of certain effects such as the snow in *Hugo* (2011), while the character animators are working on animating computer-generated characters. If the delivery of digital visual effects required the use of computer programming and simulations, a professional technical director would be included in the pipeline. The technical directors also have their own specialities. For instance, the professionals who are working on the computer programming and simulations for the fur of digital characters such as the tiger in *The Jungle Book* (2016) are grooming technical directors. Other examples of diverse technical directors are lighting technical directors, who are working on lighting related tasks; and fire technical directors, who are involved in the simulations of fire effects. The completion of a particular task discussed above such as modelling, character animation and the match moving also requires the collective

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<sup>74</sup> According to Creative Skillsets: [http://creativeskillset.org/job\\_roles/358\\_compositor](http://creativeskillset.org/job_roles/358_compositor)

<sup>75</sup> According to Creative Skillsets: [http://creativeskillset.org/job\\_roles/358\\_compositor](http://creativeskillset.org/job_roles/358_compositor)

efforts of professionals under the same job title related to the task. For example, the modelling tasks for the digital visual effects of *Hugo* (2011) could be broken down into the modelling of computer-generated visual elements in different sequences such as the opening sequence and the station inspector chasing Hugo sequence. The modelling tasks of various computer-generated elements such as the buildings and streets in digital visual effects scenes in *Hugo* (2011) could be allocated to different groups of modellers. For example, the modelling tasks of the computer-generated Paris skyline and the train station in the opening scene of *Hugo* (2011) are the joint efforts of modellers from two digital visual effects companies, which are Pixomondo, and Industrial Light and Magic. The modelling tasks for more than one sequence could be carried out at the same time, which means a modeller could work on the modelling of the part of computer-generated elements of one sequence and then move onto another.

The segmentation of workflow and the division of labour discussed above means that the digital visual effects practice for Hollywood films such as *Hugo* (2011)<sup>76</sup> is a creative team process. In other words, the integration of divergent information is necessary for the operation of the specialised labours in the pipeline. To illustrate, during the pre-production phase of *Hugo* (2011) the creative decision making of the director required technical input from the digital visual effects supervisor, and the consideration of budget and timeframe leading up to the film's release from the digital visual effects producer. To further demonstrate, multiple companies for instance, Pixomondo and Uncharted Territory<sup>77</sup> were working on the shots that involved live action footage and computer-generated Paris external urban environment. These type of shots appeared at various times during the film, such as when Hugo and Isabelle went to the cinema and when the station inspector supervised the stray boy being taken in a vehicle off to the orphanage. The information about the architectural, historical and technical aspects of the visual elements of the Paris urban environment such as the roads, pavements, bridges, lampposts and buildings simulated by one company is relevant for the modelling and texturing tasks of another company. Therefore, the appearance of the urban environment in different

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<sup>76</sup> Information about creative process of *Hugo* is from my interview with digital visual effects producer from Pixomondo Beijing.

<sup>77</sup> According to Pixomondo VFX producer and trade journal Creative Cow: [https://library.creativecow.net/article.php?author\\_folder=legato\\_rob&article\\_folder=magazine\\_30\\_HUGO&page=1](https://library.creativecow.net/article.php?author_folder=legato_rob&article_folder=magazine_30_HUGO&page=1)

shots could maintain consistency. Another case in point is the shot of Mowgli and Bagheera the Panther walking on a tree trunk over a gorge in *The Jungle Book* (2016). Even though the different attributes of the visual elements in the shots such as the lighting, the movement and the morphing were accomplished by divided labour in specific stages of the pipeline, it is crucial for them to be coherent in the final composition stage. More specifically, the width of the model gorge and the length of the tree trunk spanning the gorge along with the walking pace of Mowgli and Bagheera, has to match the dimensions of the Panther and screen time of the shot which allowed for the completion of the dialogue between the two characters. The width of the tree trunk, which communicates the age of the tree when it died therefore it is one aspect that needed to be taken into account for the design of the texture of the trunk. Moreover, the lighting in this shot also needed to echo the movement of Mowgli and Bagheera.

The digital visual effects pipeline in the current Hollywood film industry also involves a noticeable level of complexity in terms of management roles<sup>78</sup>. As mentioned in the previous paragraph of this section digital visual effects supervisor and digital visual effects producer from the film studios' side became involved in the first stage of the digital visual effects pipeline. The responsibility of the digital visual effects supervisor who has expertise in the digital visual effects related technology and on-set filming experience also includes overseeing the whole pipeline and ensuring the achievement of the creative aim of the director<sup>79</sup>. While the digital visual effects supervisor is looking after the aesthetical and technological issues, the digital visual effects producer is in charge of the practical aspects of the pipeline, for instance time management and scheduling. As more than one digital visual effects company is involved in the pipeline for films such as *Hugo* (2011), each of the companies also has their own digital visual effects supervisor and producer for the film they are working on. Digital visual effects companies such as Pixomondo also have facilities in different locations such as Germany and China that contributed to the digital visual effects tasks of a single film. Each of the facilities also appoints digital visual effects producers to manage the particular work allocated to them. Specific management roles also exist within the digital visual effects pipeline in the current

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<sup>78</sup> Discussion of the management roles in this section is based on my interview with digital visual effects producer from Pixomondo Beijing and other professionals in the current digital visual effects industry.

<sup>79</sup> According to Creative Skillset: [http://creativeskillset.org/job\\_roles/4265\\_vfx\\_supervisor](http://creativeskillset.org/job_roles/4265_vfx_supervisor)



industry. To exemplify, there are compositing leads that are supervising a certain amount of compositing tasks. Another example is the sequence leads, who are leading the delivery of digital visual effects in a sequence.

The diverse tasks studied above at the stages and sub-stages of the digital visual effects pipeline are also inter-dependent, and their organization is reminiscent of an assembly line. The modelling stage begins when the decisions on where digital visual effects take place in the diverse shots of the film are made during the planning and preparation stages of the pipeline. In other words, the information of what visual elements of a shot are computer-generated imagery is essential for the beginning of modelling tasks. In the current industry, this stage normally occurs before and during the filming of the live action part of a shot. The pipeline will progress to the texturing stage after the completion of the modelling of computer-generated elements of a shot. Meanwhile, artists, in particular the rigger, work on the skeleton of the computer-generated models of characters in order to prepare for the character animation tasks. The tasks that are accomplished by the rigger include placing handles on the joints of skeletons so these joints can be moved by the animators. Once the live action footage, which is called a plate, is delivered to the visual effects companies, the earlier stages of compositing begin, which contain specific tasks such as match moving and rotoscoping. These tasks are named as 'shot preparation tasks' in the industry. The pipeline moves to effects animation after shot preparation tasks, if the delivery of digital visual effects involves effects such as snow and fire. Based on the progression made in previous tasks, especially rigging and match moving, the character animators also start animating computer-generated characters. As mentioned above the data passing to the character animators by the match moving artists is important for the coherence of the movement of computer-generated characters in a shot to the camera movement and the motion of other relevant live action elements of the shot. The next stage of the pipeline is lighting and rendering before it reaches the final stage of compositing, where computer-generated imagery and live action shots are integrated.

Apart from being a one-man band, the earlier filmmaking practice of George Méliés shows a high level of flexibility in time management. For example, he had the leverage of being able to conduct experimental film activities in Paris (Ezra, 2000). In contrast, in the current digital visual effects industry scheduling is important to enable the progression along the pipeline, given the level of inter-dependence of the tasks for the delivery of digital visual effects. Therefore, digital visual artists are expected to conduct and complete their tasks within a given

time. The importance of time management and efficiency for digital visual production could be illustrated by the analysis of an approximate sample schedule of Pixomondo for the delivery of digital visual effects in *Hugo* (2011), which was published by FX-Guide (2011)<sup>80</sup>. As mentioned previously in this research, Pixomondo was involved in the digital visual effects of Hollywood films, with international operations in cities such as New York, Beijing, Frankfurt, and Toronto. As shown on the sample schedule, the team was attempting to take advantage of the time zone difference in cities, where its facilities were located to complete the delivery of a visual effects shot. The schedule started from 5pm New York time when the filming of the live action footage for a digital visual effects shot was finished. Then the editing decision list was intended to be sent to the digital visual effects supervisor around 2pm to 4pm in Los Angeles. This means the editing of the partial sequence has been done after the filming of the live action parts of separate shots or sequences of the film and before the start of post-production pipeline. As Los Angeles was 3 hours behind New York, the team then selected and uploaded all the materials including the live action footage for the digital visual effects tasks to the server of Pixomondo for their international located facilities to access. By the time the Los Angeles work was finished, it was around 6am to 8 am in the morning in their Beijing and Shanghai office, which is 13 hours ahead of New York. Then the team in Beijing would be working on tasks such as match moving, and the Shanghai office would be completing the modelling adjustment. According to this schedule, the modelling tasks have already been done, and the further adjustment of the modelling involved in the shot was required at this stage. Around 7 to 15 hours later the pipeline for this task would move to the team in Berlin and Frankfurt, who would complete the character and effects animation tasks. Due to the time zone differences, it would be around morning or earlier afternoon in these two cities, when the tasks arrived. After that the London facility, which was one hour behind Germany, would be working on the remaining tasks before compositing. They were also expected to make a start on compositing tasks if there was time. The team in Toronto, which was 5 hours behind London, would complete all the compositing in about five to six hours. The shots then would be finished by lunchtime in New York.

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<sup>80</sup> This article is available at: <https://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/>

The pursuit of efficiency is driven by both the organizational goals of the Hollywood studios and the digital visual effects companies. The busyness was my first impression of the professionals in the current digital visual effects industry when I was contacting them to schedule interviews for this research. In the majority of the responses I received, the digital visual effects artists were having a very busy schedule for their projects. For example, one of the digital visual effects compositors in Cinesite VFX, who was interested in participating in this research, said that she preferred to be interviewed via email as her time was tight. Therefore, if I could email her the list of questions, she might be able to answer them when she had a minute. I eventually obtained an opportunity to ask why they have such a busy schedule, when I was conducting a face to face interview with the producer in Pixomondo Beijing. The interviewee explained that efficiency and time management is significant for the post-production workflow because the film has a set release date. Therefore, it is necessary for Hollywood studios to ensure the completion of all the post-production before the release date. On the other hand, it is crucial for the digital visual effects companies to be efficient. Firstly, the ability to complete agreed tasks before the deadline would affect the level of satisfaction of their Hollywood clients who are also under pressure to complete the film before the release date. According to the survey I conducted with the professionals in the current industry, previous working experience is one of the major factors that influences Hollywood studios' decisions on appointing digital visual effects companies. Therefore, customer satisfaction is important for the digital visual effects company. Apart from that, in the current industry the digital visual effects companies get paid by the studios based on the amount of shots they agree to complete, not the hours they spend on these shots<sup>81</sup>. This means that their profitability is dependent on the cost of the shots. As the salaries they get paid for the artists on the digital visual effects pipeline are part of the cost, it is necessary for the digital visual effects company to manage the duration of a task.

To conclude, the above discussion shows that the nature of the creative process changed from the exploration of a one-man band to a complex workflow with a great deal of standardization in scheduling and routine, specialisation in roles and tasks and the clear emphasis on efficiency.

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<sup>81</sup>According to my interview with professionals in the digital visual effects industry such as the founder of Digital Domain.

### 3.3 Creativity in Teams: Communication and Distributed Directing

In this section I intend to discuss the significance of communication for the creative process of delivering digital visual effects and point out that it is necessary to understand factors affect the effectiveness of communication. To understand the importance of communication for digital visual effects practice, the following paragraphs discuss the functions of directors. Understanding of the notion of directing digital visual effects is necessary, because 94.74% of respondents to the survey I conducted strongly agreed that the communication between film directors and digital visual effects companies is very important for the aesthetics of digital visual effects. Even though the exact functions of directors might be different from film to film, in general they are responsible for the “details, quality, and meaning of the final film” (Rabiger and Hurbis-Cherrier, 2013:4). As filmmaking is the collaborative activity of a group of artists such as scriptwriters, actors, editors, and cinematographers, it is important for the directors to ensure the coherence of their contributions regarding storytelling, aesthetics and the meaning of a film. Therefore, the key responsibilities of the directors also include articulating of an overarching vision to function as a creative road map for film production (Rabiger and Hurbis-Cherrier). The above functions and responsibilities of directors in film production, is still relevant for the delivery of digital visual effects.

As discussed above, digital visual effects in films such as the *Jungle Book* (2016), *Hugo* (2011) and *Rogue One: A Star Wars Story* (2016) are part of the composition of shots, which worked together with other visual elements such as the performance of actors for storytelling, the conveying of meanings, the creating of mood, and the developing of visual style. To exemplify, the conflicts between the computer-generated character Shere Khan and the live action performance of Mowgli is the main drive of the unfolding of plots in the *Jungle Book* (2016). As shown in the film, Shere Khan’s threat of killing Mowgli during the water truce scene was the main reason for Mowgli to leave the wolf pack. Understanding the function of Shere Khan and the water truce scene in the narrative of this film is important for the modelling, animating, and texturing of this tiger. The outcome of these tasks such as the movement and facial expression of Shere Khan during the water truce, as well as the blood and the multiple scars on his face to indicate his threatening character. Therefore, the role that a director plays in the film production, especially for the coherence of diverse elements of a film, is applicable for the delivery of digital visual effects.

According to my interview and survey, professionals in the digital visual effects companies such as MPC, ILM, and Pixomondo, believed that the film directors were meant to be the decision-makers of the creative aspects of digital visual effects. These aspects include meaning, mood, and visual style. The digital visual effects team had to understand what the director intended to achieve for their own creative input. According to professionals from MPC, the digital visual effects team of *The Jungle Book* (2016) needed to follow the director's decision on the physical appearance of these animals and their movement as being naturalistic. According to the professionals in MPC the process of designing these animals was equivalent to the casting process in film production. The director had to choose the characteristics of the animals. Another case in point is *Rogue One: A Star Wars Story* (2016). The team at Industrial Light and Magic told me they were guided by the director's vision for the composition of digital visual effects shots and the creation of mood. The composition of the massive Star Destroyer hanging above the city of Jedha was for fulfilling the director's aim of achieving an intimidating mood. Therefore, it is necessary for the digital visual effects team to understand the vision and other creative decisions of the directors. The interview with the co-founder of the former Rhythm and Hues in the documentary *Life After Pi* (2014) also supported the idea that a clearly communicated vision from the film director is vital for achieving the intended aesthetic aims of digital visual effects.

In film production, directors communicate their creative decisions with the crew and cast, when directing the filming of pre-filmic events (Raniger and Hurbis-Cherrier, 2013). The notion of pre-filmic event refers to the slice of the world in front of the film camera, including actors and their performances, lighting, sets, props and costumes (Westwell and Kuhn, 2015). An example of a cinematic depiction of the film directing process is *Hugo* (2011). The portrayal of Méliés directing on set was part of the history of film scene, where Méliés shared his memories as a filmmaker with Hugo. In this scene, Méliés was walking on set, explaining his ideas to the special effects crews, who were in charge of the movement of a puppet dragon. His actions in this scene also include demonstrating the intended performance to the actors, having a final touch to the make-up of the actors and look of the sets as well as standing beside the cinematographer when filming. The directing of the pre-filmic events is still in practice for the live action part of digital visual effects shots.

However, the simulation of the computer-generated visual elements and the composition of these elements with live action elements are digital processes and simulations (Rodowick, 2007

and Manovich, 2001). This means the directing of digital visual effects involves the communication of directors' ideas to the highly divided workforce in multiple visual effects companies, who are the operators of the computer simulations. To illustrate, in *Life of Pi* (2012) visual elements such as Pi and the lifeboat in the scenes where Pi was in the Pacific Ocean after the shipwreck, were directed on set. The director was able to communicate in person with the actor regarding his performance and with the cinematographers in relation to the camera angles and movements. The other visual elements depicting Pi's journey on the Pacific Ocean including computer-generated ocean, sky, marine animals and Richard Parker the tiger, did not take part in the onset of the filming process<sup>82</sup>. This meant that any relevant ideas or creative choices from the director had to be understood by a large number of digital visual effects artists, in order to guide and inspire their practice. As explained in the previous chapters, there were more than 300 artists from the former Rhythm and Hues working on this film and there were more than ten visual effects companies involved in this film. The operations of these digital artists in fulfilling their tasks such as compositing and animation have impacts on the aesthetics of the film. For example, the animation tasks of Richard Parker contribute to the performance of this digital character. The compositing tasks have an impact on composition of shots including digital elements such as the tiger and ocean, and the interaction between these digital elements with live action parts of shots.

A complex communication process is involved in the distributed directing of digital visual effects discussed above. According to the professionals from companies such as Cinesite, the former Rhythm and Hues, MPC and ILM, who participated in my survey and research interviews, there are a number of contributing roles in between the communication of the director and the artists doing a specific job in the segmented digital visual effects pipeline. Examples of these contributing roles include the digital visual effects supervisor from the film production company; digital visual effects supervisors from individual visual effects companies involved in a film, supervisors and coordinators of the particular facilities of a digital visual effects company and the leading artists of a sequence or a specific step of the pipeline such as lead compositor. For example, a senior compositor from Cinesite explained

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<sup>82</sup> According to Life of Pi VFX breakdown by BUF <https://vimeo.com/60239413> and *FX-Guide*: <https://www.fxguide.com/featured/life-of-pi/>

that most VFX companies, VFX supervisors and producers are the first point of contact with clients such as the director or more commonly the VFX producer on the show. She further explained that “they then relate the information to the artists and delegate work accordingly”. She also said, “as an artist I occasionally get to sit in on screenings with clients but in general comments and ideas from the clients will come to us through our supervisors and producers and vice versa.” A digital visual effects producer from Pixomondo China commented that most digital visual effects companies which have multiple international facilities employ digital visual effects supervisors and producers for each facility to oversee the artists’ work. The other digital visual effects artists mentioned that their work would go through a chain of approval before reaching the director. Professionals such as lead artists and digital visual effects supervisors would make comments and suggest changes for their work.

Given that digital visual effects artists involved in Hollywood films such as *Hugo* (2011) are located in different countries, mediated communication is involved in the distributed directing process. Digital visual effects company Pixomondo<sup>83</sup>, which was part of the digital visual effects team for *Hugo* (2011), has facilities in countries such as Germany, China, and Canada. This company has an internal digital communication platform, and each of the artists in this company has an account on this platform. Through accessing their account, artists in Pixomondo can receive guidance and feedback on their work from the professionals in the contributing roles discussed above. Analysis of my survey also reveals that emails and video conferencing are utilised for providing feedback on the works of digital visual effects artists. More specifically, 63.16% of the respondents have received feedback on their work via email, and 52.63% of them have received feedback through video conferencing. These participants include digital visual effects artists involved in *Life of Pi* (2012), *Rogue One: A Star Wars Story* (2016), and *The Jungle Book* (2016). Cross-cultural communication might also be involved in this complex process, as 89.47% of the participants of my survey communicate their ideas with colleagues from different countries for doing their work in digital visual effects. As reported by the digital visual effects producer in Pixomondo in China, communication took place between him and digital artists from China in their facility for works on Hollywood films. The producer is from Germany, who speaks fluent English. Due to the fact that the Chinese

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<sup>83</sup> Discussion of Pixomondo in this paragraph is based on my interview with the digital visual effects producer and head of production of its Beijing facility.

artists in Pixomondo's facility in China were not able to speak English, translators are hired to bridge their communication.

The above discussion shows that complex communication is involved in the distributed directing and the creative decision-making process of digital visual effects. It is necessary to conduct further research into factors that influence the effectiveness of communication during the delivery of digital visual effects. According to my survey results the majority of the participants think communication has an impact on the creativity and efficiency of the individual performance of digital visual effects artists. For example, 57.89% of the participants believed that communication is one of the main factors affecting their creativity, when working for digital visual effects in Hollywood films. Conversation with my survey participants suggests that language interpretation is one of the aspects that affects the effectiveness of communication in the creative process of delivering digital visual effects. For example, a digital compositor in a major digital visual effects company in London mentioned that the understanding of the creative input from the director is affected by the interpretation process along the pipeline. Due to the use of different terminology to describe an intended digital visual effects it is unlikely that a director could give specific instructions to an artist on the highly divided pipeline. As a result, attributing roles such as digital visual effects supervisors take place to bridge the communication between directors and different digital visual effects artists. Language directors' use is considered subjective, therefore open to different ways of interpretation. The meaning of what the directors said could be misinterpreted during the process. As explained by the digital compositor "the director's voice is often lost along the pipeline." Analysis of my research interview with Darin Grant who is an experienced technological director of digital visual effects, shows that the effectiveness of communication could also be affected by cultural awareness.

Given the transnational nature of the digital visual effects team, communication took place between team members from different cultural backgrounds, which includes high context cultures and low context cultures (South Eastern University, 2016). My interviews with the two professionals above suggest that cultural awareness could affect the "psychological safety" (Johns, Lorenzen and Sapsed, 2015: 62) of team members from high context cultures such as India and China during the process of delivering digital visual effects. Jones, Lorenzen and Sapsed (2015) argue that psychological safety, a condition to "encourage speaking out, voicing divergent opinions and engaging in the creative process", affects the effectiveness of team



creativity. Darin Grant mentioned that he has experienced difficulties when talking to digital visual effects artists in his team from India. They appeared reluctant to ask for clarification of what he expected them to do when he explained tasks he allocated them. In addition, a German producer in Pixomondo experienced difficulties in encouraging their Chinese artists to voice a different opinion.

## Chapter 4 Digital Visual Effects in Contemporary Hollywood Cinema and Global Business Model

### 4.1 Filmmaking as a Spontaneous Practice and the Fixed Bidding Model

Having established in Chapter 2 that there are creative aspects beyond being photorealistic in the digital visual effects in Hollywood cinema, this section aims to further understand the characteristics of the creative process of film making. In particular I intend to point out that the creative process of films is evolutionary, experimental, spontaneous and fluid. The discussion of the creative process in general demonstrates that the creativity means being able to test new ideas, taking risks and making mistakes in the process (Jones, Lorenzen and Sapsed, 2015). The discovery of film as a medium starts with experimentation. For example, the film making practice of the Lumière Brothers involved inventing film projection mechanisms, testing camera capabilities, filming everyday objects and exposing their work to audiences (Calzetti, 1995). An analysis of the reflection of feature film directors such as John G. Avildsen on their film making practice reveals that their creativity is closely associated with the flexibility of being able to test their ideas on set and discover new directions for their films (Gallagher, 1989). Even though the technology facilitating the visualisation of the creative ideas of film making has been developed, the nature of the creative process remains the same for the professionals involved in digital visual effects heavy films such as *The Jungle Book* (2016) and *Star Wars Episode VII: The Force Awakens* (2015). To illustrate, Rob Legato, the digital visual effects supervisor of *The Jungle Book* (2016), believed that “all creativity is really based in analogue thought and behaviour.”<sup>84</sup> Despite the use of cutting edge digital technology such as virtual cinematography, he needs to repeat the process of “sketching, scribbling something down, erase it and scribble again” for the creative decision making process. He concludes “that’s the way it goes.” The director of *Rogue One: A Star Wars Story* (2016) also engaged with the process of testing ideas for his film making practice. According to the memory of Barry

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<sup>84</sup> Interview with Rob Legato analysed in this paragraph is published on *FX-Guide* and can be accessed via the following link: <https://www.fxguide.com/featured/out-of-the-pages-and-into-the-jungle-book/>

Howell<sup>85</sup>, who was the previsualisation supervisor at The Third Floor on *Rogue One: A Star Wars Story* (2016) the director, Gareth Edwards liked to discover the shots and test his ideas on set. For example, he preferred to “walk the set with the actors and find camera angles and explore the space with the actors and just the director of cinematography.”

Further evidence that supports the experimental, spontaneous and fluid nature of the creative process of film making is the experience of J.J. Abrahams in directing *Star Wars Episode VII: The Force Awakens* (2015). This recent film, released in December 2015, chronologically continues the *Star Wars* story on from the previous episode, *Star Wars Episode VI: Return of the Jedi*, released in 1983. The main characters return in their roles as the film is set about 30 years on. The main character of the previous film, Luke Skywalker, has gone into exile, while the leader of the Resistance, his sister Princess Leia attempts to locate him. Therefore, new characters such as Rey, Finn and Poe who join the struggle against the evil First Order were introduced in this film. A great deal of digital visual effects depicted space ships, weaponry, alien planets and creatures. Multiple digital visual effects companies such as ILM, Base FX, and Blind contributed to those digital visual effects. When discussing the creative process of directing this film J.J. Abrahams<sup>86</sup> emphasized the importance of discovering the shots moment by moment on set. Even though there are a shot list, pre-visualisation and storyboards to formalise the creative process J.J. Abrahams only regarded them as a first approach. He tended to add and change the shots according to his observation and inspiration from on-set experience for films such as *Star Wars Episode VII: The Force Awakens* (2015). As he explains, “When putting the script together you have to be open to the better idea”, which is always around the corner. “You get to the set and you look at the light or you see and actor do something you would never have anticipated or someone added something in set dressing you would never have considered. I try to approach every scene from the point of view of the master observing in that scene in that context and in that moment.” An example of a shot which was added based on the situation on the set was in the scene set at the Resistance base where two of the new

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<sup>85</sup> Interview with Barry Howell analysed in this paragraph is published on *FX-Guide* and can be accessed via the following link: <https://www.fxguide.com/featured/part-1-rogue-one-shows-its-force/>

<sup>86</sup> A video recorded interview with J.J Abraham studied in this section can be accessed via the following link: <https://www.premiumbeat.com/blog/top-hollywood-directors-interviewed/>

characters, Finn and Poe, are saying farewell before they embark on different spacecraft to carry out their mission to stop the First Order plan of destroying the Resistance with their ice planet that contains their Starkiller Base superweapon. The digital visual effects in this scene include the landscape and spacecraft in the background as well as the movement of the droid BB-8<sup>87</sup>.

#### 4.1.1 Creative Process of Filmmaking and Problems Facing the Digital Visual Effects Industry

The above discussion demonstrated that the creative process of film making including those with digital visual effects is spontaneous and evolutionary, during which shots could be added or changed on set. The following paragraphs aim to illustrate the impact of the spontaneous nature of the creative process and the change of shots on the practice of digital visual effects companies in the transnational network. As noted in the previous chapter, in the current digital visual effects industry the conditions for creative autonomy, which is important to accommodate the spontaneous nature of the film making process, are different from the era of early film making practice. In particular, this process tends to have segmented tasks in a standardised order. For example, according to the interview with the digital visual effects producer in Pixomondo Beijing in the current order of film making workflow digital visual effects producers from Hollywood appointed digital visual effects companies after the discussion of script breakdown with directors and digital visual effects supervisors in the pre-production phase. As briefly mentioned in the previous chapter, contracts are awarded through a competitive bidding process. These contracts are offered at fixed prices. This means the digital visual effects companies submit a bid proposal based on the initial plan of shots however this idea could be changed and developed by directors of digital visual effects heavy films such as *Star Wars Episode VII: The Force Awakens* (2015) during production period. Therefore, any changes to shots, which include digital visual effects based on new ideas evolving from on-set situations could add additional costs to digital visual effects companies.

The change of shots, which added additional visual effects work, happened for Hollywood films such as *Life of Pi* (2012) and *Hugo* (2011). According to my interview with a former Rhythm and Hues employee, who has worked on Hollywood digital visual effects films such

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<sup>87</sup> According to the VFX Breakdown of *Star Wars Episode VII: The Force Awakens* (2015) by Base FX: <https://www.youtube.com/watch?v=mPrXFX2oYFU>

as *Life of Pi* (2012) and *Transformers: Dark of the Moon* (Michael Bay, 2011), change occurred on shots to which he had already devoted the allocated time to. More specifically, he explained that he has spent a long time working on a scene, which involved computer-generated rain drops and wet hair of the tiger called Richard Parker in *Life of Pi* (2012). After working to add details and complexity to the look of the scene for the sake of photorealism he was told that the weather conditions required to be present in the scene had changed. In the new shot it was planned for there to be a sunny day. In this case extra hours were required to complete the modified shot. According to Rob Legato<sup>88</sup>, who was the digital visual effects supervisor and second unit director for *Hugo* (2011), changes were made to the digital visual effects shots in this film as well. He highlighted that the director was also pursuing the flexibility for his creative process. He believed that “The film is continually improved and honed, and is a very free-flowing organic process.” Therefore, a storyboard wasn’t even included in the making of this film. Despite this the film had a pre-visualisation process that was considered “a loose concept and a placeholder for a better idea.” As a result, Legato had to constantly negotiate with Pixomondo for changes to be added to the shots. He told Pixomondo that “this is simply the way it was going to have to be.”

Analysis of the discussion of the fixed bidding model by professionals in the former Rhythm and Hues in *Life After Pi* (Scott Leberecht: 2014) supports the idea that the tension between the spontaneous nature of the film making process and the fixed bidding model has negative influences on the profitability of visual effects companies. *Life After Pi* (2014) is a documentary discussing the bankruptcy of the former Rhythm and Hues, eleven days before *Life of Pi* (2012) received the Academy Award for Best Visual Effects in 2013. Rhythm and Hues was a visual effects company that was established in November 1987 in the USA. They have been involved in a large number of Hollywood digital visual effects films including *Babe: Pig in the City* (George Miller, 1998), *The Chronicles of Narnia: The Lion, the Witch and the Wardrobe* (2005), *The Lord of the Rings: The Fellowship of the Ring* (Peter Jackson, 2001) and *The Return of the King* (Peter Jackson, 2003), *Harry Potter and the Philosophers Stone*

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<sup>88</sup> Source of information regarding *Hugo* is from trade publication on Creative Cow: [https://library.creativecow.net/article.php?author\\_folder=legato\\_rob&article\\_folder=magazine\\_30\\_HUGO&page=1](https://library.creativecow.net/article.php?author_folder=legato_rob&article_folder=magazine_30_HUGO&page=1)

(2001) and *The Golden Compass* (Chris Weitz, 2007)<sup>89</sup>. This documentary contained interviews with both of the founders, CG supervisor, lead animator, president, animation layout supervisor, pre-light supervisor, manager in digital production, founding director in India and managing director in India. One of the founders said that many of the shots that were agreed on between digital visual effects companies and the Hollywood studios changed dramatically during the film making process. “Easily half of the shots we did could disappear and be replaced by other shots.” According to the managing director in India the changes to the shots meant that the company had to carry out the work and pay their staff out of their own pocket.

There were circumstances where Hollywood studios would reluctantly pay for extra work, after bartering on a case by case basis, but it was difficult to prove that there were additional shots that the director had very clearly changed. For most of the cases the company was not able to get much money from the Hollywood studios even though there were changes to the shots. Ben Grossman, who was visual effects supervisor for *The Jungle Book* (2016), and *Star Trek: Into Darkness* (2013)<sup>90</sup>, said that the Hollywood studios would “approve overages after a process of natural resistance” but they really wanted to “contain it to a 'budget figure' through horse-trading.”<sup>91</sup>The analysis of my research interview with Scott Ross, the Co-Founder of the former Digital Domain, offers further insight into this matter. As explained by him, there is a process called change order that exists, however the possibility to claim further payment for the additional shots is merely theoretical. For example, he said, “If the director says I want a bear and I want it black. And then half the way through the project the director came back and said I am really sorry but I actually want a tiger in orange.” In this scenario the digital visual effects companies have a choice to go through the process of change of order, however often when they do that, “The studio and producer get very upset.” Therefore, according to Scott Ross’ experience, the producer or other representatives from the studio side often negotiate with the digital visual effects company and say, “You charge me \$20 million to do the show. So can you possibly find a way to do it without changing the prices?” Apart from that, the digital visual

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<sup>89</sup> Source of information regarding Rhythm and Hues is from IMDb Pro <https://pro.imdb.com/company/co0075252/>

<sup>90</sup> According to IMDb: <http://www.imdb.com/name/nm1322973/>

<sup>91</sup> According to *FX-Guide*: <https://www.fxguide.com/featured/a-way-forward-for-the-vfx-industry/>

effects companies are under pressure to maintain client satisfaction in order to get further contracts. As explained by Scott Ross, “If I do not do them the favour, I have problems in getting the work in future.”

The above discussion shows that if they want to be profitable, the costs of producing shots must be maintained lower than the price they are bidding for. The change of shots and the evolution of new ideas for film making during the creative process leads to additional costs for digital visual effects companies to complete their tasks, therefore this has an impact on the profitability of the digital visual effects companies. These findings are also proved by my interview with other senior members of the digital visual effects community. For example, Darin Grant, chief technology officer of visual effects company Digital Domain and Method Studio. He also supports the idea that the current fixed bidding business model is problematic. Under this model digital visual effects companies find it difficult to be profitable.

The scenarios regarding the change of shots and the fixed contracts contribute to the issues of the working conditions and workers’ rights of the artists. To illustrate, the founder of the former Rhythm and Hues revealed that in order to cope with the financial pressure, the company had to make their employees work overtime without remuneration. As he said in *Life After Pi* (2014), “Our choices were to cut people’s salaries or lay off a significant number of people or to work people overtime without paying them for overtime by restructuring their contracts. So those kinds of changes are very difficult changes to make.” The issues regarding the working conditions of digital visual effects artists are serious, widely affecting digital visual effects artists throughout the world. This statement is supported by the data I have collected through the process of conducting surveys and interviews with digital visual effects artists in the current industry and participating in industry trade shows such as the VFX Festival London and SIGGRAPH Asia and analysing publications from trade journals and trade unions. Therefore, this is an ethical issue. According to a survey conducted by BECTU with workers in the current digital visual effects industry in the UK<sup>92</sup>, “81% of people have felt pressured or bullied into working overtime for free on films” and “83% of people said it was difficult or very difficult to raise a family while working in VFX. BECTU is the UK’s media and entertainment trade union, which has been trying to unionise the digital visual effects industry workers in the UK.

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<sup>92</sup> This survey can be accessed via the following link: <https://www.bectu.org.uk/news/2095>

According to my correspondence with BECTU they have been speaking with the employees in the digital visual effects companies in the UK for more than three years regarding the unpaid overtime issues. The results of my survey with employees in digital visual effects companies such as MPC, Framestore, Cinesite, Rhythm and Hues and ILM indicate that the issues relating to the poor working conditions were considered as one of the biggest problems facing the current digital visual effects industry. My conversations with professionals from digital visual effects companies in countries such as Canada, the USA and France at SIGGRAPH Asia 2014 further proved the existence of this issue.

### 4.2 Photorealism Digital Visual Effects: Aesthetics and Business Models

The above paragraphs discussed the problems associated with the fixed bidding model in the current digital visual effects industry. The following paragraphs will analyse the factors that affect the opportunities to innovate the business model. The fixed bidding business model was formed in the mid-1980, the early age of visual effects practice in the Hollywood film industry, when most visual effects companies in existence were closely associated with Hollywood directors, producers or visual effects supervisors. For example, George Lucas established Industrial Light and Magic for the making of *Star Wars Episode IV: A New Hope*, released in 1977. Director and visual effects supervisor Robert Abel founded Robert Abel and Associates, which contributed to the visual effects in the film *Star Trek: The Motion Picture* (Robert Wise, 1976). The practice of visual effects companies was considered more as service provider for Hollywood films rather than an independent business in the film industry. During that time, the number of visual effects companies was limited, while the cost of hardware for computer graphic such as workstations produced by Silicon Graphics Incorporated was noticeably expensive and the industrial-standard software such as Nuke, produced by The Foundry and Autodesk Maya for digital compositing and other forms of post-production had not yet been developed. The last few decades have witnessed many changes in the visual effects practice for Hollywood cinema. Nowadays, it has been developed into a global business with a significant numbers of visual effects companies located in various countries such as the UK, Canada, Australia, New Zealand, China, Germany, France, India, Singapore, Mexico. These have a very large number of employees equipped with desk-top workstations with specialized packaging software for digital compositing and other tasks for generating digital visual effects for Hollywood films. However, the fixed bidding business model has remained the same.



Therefore, I intend to explain why the business model has had little innovation since it was formed and adopted.

The discussion is supported by the VARIM Framework advocated by Afuah (2014). This framework introduced the following aspects to assess the business model of a company which are: value, adaptability, rareness, inimitability, and monetization. This research will focus on the discussion of two particular aspects of the business model of Hollywood studios and the digital visual effects industry, which are the inimitability and adaptability and their connection with the photorealism aesthetics of Hollywood digital visual effects. According to Afuah (2014) the term adaptability refers to whether the business model could be reconfigured in a cost effective way to have a greater range of customers. The inimitability refers to whether the benefits offered by one firm are difficult for other firms to imitate, substitute or leapfrog (Afuah). The discussion of inimitability and adaptability is relevant to this study because it affects the practice of digital visual effects companies in the transnational networks. Digital visual effects companies hesitated to negotiate any changes to the fixed bidding model, because they are afraid of losing Hollywood. To illustrate, during the interview I conducted with Scott Ross he believed that the establishment of an international trade association to represent visual effects companies would contribute to solving the problems associated with the fixed bidding model. He further explained that a legally established trade association could negotiate with the studios about how the digital visual effects companies could be paid. He has been trying for more than twenty-five years to solve the problem, even bringing a conference of the major digital visual effects companies together. However due to the fact that there are only six Hollywood studios, digital visual effects companies are apprehensive to “put any pressure what so ever on the motion picture studios to change the model because they are afraid they will be blackballed.”

I could also feel the sense of fear when I was trying to conduct surveys and interviews for this research. As discussed in Chapter 1, the first survey of this research included an open ended question, which is: What do you think are the biggest problems facing the current digital visual effects industry? While conducting the on-street surveys I stood outside the major digital visual effects companies in central London. My strategy was standing outside the front door of the companies trying to make conversation with people coming in and out. However, people were hesitant to respond to my questions. Finally, one of the employees of one of the digital visual effects companies indicated to me with a low voice that he would like to participate in my

research if I could wait for him later at the back door of the company. While waiting at the back door I discovered that people were more willing to participate with my research there. For the open-ended question described above, the majority of the respondents wrote down that the fixed bidding model and other related issues such as working conditions were the biggest problems in the current industry. The participants of my survey also explained that maintaining a good relationship with Hollywood studios is important for their company because previous experience is one of the factors affecting Hollywood studios' decisions on future collaboration.

To conclude, the above discussion reveals that the opportunities to innovate the fixed bidding model are affected by several factors. These factors include: the aesthetics of digital visual effects in Hollywood cinema; the inimitability of the business model of Hollywood; and the adaptability of the business model of visual effects companies. More specifically, it intends to reveal that the highly photorealistic digital visual effects in Hollywood films have connections with a considerably large budget, which is financed by media conglomerates and is not affordable for other world film industries. Therefore, on one hand these highly photorealistic digital visual effects have contributed to the inimitability of the business model of Hollywood studios. On the other hand, it challenges the adaptability of the business model of digital visual effects companies targeting Hollywood clients.

#### 4.2.1 The Level of Photorealism and the Inimitability and Adaptability of Business Model

Given the relationship between the level of photorealism in digital visual effects and the investment in time, labour and technological innovation illustrated in Chapter 2, the Hollywood digital visual effects with a great deal of details and complexity is facilitated by a considerably large budget. Scott Ross confirmed the visual effects that are done by the major digital visual effects companies, “cost an extraordinary amount of money.” According to his experience in the industry, budgets for digital visual effects in a major Hollywood film could cost, “\$75 to \$100 million.” Hollywood films (studied in the previous chapters of this thesis which are pursuing) with photorealistic digital visual effects such as *The Jungle Book* (2016), have large budgets. *The Jungle Book* (2016), which depicts complex movement of different digital animal characters such as a bear, tiger and wolves cost approximately \$175 million<sup>93</sup>. To further exemplify this point, the budget for another Hollywood film, *The Hobbit: An Unexpected*

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<sup>93</sup> According to IMDb: <http://www.imdb.com/title/tt3040964/>

*Journey* (Peter Jackson, 2012), which is another example of a Hollywood film with high quality photorealistic digital visual effects cost approximately \$180 million<sup>94</sup>. This film, which follows the adventure of the Hobbit, Bilbo Baggins, was set in Middle Earth, the imagined mythological past Earth inhabited by humans, elves, dwarves and other creatures. The delivery of digital visual effects enabled the depiction of the landscape, castles, giants, a dragon as well as other fictional visual elements in the imagined Middle Earth<sup>95</sup>. An example of a scene containing many complex digital visual effects is where Bilbo and the other characters on the journey arrive at the elvish sanctuary of Rivendell. In this scene there are several computer-generated waterfalls resembling the texture and dynamics of their real world counterparts. Other digital elements in this scene such as the buildings have intricate architectural features that blend into the topography of the canyon landscape and vegetation. Another case in point is *Dawn of the Planet of the Apes* (2014), the narrative of which is driven by the struggle between the human race and genetically evolved, highly intelligent apes. This film contains digital visual effects depicting the movement of a group of apes with individual characteristics, which was considered as time-consuming and technologically challenging by Darin Grant during my interview. The budget of this film was approximately \$170 million<sup>96</sup>.

Hollywood films tend to challenge the level of complexity in their digital visual effects, which requires investment in labour and technological development. Complexity means the diversity and variations in computer-generated landscape, vegetation, characters and movements appearing in the same scene. As demonstrated by professionals such as the head of production of Pixomondo Beijing and Scott Ross, the Hollywood studios keep increasing their requirement in quality and levels of photorealism in their work and new tools need to be developed for almost every coming project. For example, technological developments in motion capture took place in the visual effects company Weta Digital for the movement of digital characters such as Gollum in *The Lord of the Rings* and the Na'vi characters in *Avatar* (2009). However, in the recent film *Dawn of the Planet of the Apes* (2014), a new type of motion capture, which is outdoor motion capture was required for the facial expression and body movement of the ape

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<sup>94</sup> According to IMDb: <http://www.imdb.com/title/tt0903624/>

<sup>95</sup> *The Hobbit: An Unexpected Journey* VFX Breakdown by Weta Digital: <https://www.youtube.com/watch?v=HFzRR5LJgjs>

<sup>96</sup> According to IMDb: [http://www.imdb.com/title/tt2103281/?ref=ttco\\_co\\_tt](http://www.imdb.com/title/tt2103281/?ref=ttco_co_tt)

characters. A case in point to illustrate the increasing of the complexity in Hollywood digital visual effects is the difference in the computer-generated animal characters in the films such as *The Chronicles of Narnia: The Lion, the Witch and the Wardrobe* (2005), *Life of Pi* (2012) and *The Jungle Book* (2016). Compared with previously made digital animal character Aslan in *The Chronicles of Narnia* series, Richard Parker attempts to move and behave as a real tiger. Another example is *The Jungle Book* (2016), which has greater interactions between the live action character Mowgli and with more photorealistic and talking animals such the bear Baloo, the tiger Shere Khan and the panther Bagheera. Two years after the release of *The Jungle Book* (2016), the Hollywood film in-production *Alita: Battle Angel* (2019) feature computer-generated human-like character Alita as its main actress. Alita is a half-human and half-robot character and her journey of finding her true identity is the focus of this film. From the trailer released so far, it can be seen that Alita with human skin and hair is going to interact with live action human characters<sup>97</sup>.

This high budget facilitates digital visual effects with high levels of photorealism and complex visual elements in films such as *The Jungle Book* (2016) and *Life of Pi* (2012) and is financed by well-established global media conglomerates. By the early 2000s all major Hollywood studios were merged into six conglomerates, which were: “News Corporation, Sony, Time Warner, Viacom, Disney and General Electric” (McDonald and Wasko, 2008). Apart from film studios, these media conglomerates had ownership of TV stations, which were supplying over 80% of the primetime TV programming in the US (McDonald and Wasko; and Epstein: 2005). For example, Sony, which has businesses producing consumer electronic goods, computing and entertainment industries, took ownership of Columbia Pictures and Tri-Star in 1989<sup>98</sup>. Paramount Pictures is a subsidiary of Viacom, which also bought CBS in 1999 and Dreamworks in 2005 (McDonald and Wasko). Time Warner was the integration of diverse

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<sup>97</sup> *Alita: Battle Angel* (2019) trailer: [http://www.imdb.com/title/tt2103281/?ref=ttco\\_co\\_tt](http://www.imdb.com/title/tt2103281/?ref=ttco_co_tt)

<sup>98</sup> According to Sony Pictures company division:

<https://www.sonypictures.com/corp/divisions.html>

and Columbia Tristar Company History:

<http://www.columbiatristar.co.uk/about.html>

media companies which includes Warner Communication, Turner Broadcasting System (TBS), Home Box Office (HBO) and DC Comics<sup>99</sup>. Further integration took place in the recent business practice of these companies. General Electric sold NBC/Universal to Comcast in 2013<sup>100</sup>, while Disney was in the process of taking ownership of 20<sup>th</sup> Century Fox from News Corporation in December 2017<sup>101</sup>. These global media conglomerates were the production or co-production companies of the films with photorealistic digital visual effects, for example Disney was the co-production company for *The Jungle Book* (2016)<sup>102</sup> and *Rogue One: A Star Wars Story* (2016)<sup>103</sup>. For *Avatar* (2009)<sup>104</sup> Twentieth Century Fox was the major film production company. For the whole *Harry Potter* series (2001 to 2011) and *Fantastic Beasts and Where to Find Them* (2016)<sup>105</sup>, Warner Brothers was the major film production company. Conglomerate Hollywood studios have access to a wide variety of funding sources, because they “do not fund film production solely through profits” (McDonald and Wasko: 52). Due to the financial connections with well-established global conglomerates the major Hollywood companies have potential access to extensive resources through their parent corporations as well as “their ongoing relationships with banks and other financial institution” (52).

The high level of capital investment available to Hollywood companies has allowed them to pursue complex photorealism, which is generally not affordable for other film companies around the world. In response to my question: Why do digital visual effects companies tend to depend on the Hollywood studios, Scott Ross explained that, there is a significant gap between the budget for the major Hollywood companies and other film companies. As he said, “the problem here is budget. For films coming out of for example, the UK, Japan, Korea or Australia the budgets are minuscule compared with Hollywood budgets.” So their overall budget is not

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<sup>99</sup> According to Time Warner Inc. <http://www.timewarner.com/company/about-us>

<sup>100</sup> According to Hollywood Reporter: <https://www.hollywoodreporter.com/news/comcast-buying-ges-nbcuniversal-stake-420941>

<sup>101</sup> According to BBC News: <http://www.bbc.co.uk/news/business-42353545>

<sup>102</sup> According to IMDb: [http://www.imdb.com/title/tt3040964/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt3040964/companycredits?ref=tt_dt_co)

<sup>103</sup> According to IMDb: [http://www.imdb.com/title/tt3748528/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt3748528/companycredits?ref=tt_dt_co)

<sup>104</sup> According to IMDb: [http://www.imdb.com/title/tt0499549/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt0499549/companycredits?ref=tt_dt_co)

<sup>105</sup> According to IMDb: [http://www.imdb.com/title/tt3183660/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt3183660/companycredits?ref=tt_dt_co)

even close to the budget Hollywood has for digital visual effects. Therefore, he emphasized that it is very difficult to apply the scale of team, expertise and facilities developed for Hollywood digital visual effects to other clients. This point could be further proved by the survey conducted. There were 26.32% of respondents that did not think increasing the number of clients from world popular film industries would be beneficial for the digital visual effects companies they work for. There were 26.32% of respondents that did not think this was relevant for their companies. During the process of conducting this survey they explained that the reason they think clients outside Hollywood would not be able to be beneficial or relevant to their companies was because they would not be able to afford services for delivering the high quality complex digital visual effects. Therefore, the analysis above indicates that the photorealistic digital visual effects contribute to the inimitability of the business model of the Hollywood studios. However, it challenges the adaptability of digital visual effects companies targeting Hollywood clients.

### 4.3 The Fixed Bidding Model and the Transnational Digital Visual Effects Practice

The current visual effects business model encourages the proliferation of international and global operations for visual effects companies to ensure costs are reduced. Therefore, factors such as visual effects related film tax incentives, and lower cost labour markets are important reasons for the global and transnational digital visual effects practice. As explained by professionals in the industry during the interviews, due to the thin profit margin of digital visual effects business under the fixed bidding model, it is necessary for visual effects companies to find a cost-effective way to conduct their business. Tax subsidies offered by the British Columbia and Quebec governments in Canada, the New Zealand government, and the UK government are one of the factors that informs the formation of the transnational digital visual effects business and the international operation of digital visual effects companies in those countries. To illustrate, according to Scott Ross, the tax relief policies introduced by the British Columbia and Quebec governments in Canada motivated digital visual effects companies including the former Digital Domain to establish facilities in cities such as Vancouver and Montreal. The reason for this was that the tax rebate would allow the companies to be more competitive during the bidding process. The Hollywood studios can deduct the rebate price from the price that the digital visual effects companies bid for their projects. The former Rhythm and Hues also had a facility in the two Canadian cities. An analysis of the interviews in the documentary *Life After Pi* (2014), discussed previously in this chapter shows that to be

competitive in the bidding process was the main reason for such a move. The major digital visual effects companies in London including MPC<sup>106</sup> and Double Negative<sup>107</sup> also have established branches in Vancouver and Montreal. Framestore also has studios and facilities in Montreal<sup>108</sup>. According to my conversations with professionals in the industry, the aim of those business operations was to take advantage of the tax relief policies and maintain cost-effectiveness for their collaboration with Hollywood studios. Other companies such as Pixomondo also has facilities in Vancouver<sup>109</sup>. A study of the current tax relief policies of the British Columbia and Quebec governments in Canada shows that the establishment of facilities in Canadian cities do offer significant economic advantages to the digital visual effects business of those companies. According to the information provided by the British Columbia government website<sup>110</sup>, digital visual effects companies which have a facility in British Columbia are currently eligible to claim a 16% refund on their labour expenditure in digital visual effects and animation production. It is clearly stated on the government website that this policy is meant to encourage the digital visual effect and animation business in British Columbia as they were considered as labour intensive tasks. The tax incentives are equivalent from the government of Quebec<sup>111</sup>.

Apart from Canada, the tax incentives offered by the New Zealand government contributed to the establishment and development of digital visual effects businesses in this country. According to my interviews with professionals such as Scott Ross and Darin Grant, the New Zealand government has had digital visual effects film tax incentives all the way back to when *The Lord of the Rings* series (2001 to 2003) and *Avatar* (2009) were made. Those policies were one of the important reasons for New Zealand digital visual effects companies such as Weta Digital's ability to win contracts for those films. A study of Weta Digital demonstrates that its participation in these films laid the foundation for the development of Weta Digital in the

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<sup>106</sup> According to MPC website: <http://www.moving-picture.com/film/what-we-do/>

<sup>107</sup> According to Double Negative website: <http://www.dneg.com/contact/>

<sup>108</sup> According to Framestore website: <https://www.framestore.com/contact>

<sup>109</sup> According to Pixomondo website: <http://www.pixomondo.com/contact/>

<sup>110</sup> This information can be accessed via <https://www.creativebc.com/programs/tax-credits/film-incentive-bc/#fIBC-details/overview>

<sup>111</sup> This information can be accessed via <http://www.qftc.ca/tax-incentives/information/>

transnational digital visual effects network. Films such as *The Lord of the Rings* series (2001 to 2003) and *Avatar* (2009) were the very early practice of Weta Digital in digital visual effects. This company then grew to be a world leading facility in digital visual effects, which was involved in Hollywood films such as all the latest *Planet of the Apes* films (2011 to 2017), *The Hobbit* series (2012 to 2014) and *The BFG* (Steven Spielberg, 2016). The current films in production by Weta Digital include *Alita: Battle Angel* (2019), which features a computer-generated human-like character. The New Zealand government has launched new funding for post, digital and visual effects production in July 2017 to maintain the country's position in the transnational network<sup>112</sup>. According to the new subsidy eligible productions can access a cash rebate equivalent to 20% of qualifying New Zealand production expenditure. Analysis of data generated through interviews with professionals in the current industry as well as conducting surveys outside the major digital visual effects companies in London indicates that the UK also has had film tax incentive policies which contributed to the winning of contracts for the *Harry Potter* series (2001 to 2011) by companies such as MPC, Cinesite and Framestore. Participants in my survey and interview also pointed out the involvement of those British digital visual effects companies in the *Harry Potter* films (2001 to 2011) allowed them to build their business and facilities at an early stage.

### 4.3.1 The Transnational Digital Visual Effects Practice and Tax Incentives

Due to the problems in the adaptability of the business models for digital visual effects companies and the terms of the fixed contracts, countries such as the UK and New Zealand have continued to modify the tax incentives on offer to ensure they maintain their comparative advantage over other countries. One of the terms and conditions for the fixed contract is that those digital visual effects companies working for Hollywood film do not have the intellectual property of the project they contribute to. For example, British digital visual effects companies such as MPC and Double Negative were awarded contracts for the delivery of digital visual effects in the films of the *Harry Potter* series (2001 to 2011). Warner Brothers own the copyright for the *Harry Potter* series and the trade mark of Harry Potter. This means Warner Brothers is the company that benefits from the massive box office revenue and the profits of

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<sup>112</sup> This information can be accessed via <https://www.nzfilm.co.nz/international/financial-incentives/incentives-and-criteria-july-2017/post-digital-and-visual-effects>



more than 400 associated products<sup>113</sup>. The box office revenue for the *Harry Potter* series such as *Harry Potter and the Philosopher's Stone* (2001) and *Harry Potter and the Deathly Hallows – Part 2* (2011) was \$974,755,371 and \$1,341,511,219<sup>114</sup>, respectively. However, the digital visual effects companies do not participate in any of this revenue.

As concluded by Scott Ross they do not own a piece of *Harry Potter*. Therefore, continuous contracts from Hollywood are important for those digital visual effects companies to stay in business. In 2014 the UK government announced further modifications to their film tax incentive policies, which was aiming to facilitate the position of the British digital visual effects companies in the international market. It is clearly stated on the government consultation and the response from BFI that one of the most important reasons for the innovation was to help the UK digital visual effects businesses remain competitive. For example, BFI wrote on their response paper that the introduction of new tax rebates would “prevent the loss of the sector to international territories”<sup>115</sup>. These changes include decreasing the minimum UK expenditure from 25% to 10% for films that are eligible to apply for the tax incentive. They also modified the cultural test by adding points for digital visual effects taking place in the UK. The cultural test is a points-based assessment of eligibility of a film to be certificated as a British film. Therefore, they are able to participate in film incentives. The successful application would receive a payable cash rebate of up to 25% of UK qualifying expenditure, which is capped at 80% of core expenditure.

An analysis of the information provided by the British Film Commission regarding the current film incentive policy shows that it is targeted towards bringing digital visual effects jobs to the

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<sup>113</sup> According to World intellectual property:

[http://www.wipo.int/wipo\\_magazine/en/2007/05/article\\_0005.html](http://www.wipo.int/wipo_magazine/en/2007/05/article_0005.html)

<sup>114</sup> According to Box Office Mojo:

<http://www.boxofficemojo.com/franchises/chart/?id=harrypotter.htm>

<sup>115</sup> The former BFI response paper can be accessed via:

<http://www.bfi.org.uk/sites/bfi.org.uk/files/downloads/bfi-response-to-hm-treasury-visual-effects-consultation-2013-07.pdf>

UK<sup>116</sup>. For example, the British Film Commission state that this film tax relief is for film production companies. The definition of a British film company includes those which are responsible for the post-production of films. “There is no requirement for the film rights to be owned by the film production company at the time the film is completed”. This means that digital visual effects companies who do not own the copyright of their Hollywood project would be able to participate in this tax incentives scheme. Another case in point is their explanation for the UK qualifying production expenditure. According to the British Film Commission, UK qualifying production expenditure is defined as expenditure incurred on filming activities which take place within the UK, “irrespective of the nationality of the persons carrying out the activity”. Those activities include pre-production, principal photography and post-production. This definition of UK expenditure targets digital visual effects businesses as they may need to import skilled workers to carry out their tasks.

As explained by Scott Ross during my interview, a more competitive tax incentive policy would allow digital visual effects companies in that country to bid on the work they might not have been able to before. However, the introduction of a new policy does not necessarily mean that there is an immediate increase in creative talent, which need time to gain skills and experience. Therefore, digital visual effects companies have to import experienced artists from overseas. It is especially so with lead artists, who are relatively more influential on the creative aspects of films and tend to be imported from other countries. According to the immigration policies in countries with film subsidies such as the UK, Canada and New Zealand it is revealed that they all give special permission for digital visual effects and animation professionals to apply for visas. For example, many jobs in the digital visual effects industry are listed on the shortage occupation list of Immigration Rules of the UK<sup>117</sup>. These jobs include: 2D supervisor, 3D supervisor, digital visual effects supervisor, digital visual effects producers, digital animator, compositing artist, matte painter, modeller, rigger, stereo artist, and texture artist.

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<sup>116</sup> According to British Film Commission: <http://dev.britishfilmcommission.org.uk/film-production/uk-film-tax-relief/>

<sup>117</sup> According to GOV.UK: <https://www.gov.uk/guidance/immigration-rules/immigration-rules-appendix-k-shortage-occupation-list>

#### 4.3.2 Tax Incentives and Digital Visual Effects Industry in the UK

The adjustment of the digital visual effects related tax incentive policies did help the UK stay in the transnational digital visual effects network. UK companies were awarded contracts for a number of digital visual effects heavy Hollywood films such as *The Jungle Book* (2016), *Passengers* (2016), *Fantastic Beasts and Where to Find Them* (2016), and *Gravity* (2013). Industrial Light and Magic also opened a London facility in 2014 to work on films such as *Star Wars Episode VII: The Force Awakens* (2015), *Rogue One: A Star Wars Story* (2016) and *Star Wars Episode VIII: The Last Jedi* (2017). In response to my question regarding the decision to open a facility in London during the VFX Festival London, the professionals from Industrial Light and Magic referred to the UK tax incentive policy. After that they quickly added that there is a talented workforce available in the UK. Despite the increasing activities in the field of digital visual effects the problems regarding working conditions of digital visual effects artists are still evident. More discussion will be provided in the introduction section of the following chapter. Apart from that, the modification of the points based cultural test makes the notion of British films more complex. The complexity of the notion of British films has been studied by scholars such as Sarah Street (2009). Through a systematic study of the history of British national cinema, she points out it is contentious to assume films produced in the British film industry could be considered as British films from the perspective of cultural perception. As defined by Street (2009), the cultural perception of what British films are refers to: “the extent to which they participate in establishing nationhood as a distinctive sense, familiar sense of belonging, which is shared by people from different social and regional backgrounds”. Under the new cultural test, a great deal of films which have UK-based companies as part of the digital visual effects team are certificated as British films<sup>118</sup>. The example of these type of films are *Passengers* (Morten Tyldum, 2016), *World War Z* (Marc Forster, 2013), *Jupiter Ascending* (Lana Wachowski and Lilly Wachowski, 2015) and *Guardians of the Galaxy* (James Gunn, 2014). To illustrate, digital visual effects companies such as MPC and The Third Floor, which have a facility in London contributed to the digital visual effects in *Passengers* (2016). However, the copyright of this film belongs to Hollywood studio Columbia Pictures. It is also

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<sup>118</sup> Information about films certified as British through film culture test is available at the following link published by BFI: <http://www.bfi.org.uk/supporting-uk-film/british-certification-tax-relief/cultural-test-film#films-certified>

questionable to what extent this film embodies British culture. This film was set in a futuristic space ship, which was on a hundred and twenty-year journey to a distant colony planet. The lead actor and actress are both American, while only one of the supporting characters is British. This character was portraying the Waiter robot called Arthur, who was working on the bar area of the space ship.

In the paragraphs above I explain the connection between tax incentives and the international operation of digital visual effects companies in the current industry. In this paragraph I intend to point out the relatively lower costs of labour in countries such as India and Mexico attracts digital visual effects companies to operate there. This argument is supported by the analysis of my interviews with professionals in the industry such as a senior producer in the UK creative industry, and Darin Grant. According to the senior producer in the UK creative industry, digital visual effects companies tend to open facilities in places such as India and Mexico where they can employ relatively cheap labour with a knowledge of computer science. Darin Grant also explained that digital visual effects companies often operate in places with lower labour costs as this business is labour-intensive. Further evidence for this argument is from the study of the locations of digital visual effects companies such as the former Rhythm and Hues and MPC. This study confirms that those companies tend to establish facilities in India.

To conclude, this chapter demonstrates that the fixed bidding model in the current industry is problematic due to the nature of the creative process of film making and digital visual effects. The fixed bidding model involves digital visual effects companies being paid on delivery of the final digital visual effects shots, rather than for the hours spent, labour and materials. As the creative process is spontaneous and evolutionary, shots are often added or changed on set. This affects the profitability of digital visual effects companies as they need to handle extra costs for additional shots and modification of previous shots. This chapter explains the reason for the difficulties in innovating this model, which is relating to the adaptability of the business model of digital visual effects companies. The high quality photorealistic digital visual effects, which requires high costs of technology investment, labour and time is financed by well-established global media conglomerates. There is a significant gap between the budget of conglomerate Hollywood and other film industries, therefore this aesthetic increases the inimitability of Hollywood's business model. At the same time, this limits the adaptability of the business model of digital visual effects companies. This chapter further illustrates that the current digital visual effects business model encourages the international and global operation

## Digital Visual Effects Industry and World Popular Cinema

of digital visual effects companies for cost reduction reasons. Due to the thin profit margin, operating in places which are cost effective because of factors such as tax incentives and labour costs are considered important for digital visual effects companies. Tax incentive policies introduced by New Zealand, the UK, Quebec and British Columbia in Canada have contributed to the establishment and development of digital visual effects businesses in the above countries.

## Chapter 5 Digital Visual Effects Industry and World Popular Cinema

### 5.1. Introduction: Transnational Digital Visual Effects Networks in China

*Independence Day: Resurgence* (Roland Emmerich, 2016) is a recent Hollywood film that includes a significant amount of digital visual effects scenes, which depict the interaction between alien creatures and human characters, spaceships and other forms of alien technology, as well as a human military and research base on the moon. This film is the sequel to *Independence Day* (Roland Emmerich, 1996). Multiple digital visual effects companies that have been previously studied in this thesis were involved in the delivery of the digital visual effects in this film, such as Weta Digital, BUF and Digital Domain. As a viewer growing up in China, I was wide-eyed when Chinese product placement such as Mengniu Milk and QQ, appeared on the screen. Mengniu Milk is the product of Mengniu Dairies Ltd (Mengniu Dairies, no date); and QQ is an instant messaging software service developed by the Chinese company Tencent Ltd (Tencent, 2017). The Mengniu Milk was featured several times throughout the film. A case in point is the scene, which reveals the arrival of the Mengniu Milk on the Moon base by space vehicles. The Mengniu Milk was also visible in scenes which depict members of a space fighter pilot team consuming this product. According to the narrative of the film, the space fighter pilot team eventually saved the earth from alien invasion. Apart from the Mengniu Milk, it has been established in this film that QQ was an important form of communication between the Moon and Earth. For example, the main character, Jack Morrison portrayed by Liam Hemsworth, who was a member of Space Earth Defence, was speaking to his girlfriend on Earth from the Moon via QQ video chat. The line “Thanks for using QQ” and the penguin, which is the logo of the brand, appeared on screen at the end of the video chat.

*Independence Day: Resurgence* (2016) is not the only Hollywood digital visual effects involved film that features Chinese product placement. Another case in point is *Transformers: Age of Extinction* (Michael Bay, 2014), which is the fourth film of the Transformers franchise. The delivery of digital visual effects in this film enabled the development of plots, which are driven by the conflicts between the human race and the Transformers. The Transformers are self-configuring modular alien robots. Shuhua Milk, the product of another Chinese dairy company Yili (Yili, no date), is visible in this film. For example, the product appeared in a scene where the human character Joshua Joyce, who aimed to construct his own transformers, was waiting for his scheduled meeting with an auto-bot, which is a type of Transformer. The scene was set on a rooftop, which includes a close-up of Joshua Joyce holding and drinking the

Shuhua Milk. In this shot the product was placed on the left hand side of the grid on the foreground of the frame. Apart from the Shuhua Milk, this film includes product placements promoting Chinese brands such as Lenovo, which is a computing company; and Meters/Bonwe, which is a clothing company. The companies which have products featured in the films above, are part of the growing economies of China. For example, Tencent provides social platforms and digital content services to many millions of users, the annual revenue of which has grown from 43.9 Billion RMB to 151.9 Billion RMB between 2012 to 2016 (Tencent, 2017). The products of Tencent include online communication applications such as QQ and WeiChat; QQ-Game which is an online gaming platform; QQ-Zone, which is a social media platform (Tencent, no date). As of March 31, 2017, the monthly active user accounts of QQ was 861 million, while its peak concurrent user accounts reached 266 million (Tencent, no date). The revenue of Yili the Chinese dairy company also maintained high growth. It increased from 37.5 billion RMB to 60.4 billion RMB between 2011 and 2015 (Yili, 2017). The revenue another dairy company in China, called Mengniu, has grown from 35.9 billion RMB to 53.7 billion RMB between 2012 and 2016 (Mengniu Dairies, 2018).

Is there any particular reason for these Chinese brands to appear in Hollywood blockbusters? According to the professionals working for these companies, one of the reasons for them to promote their products through these Hollywood films is the numbers of Chinese audience they have. The Chinese box office takings from *Transformers: Age of Extinction* (2014) and *Independence Day: Resurgence* (2016) were the largest foreign box office takings for these two films to that date. More specifically, *Transformers: Age of Extinction* (2014) generated \$320,000,000 box office revenues in China (Box Office Mojo, 2014), while for *Independence Day: Resurgence* (2016) it was \$75,359,650 (Box Office Mojo, 2016). After the adoption of the revenue sharing model in 1994, an increasing number of foreign films, especially Hollywood blockbusters were permitted by the government to enter the market in China due to their profitability (Su, 2016). The number of foreign films imported per year was ten in 1994 (Su). The number increased to twenty in 2001, while an additional fourteen 3D and IMAX films were added each year 2012 (Su). With the revenue sharing model, foreign and domestic film distributors both share the box office revenue generated by these films (Su). The government has been funding the construction of cinemas with digital projection technology since 2010. China Film Digital Cinema Group (Beijing) Ltd., which is one of the subsidiaries of China Film Ltd., was established in 2010 to build exhibition and distribution networks for digital cinema. (China Film Digital Cinema Group, 2011). The company built cinemas with

digital projectors in 65 cities in China during the first year of its establishment. They intended to exhibit both domestic and foreign films (China Digital Cinema Group). The construction of digital cinema infrastructure meant the accessibility of digital cinema increased, which included Hollywood films containing digital visual effects.

Another important reason is that the companies assume Hollywood is often associated with “high technology” and “high quality production” (Montefiore and Zeitchik, 2012) in mainland China. As explained by the Entertainment Marketing Director at Ogilvy Beijing, which is the advertising and public relations agency representing Lenovo, what motivates these companies to invest in the product placement in Hollywood films is to “polish the brands’ local image” (Montefiore and Zeitchik, 2012). According to a survey of literature surrounding the reception of Hollywood films in contemporary China, scholars such as Su (2016) support the idea that “ordinary moviegoers and movie fans, strongly endorsed Hollywood movies”. Besides, the findings of Su also demonstrate that “the majority of the Chinese audience found Hollywood blockbusters very enjoyable and believed they represent universal human values” such as love and courage.

As noted above, China has increasing access to finance the building of exhibition and distribution networks availability and a large audience for Hollywood films containing digital visual effects such as *Independence Day: Resurgence* (2016) and *Transformers: Age of Extinction* (2014). Hollywood has a positive profile image in a high proportion of the audience. Apart from that, my research into the current digital visual effects industry shows that China is one of the countries where multiple digital visual effects companies that are involved in the Hollywood film industry are located. For example, Pixomondo, which is a German digital visual effects company, established its Beijing facility in 2010. This company has contributed to the delivery of digital visual effects in a number of Hollywood films such as *Hugo* (2011), and the *Fast and Furious* series (2001- ) (Pixomondo, 2016). Another case in point is Base FX, which is a digital visual effects company in China that has involvement in Hollywood films. The examples of Hollywood films Base FX have been involved in are *Star Wars Episode VII: The Force Awakens* (2015), *Transformers: Age of Extinction* (2014) and *Star Trek Beyond* (2016) (Base FX, 2017). Is there any form of connection and collaboration between the Hollywood digital visual effects companies and the expanding Chinese film industry? As demonstrated by the research into the current Chinese film industry such as Cai (2017), the



past decade has witnessed a rapid growth of the domestic Chinese popular film industry and this trend was expected to continue for the next couple of decades.

In order to shed light on the possible connections between Hollywood digital visual effects companies and the Chinese film industry, this chapter studies the operation and the digital visual effects practice of Pixomondo Beijing. The study of Pixomondo Beijing is informed by the research interviews I conducted with professionals in the current digital visual effects industry. In order to understand their involvement in *Hugo* (2011), I conducted a face-to-face interview with the digital visual effects producer of Pixomondo Beijing in 2013, who was originally from Germany. The interview took place in a Chinese operated café in a cosmopolitan area of the city near Pixomondo's office, where I was greeted by the staff in English. The menu consisted of European style cakes and drinks. Even though in this international environment, the interviewee displayed a clear attempt to acknowledge his cultural awareness of China. For example, when we were purchasing our beverage and food, he insisted on paying for both of us. He also explained to me that he knew this type of behaviour was a gesture of politeness as we were in China. This interview brought to light the connections between Pixomondo and the Chinese popular film industry. The interviewee began to discuss China as an emerging market in response to the question what Beijing can offer to Pixomondo. Despite the fact that the design of my interview questions were centred on *Hugo* (2011), and other Hollywood projects at that time, the interviewee showed a greater passion in discussing their collaboration with Chinese directors and film companies. For example, the speed of his speech was faster for topics in this area while displaying a more vivid facial expression. He also tended to give longer responses without further questions being asked.

Therefore, in order to understand the connection between Hollywood digital visual effects companies and Chinese film industry, this chapter will discuss the digital visual effects practice of Pixomondo in China. Firstly, this chapter will focus on the understanding of factors that informed the collaboration between Pixomondo and the Chinese film industry, as well as the factors that have influences on the digital visual effects practice of Pixomondo in China. Secondly, it will discuss if there is any connection between the digital visual effects practice of Pixomondo in the Chinese film industry and the Hollywood film industry. Finally, it will study the aesthetics of digital visual effects in *Impossible* (Sun Zhou, 2015), which is a Chinese film that Pixomondo contributed to.

The discussion of the digital visual effects practice of Pixomondo in China is significant as it intends to further reveal the connections between the aesthetics of digital visual effects, the practice of digital visual effects companies and diverse factors such as market and budget in the transnational production network. Furthermore, it will illustrate the transnational digital visual effects practice has on both Hollywood and Chinese cinema. More importantly, this discussion aims to shed light on the possible solutions for the problems facing the current digital visual effects industry discussed in the chapter above, especially the adaptability of the business model of the digital visual effects companies. As demonstrated by the analysis of research interviews with professionals in Pixomondo Beijing, current Chinese films have lower budgets compared with Hollywood films. As discussed in the previous chapter of this thesis, due to the gap between the budgets of Hollywood and other national cinemas, the Hollywood digital visual effects companies are facing challenges to the adaptability of their business model. These companies include Industrial Light and Magic, Rhythm and Hues, MPC, Framestore, Double Negative, Weta Digital, and Digital Domain. These companies are focused on satisfying Hollywood studios' demands for highly photorealistic digital visual effects. Therefore, the discussion in this chapter intends to propose a solution for increasing the adaptability of the business model of the digital visual effects companies in the current Hollywood film industry. The study of the existing cooperation between Pixomondo and Chinese film industries aims to inform further practice in this area. In particular, the discussion in this chapter will focus on pointing out the direction for the possible forms of collaboration between digital visual effects companies with facilities and human resources for producing high photorealism digital visual effects and film industries that only have access to lower budgets compared with the Hollywood film industry.

The discussion of a possible alternative market would be beneficial for the significant amounts of digital artists working in this industry across countries. As analysed in Chapter 4, one of the factors that led to issues with the working conditions in the digital visual effects industry is the tension between the fixed contract and the need of autonomy for artistic practice. As explained by John Hughes the Founder of Rhythm and Hues, the digital visual effects companies have to cover any additional costs incurred with changes to the appearance of the digital visual effects shots during the creative process of filmmaking. So their choices “were cut peoples salaries or to lay off a significant number of people, or to work people overtime without paying them overtime by restructuring their contracts”. However as discussed in the previous chapters, due

to challenges with adapting their business models, it is difficult for the digital visual effects companies to change this form of contractual relationship with the Hollywood studios.

The next section aims to understand the formation of the market for transnational digital visual effects in China, which informed their operation in Beijing. The understanding of the market in China has potential value for a wider community in the current digital visual effects industry. The notion of market has been frequently mentioned by diverse professionals during the business symposium at the SIGGRAPH Asia 2014 conference. SIGGRAPH Asia is part of the continent specific annual conferences convened by the Association of Computing Machinery and attended by large numbers of computer graphics professionals. According to my observations, the potential in China for digital visual effects companies in the current Hollywood film industry was one of the key topics that the panels of this symposium were interested in. The panel of this symposium were senior members of the digital visual effects community, including Scott Ross the co-founder of Digital Domain, Darin Grant the former Director of Technology of Digital Domain and Chief Technology Director of Method Studio, Mike Seymour the co-founder of digital visual effects trade journal FX-Guide, Prashant Buyyala the Head of Animation Studios in Oriental Dreamworks and former Managing Director of Rhythm and Hues India. Besides the panel, the discussion of digital visual effects business in China obtained a high level of attention from the participants. This could be seen by the increased note-taking and head nodding that could be observed from the participants. A large number of participants of the business symposium were also professionals in the field. For example, employees of BUF, which is a Paris based digital visual effects companies and was involved in *Life of Pi* (2012), were also present.

### 5.2. Pixomondo in China: the Emerging Market for Transnational Digital Visual Effects Practice

Pixomondo is a visual effects company, which has a collaborative relationship with both Hollywood and Chinese film industries. The examples of the Chinese film companies that Pixomondo has collaborated with include: China Film Group and Alibaba Pictures. It has contributed to the delivery of digital visual effects in a number of Chinese films such as *Impossible* (2015), *Lost in Hong Kong* (Xu Zheng, 2015), *The Secret* (Wong Chunchun, 2016) and *The Breakup Guru* (Deng Chao, 2014) (Pixomondo, 2016). This company also has a working relationship with Chinese director Jiang Wen for a Chinese and American co-

production film *Gone with the Bullet* (Jiang Wen, 2014). The films exemplified the collaboration between Pixomondo and Chinese film industry also include *Iron Sky: The Ark* (Timo Vuorensola, 2018).

The following section will discuss the transnational digital visual effects practice of Pixomondo in China. In this thesis transnational digital visual effects practice refers to a type of digital visual effects production that combines the expertise and facilities of digital visual effects companies in the Hollywood film industry, the photorealism aesthetics of Hollywood digital visual effects, and the needs of the Chinese domestic film market. Discussion in this section aims to reveal that the collaboration and connection between Pixomondo and the Chinese film industry is informed by an emerging market for transnational digital visual effects practice in China. The emergence of such a market is influenced by factors such as the revenue generating potential of the photorealistic Hollywood visual effects films, the establishment of cinema chains with digital projecting facilities and government regulation of the Chinese film industry. I will illustrate the above points with a close study of Pixomondo in China as an example.

The establishment of Pixomondo Beijing appears to have been with a vision in exploring the market opportunities in the Chinese film industry. Analysis of the interview<sup>119</sup> with both the head of production and the producer of this company reveals an apparent connection between the operation of Pixomondo Beijing and a market in the Chinese film industry. For example, the producer emphasized that we are here because we are working with Chinese directors and film companies. The head of production also stated that “we are here to develop the market”. He also further explained that the Chinese film industry has a great deal of potential for the digital visual effects business of this company. The rapid growth in the number of cinema chains has facilitated an increase in the demand for Chinese film in the domestic market. The past two decades have witnessed a great deal of institutional and structural reforms in the distribution and exhibition sector of Chinese film industry, which resulted in the establishment and expanding of nationwide cinema chains. In this study, Chinese films are defined as films that are either produced or co-produced by a Chinese production company. To illustrate,

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<sup>119</sup> The information in this paragraph is based on the interview I conducted with the producer of Pixomondo Beijing in 2012 and with the head of production in 2014.

structural changes such as the theatre chains system were inaugurated in 2001 to reform the distribution and exhibition system in China, which followed the Soviet model and was based on administrative regions (Zhang, 2003; Lu, 2016; Su, 2016; and Aranburu, 2017). The cinema chains system was first invented by the head of Paramount from 1915 to the 1930s as a component of the Hollywood studio system, under which film producers align with a number of cinemas to exhibit their films, sharing costs, profit and risks (Su).

The inauguration of the cinema chain system in China is significant for the growth of the Chinese film market as it intended to implement market mechanism (Byrd, 1991 and Yeh and Davis, 2008) to the field of film distribution and exhibition. In other words, it means the beginning of deregulation and the emergence of profit-driven and market oriented enterprises on the landscape of film supply and circulation (Yeh and Davis). Even though the film industry in China is still subject to government intervention (Su, 2016; Zhu and Rosen, 2010; Meyer-Clement, 2016), market mechanism (Yeh and Davis) was gradually introduced to the system as one of the factors that affects the film distribution and exhibition business. The establishment of the modern enterprise system (Zhang, 2014) to the state owned China Film Group Corporation exemplified the very early stage implementation of the market mechanism, which is stated in document 1519, which is jointly issued by SARFT and the Ministry of Culture in China from 2001<sup>120</sup>. Under the modern enterprise system, a company has “clear property rights”, as well as “rights and responsibilities”, which means the “separation of government function from enterprise management” (Zhang: 13). China Film Group Corporation play an important role during the establishment of cinema chains, as it is the dominant shareholder of China Film Stellar Theatre Chain, which was established in 2002 and currently is one of the major cinema chains in China (Lu, 2016; Su, 2016; China Film Stellar, 2017 and HPRC, 2012). Another example is the introduction of a degree of competition to the foreign film distribution market. As announced by the SARFT, China Film Group would have to share its authority of the distribution of imported films with a second company from 2002 (Aranburu, 2017). Foreign film distribution rights are important for the operation of cinema chains in China as the

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<sup>120</sup> This document is available at the website of SARFT:

<http://dy.chinasarft.gov.cn/html/www/article/2011/012d830a99bf65e34028819e2d789a1d.html>

imported foreign films, especially Hollywood films, contributed largely to the box office revenues in domestic market (Su and HPRC, 2012).

The experience and expertise of Hollywood digital visual effects companies such as Pixomondo contribute to the satisfaction of the increasing demands discussed above. The delivery of digital visual effects in Hollywood films has a noticeable contribution to the achievement of commercial aesthetics, the key characteristic of which is to provide aesthetic pleasure (Beilina, 2017). It has been proved by the research of Smith and Neale (1998), and Berliner (2017) that this type of aesthetics was one of the reasons for the commercial success of the Hollywood film industry. According to the survey I conducted with professionals working in the current digital visual effects industry, the majority of them think one of the main functions of digital visual effects in Hollywood cinema is to generate visual pleasure. An analysis of Hollywood visual effects films such as *Life of Pi* (2012) also supports the idea that the delivery of digital visual effects has contribution to the generating of visual pleasure (Smith and Neale, and Berliner). To illustrate, this film displayed a number of scenes proving aesthetical pleasure through the detailed depiction of wildlife and ocean environments, which are made possible by the delivery of digital visual effects. For example, in the evening scene when Pi was adrift in the Pacific Ocean on a lifeboat after surviving a shipwreck, the film depicted a large number of illuminated jellyfish swimming in crystal clear water in a wide shot and also a whale jumping out of the water. During Pi's journey on the lifeboat, the film includes shots that illustrate the sky with diverse shades of yellow and orange colour above the sea, a tropical island with exotic plants and monkeys, and different kinds of fish.

Pixomondo produced a significant number of digital visual effects shots for Hollywood films for example the *Fast and Furious Series*, which achieved box office success in the Chinese domestic film market. Film companies and directors in China have a noticeable intention to utilise these visually appealing and highly photorealistic visual effects in their film-making to achieve similar success. To prove this, both the head of production and producer for Pixomondo in China stated that local film companies are aware that their work in films such as the *Fast and Furious Series* were very well received by Chinese cinema-goers and achieved high box office revenue. The producer also highlighted that their Chinese clients value such success and are willing to embrace similar digital visual effects. To illustrate, *Gone with the Bullet* (Jiang Wen, 2014) is an example of a Chinese feature film that Pixomondo was involved in. This film is a period drama set in Shanghai. Pixomondo produced city-scape shots in this

film and recreated the computer-generated buildings and streets of Shanghai in the 1920s. As stated by the producer, one of the reasons Pixomondo were chosen to create the digital visual effects shots for this film was their experience with re-creating the city-scape and computer-generated buildings of 1930s Paris in *Hugo* (Martin Scorsese, 2011). Pixomondo have also been involved in the recent Chinese Sci-fi film, *The Wandering Earth* (Guo Fan, 2019). This film depicts an imagined planetary catastrophe in 2061, which is threatening the human race. A large part of the film is set in a futuristic Shanghai enabled by digital visual effects, where a number of the landmarks in the city such as the Oriental Pearl Tower are frozen around towering ice glaciers.

Pixomondo's previous experience in the Hollywood film industry equips them with the skillset, pipelines, facilities for producing highly photorealistic digital visual effects. According to the head of production, Pixomondo was pushed to develop skillsets, pipelines and technology to meet the high expectations from Hollywood in the photorealism of digital visual effects. Within the current industrial context, it was difficult to find a local digital visual effects company with such skills and facilities. As stated by the head of production, the clients came to Pixomondo because it was hard to find a similar quality of digital visual effects production from local visual effects companies, which had not worked for Hollywood before. To illustrate further, *The Promise* (Chen Kaige, 2005), set in an imagined past of China where mythical characters are interacting with people dressed in decorative costume inspired by ancient Chinese clothing. Digital visual effects shots, which were produced by a local visual effects facility, had an apparent lack of photorealism. Simple static landscapes, such as the repetition of banana trees (Figure 28) dominating the background of a shot depicting the appearance of a mythical woman at approximately 1hr 40mins into the film. The lack of vegetation diversity results in the lack of visual interest in this scene. Apart from vegetation, the design of the mythical features of the woman could also be considered simple. The movement of her hair and clothing had a significant lack of complexity. A clear repetition of the dynamic of hair movement could be easily observed from the shot.



*Figure 28 Digital visual effects shots in The Promise (2005)*

In comparison, *Once Upon Time*, (Zhao Xiaoding and Anthony Lamolinara, 2017) is another Chinese film that is set in a imagined past. A large number of digital visual effects shots were produced by Pixomondo, which included complex computer generated vegetation, dramatic landscapes and a variety of different animal species. Even though these vegetation, landscape, and animals are still less photorealistic than *The Jungle Book* (Jon Favreau, 2016), a great deal of complexity and diversity can be seen from the texture and movement of these visual elements. For example, the digital visual effects shots at approximately 4 mins into the film depicts two women in period costume in a mythical forest being transformed into animals; one transformed into a deer and the other into a white fox with many long, flowing tails. A wide variety of plants such as: ferns, trees and flowers can be observed in the scene, which also display a degree of accuracy in the movement of their leaves in coherence with the performance of the human and animal characters.

As discussed above, the expanding cinema chains operated by market-driven enterprises contributes to an emerging market for a Hollywood digital visual effects companies such as Pixomondo in the Chinese film industry. However, the Chinese film market is still under a degree of government intervention. In particular, the film administrative regulation decree that any film that is permitted to access the film market in China must pass government censorship. The following paragraphs in this section will illustrate that the way digital visual effects are utilised in Hollywood cinema not only has market potential but also the ability to pass state censorship.



According to the film administrative regulation, films are prohibited from being distributed in China if they contain the following content<sup>121</sup>:

- Opposing the fundamental principles laid down in the Constitution of the P.R.C.;
- Jeopardizing the unification, sovereignty and territorial integrity of the State;
- Divulging State secrets, jeopardizing the security of the State, or impairing the prestige and interests of the State;
- Inciting hatred and discrimination among ethnic groups, harming their unity, or violating their customs and habits;
- Propagating cults and superstition;
- Disrupting public order and undermining social stability;
- Propagating obscenity, gambling or violence, or abetting to commit crimes;
- Insulting or slandering others, or infringing upon the legitimate rights and interests of others;
- Jeopardizing social ethics or fine national cultural traditions.

As the list of contents in the censorship regulation are quite general, in practice, it is open for interpretation. According to my own experience as an intern in a Chinese state owned TV station, high school dramas have to avoid having a happy ending when portraying relationships of Chinese teenagers on campus. To do otherwise might be interpreted as misleading for students and fail the censorship procedure. The way digital visual effects are functioning in Hollywood films has the potential to reduce the risk of a film to be interpreted as having the content listed in the censorship regulation. To illustrate, one of the functions of digital visual effects is to add fantasy elements to a film and create a narrative space-time for audience to escape from reality (Wood, 2007). For example, the audience could escape to 1930s Paris in *Hugo*. Another case in point is *Star Trek: Into Darkness*, which is another digital visual effects film that Pixomondo has been involved in. Computer-generated imagery and visual effects facilitated the depiction of the city-scape of San Francisco in an imagined future and the

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<sup>121</sup> The translation of this regulation is according to the following website <https://www.eastwestbank.com/ReachFurther/News/Article/Navigating-Restrictions-In-Chinas-Film-Industry>

adventure of space ships across the galaxy. Therefore, it is easier for these films to avoid any ideological debate.

To conclude, diverse factors within the industrial context of the Chinese film industry contribute to the emergence of a market for transnational practice of digital visual effects companies such as Pixomondo. Those factors include: the growth of Chinese cinema chains, the box office success of digital visual effects heavy Hollywood blockbusters in China and government regulation in the film industry. The next section will discuss the adaptation of Hollywood film aesthetics in Chinese popular cinema through transnational digital visual effects practice with analysis of *Once Upon a Time* (Zhao Ziaoding and Anthony LaMolinara, 2017).

#### 5.2.1 *Once Upon a Time* (2017): Transnational Digital Visual Effects Practice and the Adaptation of Hollywood Film Aesthetics in Chinese films

Digital visual effects company Pixomondo has a different form of collaboration with Chinese film companies for producing digital visual effects from the way they work with the Hollywood studios. In China, Pixomondo are involved in the stage of pre-production, where the discussion of script breakdown and where digital visual effects take place in a film happen. In Hollywood, this stage is at the beginning of the digital visual effects pipeline, which occurs before the appointment of the digital visual effects companies.

Compared with the distributed directing process discussed in Chapter 4, digital visual effects artists have more creative autonomy while working on Chinese films such as *Once Upon a Time*. According to the digital visual effects producer at Pixomondo, the directors of the Chinese film he has worked on have more flexibility in scheduling the progression of film making and more time was made for face-to-face meetings with groups of digital visual effects artists in the company for inspiration. Compared with Hollywood films they have worked for, digital visual effects artists have a significantly higher chance to give artistic input and have a greater influence on the creative decision-making in producing digital visual effects shots in Chinese films. As highlighted by the Digital Visual Effects producer, Chinese directors tend to have less experience in digital visual effects compared to Hollywood.

Many of the Chinese directors show a high level of interest in learning the techniques and strategies employed by the Hollywood film industry for designing digital visual effects shots. Therefore, the film directors are more open to suggestions from Pixomondo on the aesthetics of digital visual effects shots due to the company's experience in the Hollywood digital visual effects industry. As stated by the digital visual effects producer, Chinese directors often came to Pixomondo for ideas. These ideas include the design and style of digital visual effects scenes and the development of computer-generated characters. Those forms of collaboration allow the adoption of the aesthetics of Hollywood digital visual effects in Chinese films. The next paragraph will discuss this point further with the analysis of *Once Upon a Time* (2017).

Hollywood digital visual effects company Pixomondo was involved in the delivery of digital visual effects in *Once Upon a Time*. A study of the digital visual effects shots in this film reveals a noticeable degree of similarity and resemblance to Hollywood films. For example, this film contains a significant number of digital visual effects shots, which have a high level of resemblance to *The Lord of the Rings* (2001 to 2003) series, *The Hobbit* (2012 to 2014) series, *The Jungle Book* (2016), *Life of Pi* (2012) and *Avatar* (2009). The film began with a wide digital visual effects shot of the imagined landscape of Qing Qiu (Figure 29) where immortals, animals and other mythical creatures reside in harmony. The camera is positioned higher up above a hanging valley of what looks like a glaciated landscape. In the foreground a river flows into a lake in the middle ground with wide grassy floodplains. In the foreground on the left there is a wide variation in the colour of the vegetation, which suggests an early autumnal setting. This type of landscape and vegetation is also utilised in the depiction of Rivendell, which is the home of the Elves in *The Lord of the Rings* series. The middle ground is highlighted with the glow of the sun shining on it, which resembles the look of the Shire in *The Lord of the Rings* series, where the Hobbit village is located. In the background, the single snowy peak and lower surrounding grey/green mountains have a thick blanket of mist around them. This resembles the depiction of the Lonely Mountain in Middle Earth, which is the imagined landscape in *The Lord of the Rings* series and *The Hobbit Series*. In the next scene, which is another digital visual effects shot depicting live action mythical woman, who is the Empress of Qinqi, running through the computer generated jungle. In this shot the camera pans along the jungle floor, while all the animals run in the same direction in harmony with the Empress of Qinqi (Figure 30). This has a high level of resemblance to the opening scene of *The Jungle Book*, where Mowgli is running through the jungle. In both of the scenes, there are

detailed ground level vegetation, complex tree structures covered in moss, as well as an array of animal species, most of which have fur.

At approximately 7 mins into the film the action moves to the Eastern Sea, where a computer-generated blue whale is shown and then a large mythical jellyfish carriage used by the Empress of Qinqui to transport her to a function in the Eastern Sea palace (Figure 31). The spinning movement and the texture of the blue whale in this scene also appear in the scene where the whale jump out of the water in *Life of Pi*. The texture and the self-illumination of the jellyfish is also similar to *Life of Pi*. At approximately 33 mins into the film, the crown prince Ye Hua marries the common woman named Su Su. In this marriage scene, both the live action prince and Su Su bow down to the computer-generated eastern fields and lakes (Figure 32) as witness to their union. The columnar-looking rock formation in the eastern fields and lakes is a well-known feature in the landscape of *Avatar* (2009).



Figure 29 Digital visual effects shots in *Once upon a Time* (2017)



*Figure 30 Digital visual effects shots in Once upon a Time (2017)*



*Figure 31 Digital visual effects shots in Once upon a Time (2017)*



*Figure 32 Digital visual effects shots in Once upon a Time (2017)*

To conclude, the above discussion reveals that the transnational digital visual effects practice of Pixomondo in China is informed by the needs of the local film market. Due to the popularity of Hollywood digital visual effects blockbusters Pixomondo worked on such as the *Fast and Furious* series, their experience and expertise are considered attractive to Chinese film directors. While producing digital visual effects for Chinese films, Pixomondo has a greater chance to give creative input to directors, who intent to replicate the success of Hollywood films. Therefore, the transnational digital visual effects practice of Pixomondo in China led to the adoption of Hollywood digital visual effects in Chinese films.

### 5.2.2 Digital Visual Effects Practice of Pixomondo in China and the Notion of Budget

To further understand adoption of the aesthetics of Hollywood digital visual effects in Chinese film, this section explores the impact of budgeting aspect of Chinese film industry on the transnational practice of Hollywood digital visual effects companies in China. Analysis of the interview with the producer and the head of production in Pixomondo Beijing reveals that budget is the one of the key issues for the adaptation of their business model for the emerging digital visual effects market in China. As stated by the research of Afuah (2014), the adaptability of the business model of a company depends on whether the product of this company “is cost-effectively reconfigurable to offer benefits that customers perceive as valuable to them (42)”. The delivery of high quality digital visual effects shots for Hollywood cinema is the key service provided by Pixomondo. According to the head of production and the producer, particular efforts have been made by Pixomondo to meet their Hollywood clients’

expectation of achieving high level of photorealism in digital visual effects shots. These efforts include: the innovation of technology, the design of workflow, as well as the recruiting and management of human resources. Furthermore it is clear that Pixomondo's ability to provide high quality digital visual effects services is the essential part of their value proposition to clients in the Chinese film industry. As stated by the producer several times during the interview, "Pixomondo stands for quality." The head of production also mentioned that what makes Pixomondo stand out from other local visual effects companies is their capability and experience in producing high quality digital visual effects shots. Both of them also confirmed that the company intended to adapt the pipelines and techniques they developed for their Hollywood films to Chinese films. Given the delivery of the Hollywood standard photorealism digital visual effects is facilitated by high budgets, it is necessary for Pixomondo to consider the affordability for Chinese clients.

Given that budget is one of the factor affecting the digital visual effects practice of Pixomondo in China, the following discussion will focus on the aspects relating to the finance available to the Chinese film industry. The existing research into this topic demonstrates that film productions in China are financed by different types of organizations including state-owned conglomerates and private enterprises (Cai, 2017, Aranburu, 2017 and Montgomery, 2010). A case in point to gain an understanding of state-owned conglomerates that have a level of financial involvement in film production is China Film Corporation<sup>122</sup>. The Chinese government is the majority owner of this shareholding company, the business of which includes the operation of seven theatre chains; film production and distribution; media production equipment manufacturing and retailing; television production and broadcasting talent agency; as well as film exhibition equipment rental. As the owner of the means of film production, distribution and exhibition vertical integration, this company has adopted vertical integration (Croteau and Hoynes, 2003) as part of its business strategies. This means the financial resources of this company includes the profit of its cinema chains and the share of box office revenues of imported foreign films distributed by the company. Private enterprises are another contributor to the financing of film production in China. The number of private studios have been increasing since 2003 when SARFT issued the "temporary Regulation on Access to Film

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<sup>122</sup> Information About this company is available at its website:

<http://www.zgdygf.com/Introduction>

Distribution and Exhibition” (Aranburu, 2017). “This regulation gave the same rights and responsibilities as the state-owned studios to the private enterprises (Aranburu, 2017; Song, 2009; Van der Berg, 2013). For example, private conglomerates Wanda Group established a film production company Wanda Pictures in 2010<sup>123</sup> and recently Alibaba Group also established a film production company Alibaba Pictures<sup>124</sup>. Therefore, the paragraphs below study to what extent there is an emerging circumstance surrounding both the state-owned conglomerates and private studios in film production having connections with the budgets for digital visual effects practice at present and in the near future.

The first circumstance is the move of private enterprises in the cultural industry in the process of media convergence. The concept of media convergence means “the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behaviour of media audiences who would go almost anywhere in search of the kinds of entertainment experiences they wanted” (Jenkins, 2006: 2). It is shaped by the desires of media conglomerates to expand their empires across multiple platforms and by the desires of consumers to have the media they want where they want it, when they want it, and in the format they want (Jenkins). Alibaba is an example of the private enterprises that participate in the process of media convergence in China. As mentioned in the beginning of this section, Alibaba Group Holding Limited<sup>125</sup> is a Chinese private enterprise, which operates a wide range of businesses and services such as e-commerce, cloud computing, digital financial services and online marketing technology services. This company started its exploration in the media industry in 2011 and subsequently established Alibaba Pictures<sup>126</sup>, the key businesses of which

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<sup>123</sup> According to the company profiles on the web page of Wanda Pictures: <http://www.wandamedia.cn/en/webpage/About/company.shtml>

<sup>124</sup> According to the company profiles on the web page of Alibaba Pictures: [http://www.alibabapictures.com/simp/1-about\\_01.html](http://www.alibabapictures.com/simp/1-about_01.html)

<sup>125</sup> The information about Alibaba Group is from the Company Overview Webpage of Alibaba Group <http://www.alibabagroup.com/en/about/overview> and the Our Business Webpage of the company <http://www.alibabagroup.com/en/about/businesses>

<sup>126</sup> Alibaba Pictures was formerly known as China Vision Media Group Limited. This firm changed its name to Alibaba Pictures in 2014. The study of Alibaba Pictures in this chapter is based on information from its annual report from 2011 to 2014. These reports are published at



are comprised of film and television drama production. This company has been developing multiple platforms for the consumption of media content. A case in point is the online streaming platform Youku Tudou. The establishment of this platform was based on the integration of two online video-sharing websites purchased by Alibaba in 2016, which were known as Youku and Tudou<sup>127</sup>. The users of this platform are able to stream a wide variety of media contents such as films, TV drama, TV programs, news, music, sports, and animation. This means that the company has a digital distribution channel for the film and television drama contents produced by them. Alibaba Pictures also developed a digital ticketing platform, the key product of which is the app Tao Piao Piao. Alibaba has reached contractual agreements with major Chinese cinema chains such as the Wanda Group for ticket sales and film promotion through this app. According to the 2016 annual report of this company<sup>128</sup>, Alibaba Pictures has the vision of further developing Tao Piao Piao to a multi-functional platform, the services of which include ticket sales, film promotion, social media as well as entertainment contents browsing. As the owner of the largest e-commerce websites such as T-mall and TaoBao, this company, also working on the development of a digital platform for selling film and other media content associated merchandises. In addition, this company also initiated a collaborative relationship with three telecommunication companies: China Mobile, China Unicom and China Telecom for the development of a mobile phone TV program streaming platform. In 2016, with the vision of becoming a media conglomerate, Alibaba Group found Alibaba Digital Media and Entertainment Group, which has integrated Alibaba Pictures as one of its subsidiaries. This

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the investors website and can be accessed online: [http://www.alibabapictures.com/simp/2-invest\\_en.html](http://www.alibabapictures.com/simp/2-invest_en.html). Other sources for the study of Alibaba includes trade publicans such as *Hollywood Reporter* and *Variety*

<sup>127</sup> The information about the integration of You Ku and Tudou is from the announcement on the website of Youku: [http://c.youku.com/aboutcn/youtudetail/\\_aid85172\\_515](http://c.youku.com/aboutcn/youtudetail/_aid85172_515); The information about Alibaba Group acquired the ownership of Youku Tudou is from the announcement of Alibaba Group <http://alibaba.newshq.businesswire.com/press-release/alibaba-group-announces-non-binding-proposal-acquire-all-outstanding-shares-youku-tudo> and the 2016 Annual Report of Alibaba Pictures: <http://www.alibabapictures.com/upload/2003/650afac9-0be5-4a3e-a09a-0a200778cd70.PDF>

<sup>128</sup> The 2016 annual report of Alibaba Pictures is available online at <http://www.alibabapictures.com/upload/2003/650afac9-0be5-4a3e-a09a-0a200778cd70.PDF>

recently established parent company is progressing on the development of online gaming, literature, music and sports programming platforms.

Apart from Alibaba, other digital media enterprises such as Tencent<sup>129</sup> is investing in the construction of media convergence platforms. Examples of these multiple platforms include: online instant message platforms such as QQ and Wechat; social media platforms such as QQ zone, online gaming platforms such as QQ games, as well as a live-sports streaming platform, which is known as Penguin e-sports. The digital platforms developed by this company also include an online video sharing and streaming platform known as Tencent Video, a literature platform, a comic and animation viewing platform, as well as a music platform. As the owner of multiple media platforms, this company recently established a subsidiary named Tencent Pictures, which is aiming to produce digital media content that merges diverse media such as film and computer games. Furthermore, a survey of trade publications has indicated that the emerging enterprises with digital platforms<sup>130</sup> for the consumption of media contents tend to collaborate and with existing media conglomerates such as the Wanda Group. The fact that such a collaboration happens is further proved by the study of the production and distribution of a recent Chinese film *Beijing Love Story* (Chen Si Cheng, 2014). To illustrate, this film is produced by Wanda Group, the content of which is also distributed via the online streaming platforms of Tencent<sup>131</sup> and Alibaba<sup>132</sup>. It is also stated in the 2012 annual report of Alibaba Pictures<sup>133</sup> that this company has developed a collaborative relationship with Tencent in that year. At present, the evidence of collaboration between these two companies is the fact that the

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<sup>129</sup> The information about the multi-media platform owner by Tencent is based on the information from the company's web page: <https://www.tencent.com/en-us/system.html>

<sup>130</sup> <http://ieg.tencent.com/about.html>

<sup>131</sup> *Beijing Love Story* (2014) online streaming Webpage on Tencent Video: <https://v.qq.com/x/cover/svetu681um6g6af/u0014lbkj2k.html>

<sup>132</sup> *Beijing Love Story* (2014) online streaming Webpage on Youku Tudou: [http://list.youku.com/show/id\\_z29b931a0fe6811e29abd.html](http://list.youku.com/show/id_z29b931a0fe6811e29abd.html) Youku Tudou is digital streaming platform of Alibaba Group

<sup>133</sup> Online access to the annual report: <http://www.alibabapictures.com/upload/2003/677da421-67ee-46c0-bd0c-5c9f229226fe.pdf>

products of Tencent such as the membership of Tencent Video are selling on the e-commercial platforms of Alibaba Group<sup>134</sup>.

The process of media convergence discussed above has potential in contributing to the finance available for digital film productions in China. As proved by the majority of the research into media convergence, this concept has economic powers for the operation of enterprises that have ownership of multiple media platforms (Iosifidis, 2010 and Jenkins, 2006). To explain, the integration of diverse platforms may provide a firm more chances and channels to exploit the value of a creative content (Jenkins; Tim, 2010; Lawson-Borders, 2006; Kackman, Binfield, Payne, Perlman, and Sebok, 2011). This means that the process of media convergence has the possibility to enhance the revenue generating capability of certain creative products such as a film or a TV drama. In the case of Alibaba, a film produced by Alibaba Pictures not only has the chance to be distributed in cinema but also on the online streaming platform of this company. This means the companies could gain profit from this film through box office revenue, advertisement on online streaming as well as membership fees of users of its streaming platform. Apart from that, the ticketing platform of this company known as Tao Piao Piao could be utilised as a promotion tool for films produced by this company, while the online shopping platforms of this company offer profit-making possibilities of developing associated merchandises. Due to the forms of cooperation discussed above, film production companies who have agreements with companies such as Alibaba could also take advantage of the profit generating ability of the digital platforms. Furthermore, these multiple forms also offer possibilities of creating franchises. For example, *Roco Kingdom* is an online game produced by Tencent. This game is set at a magical kingdom where the users could interact with computer-generated magical creatures, and fantasy characters. Meanwhile, the companies also produced films and animation series based on stories that happened in the imagined Roco Kingdom<sup>135</sup> for the game. An example of an animation series based on the Roco Kingdom is *Roco Kingdom: The Desire of Dragon* (Yu Shengjun, 2013).

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<sup>134</sup> Membership of Tencent Video is available to be purchased via Tmall.com, which is one of the e-commercial platforms of Alibaba Group. The following link is to purchase Tencent Video's membership on Tmall.com:

[https://www.tmall.com/mlist/cp\\_zNrRtsrTxrW74dSx.html](https://www.tmall.com/mlist/cp_zNrRtsrTxrW74dSx.html)

<sup>135</sup> IMDb page for Roco Kingdom Video Game : <http://www.imdb.com/title/tt2186804/>

Another circumstance is the government's clear intention in facilitating digital cinema and technological intensive film production. To illustrate, the Administration of Press, Publication, Radio, Film and Television of the Chinese government issued the document *Guidelines for the Development of Digital Cinema* in 2004<sup>136</sup>. This document was based on the outcome of the discussion of the 16<sup>th</sup> National Congress of the Communist Party of China, and the purpose of which was to inform the practice of the state owned film production companies, and cinema chains as well as other related organizations. It is stated at the beginning of the document that the state intended to focus on the development of digital cinema. This document especially mentioned that the state encouraged their own film production companies to produce films including digital visual effects. The document also explained the aim was to keep up with the development of world leading film industries outside China. Another government agency is the Administration of the Special Funds for the Development of the Film Cause, also issued a document which is entitled *Regarding Special Funding for High Technology Formats Filmmaking* in 2012<sup>137</sup>. This document states that the government intended to provide funding for films produced for exhibiting in digital 3D and IMAX theatres. The Administration of the Special Funds for the Development of the Film Cause also published a new issue of the above document in 2016<sup>138</sup>. In this new issue, the government introduced a points-based system to assess the eligibility of films to obtain funding. Aspects such as whether a film has digital visual effects and the level of photorealism of its digital visual effects are both listed as criteria in this system.

The intention of the Chinese government is significant for the understanding of the finance available for digital visual effects production, due to the economic power it has. Even though

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<sup>136</sup> *Guidelines for the Development of Digital Cinema* is available online: <http://dy.chinasarft.gov.cn/html/www/article/2011/012d8290906654454028819e2d789a1d.html>

<sup>137</sup> *Regarding Special Funding for High Technology Formats Filmmaking* is available online: <http://dy.chinasarft.gov.cn/html/www/article/2014/01493fefda9332d6402881a7470edaf0.html>

<sup>138</sup> The new issue of *Regarding Special Funding for High Technology Formats Filmmaking* is available online: <http://www.zgdypw.cn/#/policies/check.html?id=29>

private and foreign investment is welcomed in the Chinese economy, state-owned enterprises still dominate essential areas of the national economy. These areas include water-resources, electricity, railway, steel, petroleum and gas and telecommunications. Furthermore, the majority of research into the Chinese film industry such as Su (2016), Zhu and Rosen (2010) advocates that despite the process of commercialization and the introduction of private investment in film production, distribution, and exhibition in China, the state still plays a vital role in this industry (Su). This argument is valid, because the state is the owner of many nationwide cinema chains such as China Film Stellar Theatre Chain, and large film production companies such as the China Film Group. This means that the intention of the state influences the practice of these state-owned film companies. Research into the recent filmmaking practice of state-owned film production companies shows that they have started to produce films that involve digital visual effects. For example, the state-owned film company Dream Sky Entertainment was involved in making the film *Monster Hunt* (Raman Hui, 2015). The narrative of this film follows the adventure of a monster known as Wuba in ancient China. Delivery of digital visual effects enabled the depiction of a fantasy world where the human race and monsters co-exist as well as the interaction between these monsters and human characters. Hollywood digital visual effects companies such as Industrial Light and Magic and Base FX were involved in the delivery of digital visual effects in this film<sup>139</sup>. Apart from that, China Film Group also announced that *The Wandering Earth* (Guo Fan, 2018)<sup>140</sup>, which is the adaptation of the science fiction novel with the same title, is currently in production.

The discussion above suggests that there are two emerging circumstances impacting the financial availability of digital visual effects film production. The first is that private enterprises are beginning to explore the economic power of media convergence (Iosifidis, 2010 and Jenkins, 2006). The government has established a strategy and the funding for developing digital cinema and technology intensive films. However, there is still a gap between the budget for digital visual effects in Chinese films and Hollywood cinema. As stated by the head of production in Pixomondo Beijing, one of the challenges for Pixomondo in China is the team

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<sup>139</sup> According to the company credits of *Monster Hunt* (2015) on IMDb: [http://www.imdb.com/title/tt3781476/companycredits?ref=tt\\_dt\\_co](http://www.imdb.com/title/tt3781476/companycredits?ref=tt_dt_co)

<sup>140</sup> China Film Group's announcement about *The Wandering Earth* <http://www.zgdygf.com/News/Info/9208f587-16b9-4ac1-ba95-05ee1381bd40>

need to work with a budget that is less than a Hollywood project. Therefore, the following part of the section aims to discuss the reasons for the gap between the two film industries. Currently, the budget for Chinese digital visual effects production is lower than Hollywood films for diverse reasons. Firstly, Hollywood has more than 40 years of experience in producing digital visual effects heavy science fiction and fantasy films, however Chinese film companies are still in the stage of exploration in this market. This means that even though there is an emerging market for digital visual effects practice in China, the market is still developing. As emphasized by both of the head of production and the producer of Pixomondo, “the market in China is still young”. The head of production also added that sometimes the directors they are working for, “do not know what to expect.” It is only in the recent years that China started to adopt Hollywood computer-generated-imagery in the form of digital visual effects in science fiction and fantasy films. Examples of the digital visual effects used in science fiction and fantasy films include: *Monster Hunt* (2015), *Impossible* (2015), *The Three Body Problem* (Fan Fan Zhang, 2018) and *The Chronicles of the Ghostly Tribe* (Lu Chuan, 2015). A case in point to illustrate the lack of experience of Chinese film companies in this area is *The Three Body Problem* (Fan Fan Zhang, 2018), which is an adaptation of a Chinese science fiction novel with the same title. The original release date of this film was in 2016. However, due to the lack of accuracy in estimating the budget and the time for achieving the intended look of digital visual effects, the film had to delay its release data in mainland China<sup>141</sup>. It is currently still in production.

Hollywood digital visual effects heavy blockbusters have a well-developed worldwide market. However, Chinese visual effects films such as *Monster Hunt* (2015) and *Impossible* (2015) were struggling to generate box office revenue on the international film market. To illustrate, Hollywood films such as *Star Wars Episode VII: The Force Awakens* (2015) generated \$2,068,223,624<sup>142</sup> box office revenue worldwide including \$124,159,138 in China; *Life of Pi*

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<sup>141</sup> Report about the delay of *The Three Body Problem* (2018) on Sina.com: <http://ent.sina.com.cn/2016-06-23/doc-ifxtmweh2362899.shtml>

<sup>142</sup> Information of *Star Wars The Force Awakens*’ (2015) box office revenue is from Box Office Mojo: <http://www.boxofficemojo.com/movies/?page=main&id=starwars7.htm>

(2012) generated \$609,016,565 worldwide and \$90,806,000 in China<sup>143</sup>; *The Jungle Book* (2016) generated \$966,550,600 worldwide and \$150,140,000 in China<sup>144</sup>. In comparison, the Chinese fantasy film *Monster Hunt* (2015) generated \$3,424,817 outside China including only \$32,766 in the USA<sup>145</sup>; *Impossible* (2015) and *Chronicles of the Ghostly Tribe* (2015) were only released in Chinese cinemas. They generated \$15,396,000 and \$106,380,000, respectively<sup>146</sup>.

Finally, as discussed in Chapter 3, the Hollywood digital visual effects production is financed by well-established media conglomerates. Despite that, private enterprises in China are at the very beginning of the process of exploring the economic power of media convergence. To exemplify, the Alibaba Digital Media and Entertainment Group was newly founded in 2016. The majority of content on the company's web page, which only has a Chinese version, is about the company's future plan and recruitment<sup>147</sup>. The main business activities of this company was focusing on integrating other media companies Alibaba Group purchased the online video streaming website YouKu Tudou, and the navigation and location based service company Gao De Map. Considerable costs were incurred in 2016 due to the establishment of the media convergence platform. For example, according to the Alibaba Pictures Group 2016 Annual Report<sup>148</sup>, there was a net loss in 2016 of \$150.32 million compared with \$71.76 million in the previous year. The main cause of the net loss was the marketing expenses incurred by Tao Piao

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<sup>143</sup> Information of *Life of Pi*'s box office revenue is from Box Office Mojo: <http://www.boxofficemojo.com/movies/?id=lifeofpi.htm>

<sup>144</sup> Information of *The Jungle Book*'s box office revenue is from Box Office Mojo: <http://www.boxofficemojo.com/movies/?id=junglebook2015.htm>

<sup>145</sup> Information of *Monster Hunt*'s box office revenue is from Box Office Mojo: <http://www.boxofficemojo.com/movies/?id=monsterhunt.htm>

<sup>146</sup> The information of box office revenues of *Impossible* and *Chronicles of the Ghostly Tribe* is available on IMDb Pro

<sup>147</sup> Information of the Alibaba Digital Media and Entertainment Group in this paragraph is from the Website of this company <http://campus.chinahr.com/2017/alwy/companyproduce.html>

<sup>148</sup> Alibaba Pictures Group 2016 Annual Report is available online: <http://www.alibabapictures.com/upload/2003/650afac9-0be5-4a3e-a09a-0a200778cd70.PDF>

Piao, more specifically ticket subsidies and promotions to movie-goers. The reason for the utilisation of this marketing strategy is to build a user base for this online ticketing platform.

It is necessary for Pixomondo to consider the affordability of the Chinese film industry, in their pursuit of photorealism in their digital visual effects practice in China. In order to adapt their expertise and facilities in producing highly photorealism digital visual effects to a lower budget, the firm developed two strategies. The first strategy was to avoid certain tasks that required high costs while designing a digital visual effects scene and developing a computer-generated character. As explained by the head of production of the company, “it is like we are adopting certain things we have learnt from Hollywood... to the market here, of course not in the same way because they do not afford the same way”. He also says, “Hollywood is very expensive. We are trying to cut the expensive parts out”. According to the discussion in Chapter 2, certain tasks in the delivery of Hollywood digital visual effects are more complex and required technological innovation, and a significant amount of time and labour. Examples of these tasks include the animation and grooming tasks for photorealistic animal characters such as Baloo in *The Jungle Book* (2016) and Richard Parker in *Life of Pi* (2012). The second is to try to reduce the amount of digital visual effects shots, when discussing scripts breakdown with directors. Pixomondo as a digital visual effects company is able to be involved in the stage of discussing the script with the director and giving input where digital visual effects would take place in a film. Detailed discussion of the working relationship between Pixomondo and their Chinese clients will be included in the next section.

According to the producer I interviewed, the company has given advice to Chinese directors to reduce the amount of digital visual effects shots in a film. A director of one film was intended to have approximately 500 digital visual effects shots in the film, which included about 100 shots depicting arrows flying through the air. As reported by the producer, “we go through the script and say you don’t need 100 visual effects shots when you just see arrows flying through the air because it doesn’t drive the story”. “Why don’t you go for maybe 50 shots that are awesome that have a really good quality?” He explained that it was necessary to reduce the number of the digital visual effects shots as the company “always tries to maintain a certain quality”. And “in the end it’s a budget thing.” The clients in China “can’t afford 500 visual effects shots but maybe they can afford 50 good ones.”



5.3 *Impossible* (Sun Zhou, 2015): Transnational Digital Visual Effects Practice

Building on from the ideas that the digital visual effect practice of Pixomondo in China is affected by diverse factors within the production context such as budget and market conditions, this section further explores the influence of these factors on the aesthetics of the Chinese films, through the study the digital visual effects in *Impossible* (2015). In particular, the way the budgeting aspect of Chinese film industry affects Pixomondo's approach to the adoption of Hollywood aesthetics in Chinese film they worked on. *Impossible* (2015) is a science fiction comedy, which is a co-production between Chinese state owned film companies such as China Film Group, and private enterprises such as Alibaba Group and the former iQiYi Moving Pictures. Pixomondo produced the majority of digital visual effects that are depicting the adventure of an alien, called Muah Muah, on Earth where he encounters live action characters such as a depressed employee of a logistics company and an e-commerce shop owner. The delivery of digital visual effects enables the interaction between this alien character and the live action characters in Beijing. Pixomondo were also involved in the content generating process and also had creative influence on the styles of the film and the development of the alien character. Also, as stated by the executive producer, they have been helping the production companies manage their budget. The budget of *Impossible* (2015) is lower than Hollywood films that Pixomondo have also been involved in such as *Hugo* (2011). The estimated budget of *Hugo* (2011) was \$150 million, while the estimated budget of *Impossible* (2015) was \$15.4 million. Therefore, a question can be raised as to what extent the involvement of Pixomondo, which has expertise and experience in Hollywood cinema, impacts on the aesthetics of this film. There is also a question that given the connection between the level of photorealism, the complexity and details of the digital visual effects in Hollywood cinema and the cost of human labour, time and technological innovation; does the gap between the budgets have any influences on the look of the digital visual effects scenes in this film?

*Impossible* follows Hollywood's approach to the depiction of the fantasy elements. Fantasy elements refers to the imagined visual elements in a film which the audience would not have any previous audio/visual experience of. For example, Jar Jar Binks and the Gungans in the *Star Wars* series of films, magical creatures in *Fantastic Beasts and Where to Find Them* (2016) and Gollum in *The Lord of the Rings* series (2001 to 2003). Hollywood intended to achieve a photorealistic depiction of those imagined visual elements through defining reference for the development of those characters. To illustrate, the design of magical creatures in *Fantastic*

*Beasts and Where to Find Them (2016)* are grounded by natural animal references<sup>149</sup>. A case in point to illustrate the adaptation of this approach in *Impossible* is the design of the alien character Muah Muah. Despite the fact that Muah Muah is an imagined alien character, Pixomondo used species of Jellyfish as the reference for the modelling texture and movement of this character<sup>150</sup>. Also, the head of production at Pixomondo stated they has applied their expertise and pipelines of Hollywood digital visual effects production for this film in order to achieve a similar standard of photorealism in their digital visual effects, which includes the look of Muah Muah.

In order to further understand the depiction of the alien character Muah Muah, this paragraph analyses the scene where the small spherical alien Muah Muah first revealed itself in front of the main human character, Tang Ligo. The analysis will focus on the texture, modelling and movement of Muah Muah as well as its interaction with Tang Ligo, who is an employee of a logistics company. At the beginning of the movie, the alien hid in the laptop computer of Tang Ligo after falling to Earth, hitting Tang Ligo's logistics van, which knocked him unconscious. Just over twenty minutes into the film Muah Muah revealed himself from Tang Ligo's laptop and presented him a gift of a car in the middle of his apartment room. In this scene Muah Muah's resembles the physical appearance of metal texture, with a degree of variation on the roughness. Detailed information was included to represent the differences in the roughness of the metal texture. To illustrate, the forehead of it was more polished, while areas such as the cheeks appeared to be more uneven. The variation of the colour is coordinated with light movement and roughness of the texture in particular areas of its body. The pulsating body movements of Muah Muah have similarities to the way jellyfish move and the gills at the rear are comparable to the way fish breathe. Such movement can be seen when Muah Muah is breathing or in conversation with Tang Ligo in this scene. The film also includes detailed visual information to communicate Muah Muah's movement through the air. For example, when moving at a slow pace Muah Muah was floating and gently bouncing through the air.

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<sup>149</sup> The information about the design of magical creatures in *Fantastic Beasts and Where to Find Them* is form FX-Guide : <https://www.fxguide.com/featured/fantastical-effects-and-how-to-create-them/>

<sup>150</sup> Information for the reference of Muah Muah: <http://ent.sina.com.cn/m/c/2015-12-08/doc-ifxmihae9298136.shtml>

However, when it moves fast the movement has similar style to the Golden Snitch in the games of Quiddich shown in the Harry Potter movie series. More specifically, Muah Muah was springing around the screen space at high speed.

The design of Muah Muah's texture and movement requires a lower budget compared to other digital visual effects characters in Hollywood films. What can be seen in the scene is that Muah Muah has a solid skin without hair, therefore the time, labour and technology in the grooming process of Hollywood characters such as Shere Khan and Baloo in *The Jungle Book* (2016) is not required here. It also requires less animation operations as Muah Muah is essentially as sphere with the absence of any limbs. For example, characters such as those in *Fantastic Beasts and Where to Find Them* (2016) all have more complex anatomical features such as legs, torsos and wings. More specifically, the short-haired black Niffler has a flat beak, a plump body with pouch to store shiny objects it collects and claws for toes and fingers. Another creature, a bird called a Thunderbird has four wings besides a head, body, two legs, claws and a beak. The Erumpant is a Rhinoceros like creature which features a giant body, strong legs and a large horn. When they move they need to be fully animated. To exemplify, the scene inside the suitcase showcases the movement of diverse creatures such as the Thunderbird and Graphorns with their thick skins and tentacle mouths. In this scene the Graphorns displayed a great deal of complexity in their movements. Each tentacle on their mouths have individual characteristics when the Graphorns were interacting with the live action characters. Movements such as stretching of muscles, chest and belly movements when breathing, tail wagging and neck turning could also be observed in the scene. Technological innovation might also be involved in the representation of anatomical movements in films such as *Avatar* (2009) and *The Lord of the Rings* series (2001 to 2003). Motion capture technology was involved in the delivery of photorealism movement of the blue Na'vi characters in *Avatar* (2009) and Gollum in *The Lord of the Rings* series (2001 to 2003).

In *Impossible* (2015) there are less digital visual effects scenes especially those with very complex operations compared with digital visual effects heavy Hollywood films such as *Star Wars Episode VII: The Force Awakens* (2015) where there is less dialogue than in *Impossible* (2015). Both *Impossible* (2015) and *Star Wars Episode VII: The Force Awakens* (2015) were science fiction films released in December 2015. In *Impossible* (2015), after the initial appearance of the alien Muah Muah the film mainly focuses on live action performance until the second appearance of Muah Muah, which is approximately twenty minutes into the film.

In the opening scene the computer-generated digital visual elements include the fireballs shooting through the sky and one of them hitting and blowing a hole in Tang Liguó's delivery van. The digital visual elements in the scene also feature Muah Muah emerging from the hole in the delivery van, scanning the area, repairing damage to the delivery van and healing Tang Liguó's bloodied head while he was unconscious. It can be argued that the major digital visual effects in the film were interactions between Tang Liguó and Muah Muah until the scene where there is a fight in the warehouse at approximately seventy minutes into the film. This then leads to Tang Liguó's transformation into a creature once he swallows Muah Muah. This scene which has the most intensive digital visual effects, lasts approximately eighteen minutes. In this scene, Tang Liguó initially transformed a large jellyfish-like floating creature with tentacles protruding from the lower part. The creature then reconstructs itself into one with a more complex large body structure with legs, spider-like face and a number of claws. The delivery of digital visual effects in this scene also include the interactions of this creature with the friends of Tang Liguó and the villains, which are led by Wu Yiran. Wu Yiran is an ambitious entrepreneur and ruthless money-lender.

In contrast, *Star Wars Episode VII: The Force Awakens* (2015) has a considerably larger number of digital visual effects. To illustrate, the opening scene of this film was set in space orbiting the desert planet Jakku and on the surface of this alien planet at night. The delivery of digital visual effects facilitates the portrayal of a scene with diverse objects and movements. More specifically, the scene starts with the landing of Stormtroopers from the evil First Order in their landing craft spaceship on the planet in the centre of a village they wish to search. The villagers attempt to defend themselves, which leads to the depiction of an intense fighting scene. The actions of the Stormtroopers high technology weapons such as laser blasters, the use of a lightsaber by their leader Kylo Ren, the movement of the BB-8 droid, fires and explosions could be seen in the scene. It also involved diverse computer-generated spaceships, including those with complex structures, for example, Kylo Ren's command shuttle, which appears through the smoke with large wings that fold up for landing. Apart from the opening scene, digital visual effects were utilised in almost every scene of this film. The delivery of those effects enabled the depiction of the environments and landscape of diverse alien planets; spaceships and vehicles; alien architecture and interiors; droids and alien creatures as well as their seamless interaction with live action characters and other forms of visual elements.

The different arrangements of digital visual effects scenes in *Impossible* (2015) and *Star Wars Episode VII: The Force Awakens* (2015) has connections with aspects of the creative contents of these films. In *Impossible* (2015) the narrative of the film was mostly set in the urban environment of a contemporary Chinese city of Earth. This involves a considerable amount of live action footage depicting the city, the flat of the main character, offices and a warehouse. Except Muah Muah, the rest of the characters are humans performed by Chinese actors and actresses. For example, the protagonist, Tang Ligu, is performed by a popular Chinese film and television actor. He has performed in films which have achieved box office success in the Chinese domestic market, for example, *A World Without Thieves* (Feng Xiaogang, 2004). The main supporting character, Mr Wang, who is the logistics company boss which Tang Ligu works for, is performed by a well-known comedy actor Xiao Shenyang. He has expertise in folk art known as Er Ren Zhuan, which was originally from Dongbei Province in China. He has also performed in a comedy sketch at the 2009 Chinese New Year Gala television programme broadcast by the mainstream Chinese television station CCTV1. This Chinese New Year Gala programme is the most watched television show in China each year. The comedy sketches he was involved in received an award for the audience favourite of the Chinese New Year Gala.

Furthermore, the unpacking of the story in *Impossible* (2015) is largely driven by the conflicts between the human characters and the development of their relationships. These conflicts include the ambition of the antagonist Wu Yiran to take over the logistics company that Tang Ligu worked for. Many of the plots concerns Mr Wang and Tang Ligu's struggle to escape and survive Wu Yiran's threats and other evil plans. Another example of the conflicts between those human characters is over the contents of the damaged delivery van. The main female character, Tian Jing, owns an e-commerce company whose products for delivery were destroyed in the opening scene. A large part of the first twenty minutes of the film was concerned with her negotiating with Tang Ligu in order to claim her money back. Tang Ligu was struggle to pay her back because his boss, Mr Wang was facing the bankruptcy of his logistics company and the threats from Wu Yiran. This particular conflict was resolved by Tang Ligu's decision to pay back Tian Jing with his own money, which leads to the development of a romantic relationship between Tang Ligu and Tian Jing. The development of this relationship was one of the main plot lines for the rest of the film. Apart from the relationship between Tang Ligu and Tian Jing, another drive for the plot is the relationship between Tang Ligu and his daughter. The film spends a considerable amount of time

portraying the guilt and sadness Tang Liguó experienced after the death of his daughter in a car accident three years before the start of the film.

Comparing with *Impossible* (2015), *Star Wars Episode VII: The Force Awakens* (2015) was set in a galaxy far, far away and the main driver for the plot is the conflict between two galactic organisations, which are the First Order and the Resistance. The First Order grew out of the evil Galactic Empire led by Emperor Palpatine and Darth Vader from the previous films who ruled the galaxy with fear and oppression with shiny high-tech and destructive weaponry. A large number of computer-generated images were used in this film to depict the weaponry such as The Finalizer, a Resurgent-class Star Destroyer that is almost three kilometres long with a complex structure and a large storage capacity for weaponry and crew. The main body of the ship has many decks for turbo lasers, ion cannons, star fighters, assault craft, Stormtroopers accommodation and crew facilities. Other examples of the weapons include Starkiller base, which is a whole alien planet icy that has been turned into a star and planet killing weapon. The depiction of the landscape, architecture and military vehicles on this planet had to largely rely on digital visual effects. Facing the expanding power of the First Order was the Resistance, which grew out of the Rebel Alliance with the aims of establishing peace and justice in the galaxy. Although possessing capable Starfighters they are few in number and they often have customised older weaponry that appear tired and worn out. Therefore, a large number of plots was surrounding how they are able to escape from situations where they face been overwhelmed by First Order weaponry discussed above. In those scenes a considerable amount of digital visual effects was involved in portraying the space ships and vehicles such as the Millennium Falcon and Resistance transports that were utilised by the members of the Resistance to escape.

Besides the involvement of digital visual effects, *Impossible* (2015) also has a degree of representation of Chinese culture especially cyber culture. A case in point is the name of the digital character alien Muah Muah. This is a phrase that has been invented and is frequently used by internet users in China on social media platforms such as QQ and WeChat. Among those users this phrase means kiss and an expression of affection usually used at the end of sentences during the communication between the users of those social media platforms. In this film the main character was addressed as ‘Diao Si’, which means ‘loser’, by the alien Muah Muah. This phrase ‘Diao Si’, was another invention of Chinese social media users, which is normally used to describe people with less attractive physical appearance and unsuccessful

careers. Also, during the conversation apart from the use of phrases popular on social media the conversation between Muah Muah and Tang Liguu has had some aspects of Chinese culture mentioned. For example, when Muah Muah first introduced itself it has presented Tang Liguu with a car in his apartment and explained that the gesture of presenting an initial gift was part of Chinese culture. However, Tang Liguu was struggling to accept such an expensive gift. The film then shows that Tang Liguu emphasized to Muah Muah that “this is in China. Everything is regulated.”

To conclude, this chapter illustrates that the digital visual effects practice of Pixomondo in China is affected by various of factors such as market needs and budgeting situation in the transnational production network. Emergence of the Chinese film market is a factor that informed the formation of the transnational digital visual effects network of Hollywood cinema. Collaboration between Pixomondo having Hollywood experience and expertise with local film directors in China led to the adoption of Hollywood film aesthetics in Chinese films such as *Once Upon a Time* (2017). This chapter also discussed the impact of budgeting situations in the Chinese film industry on the approach Pixomondo took to adopting the aesthetics of Hollywood digital visual effects in Chinese films such as *Impossible* (2015). Discussion of Pixomondo’s digital visual effects practice in producing *Impossible* also pointed out a new approach for Hollywood digital visual effects companies to increase the adaptability of their business model. Characteristics of this approach include: the adoption of the aesthetics of Hollywood digital visual effects and the development of creative contents that allows digital visual effects companies to balance the affordability of Chinese film industries.

## Chapter 6 Conclusion

### 6.1 Digital Visual Effects in the Hollywood Film Industry: Aesthetics, Network and Transnational Practice

The intention of this research was to understand the causes and effects of transnational digital visual effects practice in the contemporary Hollywood film industry. As discussed in my introduction, transnational digital visual effects refer to the involvement of multiple globally located digital visual effects companies in the delivery of digital visual effects of single Hollywood films. Over the last two decades, this form of practice has taken place in a significant number of Hollywood films including the *Star Wars* series (1977-2019), *The Lord of Rings* series (2001 to 2003), the *Harry Potter* series (2001 to 2011), *Avatar* (2009), *Hugo* (2011), *Life of Pi* (2012), *Gravity* (2013) and *The Jungle Book* (2016). The proliferation of transnational digital visual effects production in Hollywood cinema has contributed to the emergence of digital visual effects industries in countries such as the USA, the UK, Germany, and New Zealand. Companies in the UK include Moving Picture Company, Double Negative, Framestore and Cinesite, which have contributed to more than fifty digital visual effects intensive Hollywood films. To exemplify, the cargo ship sinking and associated events in *Life of Pi* (2012) and animal characters in *The Jungle Book* (2016) were made by MPC. In Germany digital visual effects companies such as Pixomondo were involved in films such as *Hugo* (2011) and *Fast & Furious 6* (Justin Lin, 2013)<sup>151</sup>. In New Zealand Weta Digital were participating in the delivery of digital visual effects in films such as *Avatar* (2009) and *The Hobbit* series (2012, 2013 and 2014). Transnational digital visual effects practice also resulted in the international operation of digital visual effects companies discussed above in countries such as Canada, China and India. For example, the German based digital visual effects company Pixomondo established facilities in Chinese cities such as Shanghai and Beijing. Moreover, companies which have facilities in Canada and India include MPC and the former Rhythm and Hues.

Interesting outcomes from the exploration of the transnational digital visual effects practice include connections between economics, aesthetics, tastes and pleasures of the audience,

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<sup>151</sup> Pixomondo's involvement is introduced on the company's Website: <http://www.pixomondo.com/portfolio/fast-furious-6/>



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software and hardware of the films. As discussed in the Literature Review section of Chapter 1, the photorealism aesthetics of digital visual effects, in particular its challenge to film realism theory was one of the main focuses of scholars such as Rodowick (2007) and Prince (1996) in the field of film studies. This research further developed understanding of the aesthetics of digital visual effects in Hollywood cinema by revealing its connections with time, invisible labour, technological innovation, budgets, local film industries such as that of China, as well as the business models of Hollywood studios and digital visual effects companies.

A study of films such as *The Jungle Book* (2016) in Chapter 2 revealed that notion of photorealism of the digital visual effects scenes in Hollywood cinema is a complex and relative idea. In other words, the level of likeness of computer-generated visual elements to their real world counterparts is variable. Examples of these visual elements include the hair, muscles, skin and movement of animal characters in *The Jungle Book* (2016) such as Baloo and Shere Khan. Another case in point is coherence between the position and density of the breath on the visors and the performance of characters in *Gravity* (2013). Furthermore, while human agents are erased or absent from the representation of the impression of reality in analogue film, the intention to achieve a high level of photorealism in Hollywood digital visual effects is facilitated by technological innovations, a large number of invisible labour and considerable amount of time. Apart from software for digital visual effects and animation production such as Autodesk Maya, Houdini and Nuke, by The Foundry, specialised tools were programmed in MPC for tasks such as grooming computer-generated animals in *The Jungle Book* (2016). A large number of invisible labour and considerable amount of time were involved in defining and studying reference photos and videos for operations in the modelling, texturing and animation tasks of the animal characters, digital landscapes and environments in *The Jungle Book* (2016). Complexity and variation of the facial expressions and body movements especially required human agents and a considerable amount of time. As stated by the director of *The Jungle Book* (2016), “Even though we used motion-capture and video reference, these movies are handmade films. Even with a motion-capture movie you hear so much about, there are hundreds of artists whose jobs it is to take that captured data and make that animation look like it is real. They are breathing their own humanity and their touch into it. And that is what

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brings it to life!”<sup>152</sup> He further stated that as an insider of the film industry for many years he wasn’t aware of the involvement of human agents besides digital technology until the experience of directing *The Jungle Book* (2016). Therefore, he emphasized that “I’ve worked on VFX movies before but never so close with the artists. I was assuming that the computers were doing a lot of the work but really the computer is just a tool!” This reinforces the importance of the skills of the digital artist.

The aesthetics of digital visual effects of Hollywood cinema is also a manifestation of a global business model of contemporary Hollywood cinema. As discussed in Chapter 4, the large budgets of high quality photorealistic digital visual effects, which require investment in technological innovation, labour and time, are financed by global media conglomerates. Due to the significant gap between the budget of Hollywood and other world popular film industries, the aesthetics of Hollywood digital visual effects especially the high level of photorealism, contribute to the inimitability of the business models of the Hollywood studios. However, it challenges the adaptability of the business model of the digital visual effects companies, which are targeting Hollywood clients. As expressed by Scott Ross during my interview described in Section 4.1.1, it was difficult to produce digital visual effects for clients outside Hollywood because the overall budget of their films were not even matching up to the budget Hollywood had for digital visual effects.

Aesthetic goals intended to be achieved by digital visual effects in Hollywood films are beyond just being as photorealistic as possible. There are subjective and directable aspects of digital visual effects, which require creative control and decision-making. For example, the surface colour, texture and lighting of computer-generated architecture, streets, weather, steam, smoke and transportation in *Hugo* (2011) intended to achieve a visual style, which pays homage to the original illustration book. Another case in point is the study of *Rogue One: A Star Wars Story* (2016) in Chapter 3. The design of computer-generated visual elements such as a Star Destroyer above the city on Jedha, as well as composition of scenes set on Jedha were meant to convey an intimidating feeling. Therefore, Chapter 3 discusses factors within the current industry that are associated with the notion of creativity. In particular, it discussed the

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<sup>152</sup> This interview with the director of *Jungle Book* is available at Animation World: <https://www.awn.com/animationworld/jon-favreau-s-photoreal-jungle-adventure>

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conditions of the creative autonomy of professionals in the transnational digital visual effects network in comparison with that of the early film maker George Méliès. The discussion illustrates that compared with George Méliès the nature of the creative process changed from a one-man band exploration to a complex workflow. It involved a great deal of standardization in scheduling and routine, specialisation in roles, tasks and a clear emphasis on efficiency. Considering complexity of the workflow, Chapter 3 further investigated issues in relation to collaboration of transnational teams working on single Hollywood films and the process of distributed directing involved in the delivery of digital visual effects. Due to pro-filmic events being missing from the simulation of digital imagery, complex communication practice was involved in the distributed directing process and collaboration of multiple globally located companies. As discussed in Chapter 4, this communication practice involves mediated communication, cross-cultural communication, and communication between professionals with different skillsets. It also involves interpretation and inputs from diverse contributing roles in the digital visual effects pipeline such as digital visual effects supervisors, digital visual effects producers, and lead artists.

As revealed by the case study of the digital visual effects practice of Pixomondo in China, the taste and mentality of these multiplex audiences contributed to an emerging market for transnational digital visual effects practice in the Chinese film industry. This means opportunities and potential exist for collaboration between digital visual effects companies, which have expertise, facilities and experience in producing the highly photorealistic digital visual effects, and Chinese film companies. Connections and collaboration between Hollywood digital visual effects companies such as Pixomondo Beijing and Chinese film companies led to adoption of the aesthetics of Hollywood digital visual effects in the Chinese film industry. This type of practice sheds light on exploration of a new approach towards digital visual effects in Chinese films. This new approach combines photorealism aesthetics, pipelines and strategies for designing digital characters developed for Hollywood films, affordability of Chinese production companies, as well as the specialised needs of local film industry.

### 6.2 Main Findings Regarding the Research Questions

This research has been guided by two related research questions. The following paragraphs aim to discuss the possible answers to these questions:

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1) What are the factors that inform transnational digital visual effects practice for the contemporary Hollywood film industry?

In terms of the first question, this research shed light upon several factors that inform transnational digital visual effects practice for the contemporary Hollywood film industry. Firstly, the high cost and large team associated with achieving photorealism in the complex digital visual effects scenes in Hollywood films is part of reasons for involvement of multiple digital visual effects companies in single films. Regarding this matter, the production director of Pixomondo Beijing especially mentioned that it is necessary to have diverse digital visual effects companies for single Hollywood films, which have high budgets and complex tasks. As discussed in Chapter 4, even though labour and technology costs are generally divided between several companies for the completion of all digital visual effects tasks in a film, digital visual effects companies in the current industry already experience difficulties in adapting their business models. If a company needs to maintain human resources and facilities for the scale of digital visual effects production as large as Hollywood, it would face a higher level of risk and have less flexibility in its business operation. Secondly, as mentioned in many of the previous chapters of this research, contracts from Hollywood studios for digital visual effects companies were awarded through a fixed bidding process. This fixed bidding model encourages international operations of digital visual effects companies in countries where they could complete tasks in a cost effective way. Cost reduction means there are greater possibilities to increase profitability. Therefore, tax subsidies offered by the governments of British Columbia and Quebec in Canada, the New Zealand government, and the UK government are one of the factors that informs the formation of digital visual effects businesses in those countries. Apart from that, the lower labour costs in countries such as India contributed to the establishment of digital visual effects business there. Another factor that informs the transnational digital visual effects practice is market. As discussed in Chapter 5, the international operation of digital visual effects companies in the Hollywood film industry such as Pixomondo in China was due to the market opportunities there.

2) In what ways and to what extent do transnational digital visual effects practices influence the aesthetics of contemporary Hollywood cinema?

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Transnational digital visual effects practice creates the possibility of world popular film industries' adoption of the aesthetics of digital visual effects in Hollywood cinema, which might shape the look of world cinema in the near future. Digital visual effects scenes in Hollywood films such as *Fast and Furious 6* (2013), *The Hobbit* series (2012 to 2014), *Life of Pi* (2012) and *The Jungle Book* (2016) delivered by digital visual effects companies in countries such as the UK, China, India, Canada and New Zealand also reached a worldwide audience through the increasingly globalised cinematic experience. For example, the flying dragon in *The Hobbit* (2012 to 2014) was animated by digital visual effects artists in Weta Digital, while the fluffy coat of Baloo in *The Jungle Book* (2016) was facilitated by the grooming tool programmed by the professionals in Moving Picture Company. Those visual elements have capability to generate visual pleasure for the multiplex audiences in China. This could be considered as another layer of connections and networks of the transnational digital visual effects practice. As mentioned in Section 6.1 above, these types of connections could contribute to the emerging market in world popular film industries for digital visual effects companies involved in the Hollywood film industry. A case in point is the Chinese film industry, which is also targeting multiplex audiences in China. Collaboration between Hollywood digital visual effects companies such as Pixomondo and Chinese film companies led to the adoption of the aesthetics of Hollywood digital visual effects in Chinese films such as *Impossible* (2015).

### 6.3 Implications for the Digital Visual Effects Industry

My study intended to point out a direction for increasing the adaptability of the business model of digital visual effects companies involved in Hollywood films. It is necessary to increase the adaptability of the business model of digital visual effects companies, whose customer focus is primarily associated with Hollywood.

Firstly, increasing the adaptability of the business model is beneficial for the sustainable development of digital visual effects companies in the transnational networks. As discussed in Chapter 4, the tension between the spontaneous nature of the creative process of filmmaking and the use of fixed price contracts has negative impacts on the profit margins of a large number of digital visual effects companies. Issues relating to the fixed term contracts are considered as the most significant problems facing the current digital visual effects industry. My study of the business model of digital visual effects companies in the transnational network shows that the majority of these companies are over-dependent on clients from Hollywood. The problems in

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finding alternative markets make it difficult for the digital visual effects companies to innovate their business model and negotiate their contractual relationship with Hollywood studios. Therefore, it is urgent for the digital visual effects companies to increase the adaptability of their business model and approach other world popular film industries such as the film industry in China.

Secondly, increasing the adaptability would contribute to the improvement of working conditions of a large number of digital visual effects practitioners across countries. The discussion in Chapter 4 illustrates that the problems of the fixed bidding model in the digital visual effects industry led to poor working conditions for a large numbers of digital visual effects artists. To illustrate, fixed price contracts mean that payment from Hollywood to the digital visual effects companies is subject to the completion of the agreed digital visual effects shots, not the time expended and resources used. Therefore, the profitability of digital visual effects companies depends on accurately estimating the cost of digital visual effects projects prior to submitting bids and management of cost during the project. However, due to the creative and spontaneous nature of the film making process, it has been reported by various professionals in the current industry that it is difficult to estimate and manage the costs for delivering digital visual effects shots. The current situation is that the majority of the digital visual effects companies are operating with thin profit margins therefore additional costs generated by circumstance such as changes in creative aspects of shots they bid for would add financial pressures. My conversations with digital visual effects artists working in the current industry shows that shot changes tend to happen. For example, according to a senior compositor in Cinesite, the creative decision makers for the *Harry Potter* series (2001 to 2011) from the studio side only managed to decide on the intended look of the computer-generated nose of Voldemort half way through the project. Therefore, Cinesite has to modify and adjust every shot that involved the nose, which had already been done in a previously agreed version. In order to handle the additional costs on top of their thin profit margin, digital visual effects companies tend to require their artists to work overtime without correctly remunerating them. This has left many digital visual effects artists with poor working conditions. Many artists I talked to while conducting a survey informed me that a considerable number of digital visual artists were having temporary contracts, therefore they have to work longer hours to meet tight deadlines to satisfy the needs of clients and ensure they are considered for renewal when the end of their employment contract approaches.

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Thirdly, increasing adaptability could help to further realise the potential of human creativity in digital visual effects practice. The majority of the participants in my survey believed that their creativity and the efficiency of their performance in digital visual effects related tasks are affected by their working conditions. Some of them mentioned that the long working hours are counterproductive to their creativity in the delivery of the digital visual effects shots. The sense of pressure and insecurity is not very helpful for them to be creative. It is also mentioned that their creativity is affected by how motivating the culture is in the digital visual effects company they work for and the quality of teamwork. Issues relating to the working conditions tend to create tension between the digital visual effects companies and the artists they employ. This point is supported by the study of the interview with the Co-Founder of the former Rhythm and Hues in the documentary *Life After Pi* (2014) and my interview with Scott Ross. The Co-Founder of the former Rhythm and Hues particularly mentioned that extended working hours and other related issues have a negative impact on the company culture and its relationship with employees. Scott Ross also pointed out that digital visual effects artists tend to blame their company and have negative thoughts about the digital visual effects companies employing them rather than the Hollywood studios for working conditions problems. Increases in the adaptability and its potential benefits for the profitability of the digital visual effects companies could make better working environments for the professionals in the current industry. Therefore, it could have a positive impact on the creativity of the digital visual effects artists. Apart from that, exploring the opportunities of alternative markets in world popular cinema could lead to the cinematic representation of wider themes through the exploitation of digital visual effects. A case in point is the digital character Wuba in *Monster Hunt* (2015). *Monster Hunt* (2015) is a Chinese digital visual effects film. Industrial Light and Magic was part of the digital visual effects team for this film. One of the main theme of *Monster Hunt* (2015) is the parental bond, which is a key aspect of Confucian culture (Pan, 2015). This film depicted the development of the relationship between a computer-generated monster, named Wuba, and his adopted father. For example, the last scene of this film displayed the father's sense of responsibility he had for Wuba and the difficulties he faced with letting him go on a separate journey.

This research has proved that it is possible to increase the adaptability of the business model of digital visual effects companies involved in Hollywood films. My participation and observation in a practice-based computer graphic course allowed me to have a greater understanding of the hard work involved in the delivery digital visual effects. In the second

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year of conducting this research, I audited a computer animation unit delivered by the Computer Science Department, The University of Bristol. This unit was focused on studying Autodesk Maya, which is an industry standard packaging software for animation and modelling tasks in the digital visual effects pipeline. Through the hands-on sections of this unit, I realised that, even after training, complicated operations in Maya can take many long hours of concentrating on computer screens, as well as attention to detail in simple tasks such as modelling of small buildings. This course also gave me a chance to observe the practice of other students. Part of the assessment of this unit was to model the Wills Memorial Building at The University of Bristol. All of the students were very enthusiastic, as the lecturer mentioned that the most realistic model would be produced using a 3D printer. I saw the other students out taking reference photos of the building from almost all angles that they could possibly manage both inside and outside the building and spend long days on their computers, in order to achieve a realistic look. At the end of this unit, the lecturer commented that it was the number of reference photos and every detail added that enabled the “magic moment” to happen. The “magic moment” was when the building stopped look like a toy and began to look real. Therefore, understanding the great efforts made by artists in delivering digital visual effects motivated me to find solutions for the digital visual effects artists in the current industry, who have been facing issues such as poor working conditions and instability of employment.

This research has pointed out it is essential to study the aesthetic aspects and the audience of digital visual effects in relation to the economic innovation of the business model. Problems with actions taken so far to address the issues of the fixed bidding model in the industry are largely caused by a limited consideration of a single aspect of a complex network surrounding digital visual effects practice. For example, it has proved difficult to unionise employees of digital visual effects companies in the UK as this action was just focusing on addressing employment issues. Therefore, it would be hard for digital visual effects companies to accept any request of representation from unions. Furthermore, actions and campaigns intended to change the fixed contract model also experienced difficulties due to the overdependence on Hollywood clients. Professionals have considered that it is the gap between the affordability of conglomerate Hollywood and world popular film industries that led to the overdependence. While revealing the network surrounding digital visual effects practice, this research attempted to find out if studying the global audience of the photorealistic digital visual effects produced by digital visual effects companies in the transnational network of Hollywood cinema would inform potential markets for those companies. Evidence presented in Chapter 5 illustrates that



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the Chinese multiplex cinema audience contributed to an emerging market where companies such as Pixomondo have gained profitable contracts. To a certain extent it is possible to balance the expertise and facilities those digital visual effects companies have in producing high quality photorealistic digital visual effects with the affordability of film industries outside Hollywood through working on the aesthetics and creative aspects of films that have digital visual effects. The examples of the aesthetics and creative aspects include the setting of the story, the narrative, the design and development of digital characters. For example, the setting of the film *Impossible* (2015) was on contemporary Earth, which allowed a large amount of screen time to be focusing on the live action performance of human characters. Therefore, the number of digital visual effects shots could be reduced to maintain the sense of realism and quality despite having a lower budget.

### 6.4 Recommendations for Further Research

As demonstrated in the section above, it is beneficial for the future development of the digital visual effects industry and the wellbeing of the practitioners to explore the possibilities of collaboration with the world popular film industries outside Hollywood. The direction for overcoming the barriers of affordability of world popular film industries in facilitating photorealistic digital visual effects is the innovation of creative approaches to digital visual effects practice. Therefore, I intend to recommend further research into the possible collaboration between digital visual effects companies and world popular film industries; as well as creative strategies for the adoption of the aesthetics of Hollywood digital visual effects in world cinema. More specifically, further understanding of the digital visual effects market in China, the exploration of the digital visual effects markets in other industrial locations of the current digital visual effects businesses such as the UK and the development of creative content to accommodate their budget and any specific needs of domestic audiences.

#### 6.4.1 The Transnational Digital Visual Effects Practice in China

Possible case studies could be conducted into another Chinese digital visual effects film *Monster Hunt* (2015) for more in-depth understanding of the adoption of Hollywood digital visual effects in the Chinese film industry. *Monster Hunt* (2015) is another example of a Chinese that has a team of artists who have Hollywood experience working on producing digital visual effects shots. This film depicts a fictional ancient China, which involves fantasy elements such as computer-generated monsters. The digital visual effects company Industrial

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Light and Magic was involved in the design of digital visual effects in this film. A study of the computer-generated monster characters (Figure 33) shows a degree of resemblance to the character Shrek in terms of their body shape and movements. The digital visual effects supervisor of this film was previously involved in the animation for the film *Shrek* (Andrew Adamson and Vicky Jenson, 2001). Therefore more research could be conducted into the approach this film took to utilise the aesthetic and technique of Hollywood digital visual effects.



*Figure 33 Digital visual effects shots in Monster Hunt (2015)*

More research could also be conducted into understanding the mentality and taste of Chinese audiences in relation to transnational digital visual effects practice. For example, a study of the mentality of audiences for Chinese science fiction films could be conducted to inform the potential adoption of the aesthetics of digital visual effects in domestic Chinese films. While studying the recent films produced by China Film Group, I noticed that a science fiction film called *The Wandering Earth* (Guo Fan, 2019) has been released last year. This is an adaptation of a novel I read with the same title when I was fifteen years old. I remembered that this novel as well as other science fiction stories were also popular among my peers at school. Apart from books related to my schoolwork this genre was encouraged by parents and teachers because they thought this would help me understand some science, maths and logic concepts to help improve my academic performance. Novels published in a popular magazine called *Science Fiction World* could be considered ‘coming of age’ as they initiated my peers and I thinking about topics such as the impact of technology on human society, the future of civilisation, the origins of the universe and the meaning of life. The themes in these novels often led to long

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discussions among students in my high school. The imagined world depicted in these science fiction stories were part of a limited means of escape from the heavy school workload in preparation for college entrance exams and the pressure from parents' expectations. A brief chat with one of my school friends regarding the cinematic adaptation of *The Wandering Earth* suggests they wish to see a photorealistic depiction of the science fiction elements from the novel. For example, one of my friends mentioned that, "it would be a dream come true to see the world I imagined to be vivid and believable on the screen." She was not sure that, with the current technology available in China, it would be able to be attained to the same level as Hollywood films such as in the latest Star Wars films. This leads to the question: what is the mentality of the post 1980s and 1990s generation in China towards cinematic adaptation of Chinese science fiction novels? How does this mentality impact digital visual effects practice in this type of film?

Another direction for further research is how digital visual effects practice in Chinese films could be influenced by the intention of the Chinese film industry to explore international markets. A study of publications in Chinese mainstream newspapers such as People's Daily shows that the State Administration of Press, Publication, Radio, Film and Television in China intends to promote the export of Chinese films through establishing an overseas distribution network. According to an article published in the online platform of People's Daily<sup>153</sup>, they believe this will provide long-term economic benefits for the Chinese film industry and increase the prominence of Chinese culture. The Chinese digital visual effects film *Monster Hunt 2* (Raman Hui, 2018) is set to be released in both China, the USA and the UK during the upcoming Lunar Calendar New Year 2018. I recently noticed the film being advertised on bus stops in Bristol city centre. A few questions could be asked: What type of creative content would be popular for audiences in both the domestic and foreign markets of Chinese films? What role could digital visual effects play in producing such content?

My current research into Alibaba Pictures reveals that the group has a strategy to investigate possibilities in overseas film markets through the use of digital visual effects. In particular, Alibaba Pictures has acquired the film rights to *Warriors*, which is a British novel series about

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<sup>153</sup> The article on People's Daily is available online: <http://media.people.com.cn/n1/2016/0215/c40606-28123225.html>

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warrior cats published by HarperCollins. According to Alibaba Pictures Group President Zhang Wei<sup>154</sup>, “Alibaba Pictures is planning to turn ‘Warriors’ into a film franchise that will bring to life the spectacular animal and jungle worlds depicted in the novels, using world-leading visual effects.” This raises the question: would the production of Warriors inform the collaboration and connection between the Chinese film industry and digital visual effects companies in the UK? As discussed in previous chapters, British digital visual effects companies such as MPC have expertise and experience in producing photorealistic digital animals and jungle landscapes from their work on *The Jungle Book* (2016). How would film tax incentives of the British government affect the potential collaboration between Alibaba Pictures and British digital visual effects companies? Alibaba Pictures Group have established a co-production agreement with Heyday Films in the UK. The founder of Heyday Films, David Heyman, has been appointed as the producer of the *Warriors* franchise. David Heyman has previously worked as the producer of the Hollywood studio, Warner Brothers film adaptation of *Harry Potter*, another British novel series.

### 6.4.2 Hollywood Digital Visual Effects Companies in the UK and European Film Industry

Apart from China, more research could be conducted into the collaboration and connection between the globally located Hollywood digital visual effects companies and the film industries of countries such as the UK. As studied in this research, many digital visual effects companies are based in the UK such as MPC and Double Negative. My most recent cinema-visit and conversations with British everyday audience shows that it is necessary to research into the market potential in the UK for the photorealistic digital visual effects in Hollywood films such as the *Star Wars* series. A few days before Christmas 2017, when I was typing words into computer, my husband asked, “I know you are busy. But friends are asking if we could watch the new *Star Wars* film when we are back home. It is a tradition thing”, he added in the best tone he could manage. He explained to me before watching *Star Wars* films was one of the most memorable shared activities with his schoolmates. The release of a new *Star Wars* film provided an almost ideal activity for these school friends to catch up, who embarked on different journeys and moved to other cities to pursue their life goals. In 2015 when *Star Wars Episode VII: The Force Awakens* was released in cinema, they established a new tradition of

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<sup>154</sup> The interview is available at Variety: <http://variety.com/2016/film/asia/alibaba-pictures-film-rights-warring-cats-book-series-warriors-1201895983/>

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watching the upcoming *Star Wars* stories together, when they returned to their hometown for Christmas. “In that case I think the answer is yes,” I said.

The cinema I visited for *Star Wars Episode VIII: The Last Jedi* (Rian Johnson, 2017) was located adjacent to an out of town retail centre near Bridgend in Wales. While watching trailers for the upcoming films such as *Alita: Battle Angel* (Robert Rodriguez, 2019), I realised the screen room was packed with families and kids holding ice creams, bags of jellybeans or toy lightsabers; as well as early career professionals. A noticeable number of them were carrying shopping bags with words highlighting Christmas sale, and a few of them were wearing sweatshirts with the prints of *Star Wars* characters and space-crafts. After watching the film, audience members like my husband and his school friends tended to continue their social activities in nearby café and restaurants, which involved conversation about the film they just watched; and the consuming of tea and cakes. Through conversation with these friends, I realised that Hollywood’s approach to digital technology; as well as the photorealism aesthetics of digital visual effects were gradually accepted and considered as “enjoyable” by them. These friends, who were lawyers, engineers, school teachers and store managers, were members of the everyday audience in the UK. According to them, they witnessed the release of *Star Wars Episode 1: The Phantom Menace* in 1999. Parents dropped them at the cinema then they went shopping, while their children were in the cinema.

I asked “Do you still like the films even though part of them were not real?” I carefully phrased my question and trying to be sensible of their observable emotional attachments to the *Star Wars* Series, “I mean the parts that were computer-generated imagery.” I can still remember the audible protectiveness in their voices in response to my slightly critical opinions about the character development of Rey in *Star Wars Episode VII: The Force Awakens* (2015). A few of them said “That is where the fun comes from”. They further explained that they were aware to a certain degree that there were computer-generated shots because “the *Star Wars* series was depicting creatures and events that were just not possible in the real world.” However, they thought “that is how it could look like if these events were possible to happen in reality.” Then they used the phrases such as “exciting” and “fulfilling” to describe their viewing experience. For example, one of them said “Seeing what you can only imagine in your head look real on the big screen is exciting.” Another added “most of us had dreamed about having space adventures. Those believable computer-generated shots added more material and inspiration for our own imaginations.” Therefore, a study of the mentality and taste of British everyday

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audiences could shed light on the possible market for digital visual effects in the popular film industry in the UK.

It is also important to study the existing collaboration between British digital visual effects companies and European film industries in the *Paddington* franchise and *A Monster Calls* (J.A. Bayona, 2016). The London-based digital visual effects company Framestore was involved in the delivery of digital visual effects in the *Paddington* franchise (Paul King, 2014 and 2017). This franchise is a co-production between Studio Canal and Heyday Films, which depicts the adventures of a bear named Paddington in London. Another UK-based digital visual effects company, MPC was involved in generating the digital visual effects in *A Monster Calls* (2016), which is produced by European film production companies such as Apaches Entertainment. Research into these two films could shed light on how to balance the level of photorealism and the affordability of digital visual effects through the innovation of creative approaches. In *Paddington* (2014) the computer-generated bear character displayed a degree of photorealism aesthetics, especially in the look of his hair and texture of his skin, nose, eyes and clothing. However, his movement was not constrained by the need to have a realistic representation of a real bear. It still appears photorealistic and believable, because of the fantasy nature of this character and the narrative of this film. In this film Paddington is an imagined bear cub that comes from the forests of Peru. His complex interaction with multiple live action characters appeared seamless, despite the flexibility in his movement. According to the compositing supervisor of *Paddington* at Framestore the team were involved in the early stages of this film and the character development of Paddington<sup>155</sup>. They intended to achieve a more real animal look for Paddington compared with the original 1950s version, which looked more like a teddy bear. Their aim was to combine the real animal look with human-like characteristics, therefore it could be easier for audiences to relate to him. In *A Monster Calls* (2016) the adoption of photorealism is evident in aspects such as the texture of a computer-generated visual elements of the monster in this film. This monster was an imagined character in the mind of a little boy to manage the sadness of losing his mother. The main theme of this film was the way to deal with the perspective of losing a family member. Therefore, a large amount of the screen time was devoted to live action performance. The scene where the

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<sup>155</sup> The interview with professionals in Framestore regarding the character development of *Paddington* is available online: <https://www.youtube.com/watch?v=4ViSHOSDcCY>

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monster appeared was meant to be purely in the head of the boy. This means there is flexibility for the design of the movement of this monster.

Overall, the study of the transnational digital visual effects network reveals that even though a great deal of digital technology is involved in producing digital visual effects in Hollywood films the practice of digital visual effects artists and the aesthetics of digital visual effects is related to complex factors such as labour, time, market, budgeting, business model and human creativity.

## **Filmography:**

*Arrival of a Train at La Ciotat* (Auguste and Louis Lumière, 1896)

*The Vanishing Lady* (Georges Méliès, 1896)

*The Famous Box Trick* (Georges Méliès, 1898)

*A Trip to the Moon* (Georges Méliès, 1902)

*Safety Last* (Fred Newmeyer and Sam Taylor, 1923)

*Wings* (William Wellman and Harry d'Abbadie d'Arrast, 1927)

*Under The Rooftops of Paris* (René Clair, 1930)

*Roman Holiday* (William Wyler, 1953)

*The Jungle Book* (Wolfgang Reitherman, 1967)

*Star Trek: The Motion Picture* (Robert Wise, 1976)

*Star Wars Episode IV: A New Hope* (George Lucas, 1977)

*Star Wars Episode V: The Empire Strikes Back* (Irvin Kershner, 1980)

*Star Wars Episode VI: Return of the Jedi* (Richard Marquand, 1983)

*Terminator 2: Judgement Day* (James Cameron, 1991)

*Jurassic Park* (Steven Spielberg, 1993)

*Independence Day* (Roland Emmerich, 1996)

*Babe: Pig in the City* (George Miller, 1998)

*Star Wars Episode I: The Phantom Menace* (George Lucas, 1999)

*The Fast and Furious* (Rob Cohen, 2001)

*Shrek* (Andrew Adamson and Vicky Jenson, 2001)

*Harry Potter and the Philosopher's Stone* (Chris Columbus, 2001)

*Lord of the Rings: The Fellowship of the Ring* (Peter Jackson, 2001)

*Lord of the Rings: The Two Towers* (Peter Jackson, 2002)

*Star Wars Episode II: Attack of the Clones* (George Lucas, 2002)

*Hero* (Yimou Zhang, 2002)

*Harry Potter and the Chamber of Secrets* (Chris Columbus, 2002)

*2 Fast 2 Furious* (John Singleton, 2003)

*Lord of the Rings: The Return of the King* (Peter Jackson, 2003)

*House of Flying Daggers* (Yimou Zhang, 2004)

*A World Without Thieves* (Feng Xiaogang, 2004)

*Harry Potter and the Prisoner of Azkaban* (Alfonso Cuarón, 2004)



*Star Wars Episode III: Revenge of the Sith* (George Lucas, 2005)  
*The Chronicles of Narnia: The Lion, the Witch and the Wardrobe* (Andrew Adamson, 2005)  
*The Promise* (Chen Kaige, 2005)  
*Harry Potter and the Goblet of Fire* (Mike Newell, 2005)  
*The Fast and the Furious: Tokyo Drift* (Justin Lin, 2006)  
*Australia* (Baz Luhrmann, 2006)  
*Harry Potter and the Order of the Phoenix* (David Yates, 2007)  
*Crocodile Dreaming* (Darlene Johnson, 2007)  
*The Golden Compass* (Chris Weitz, 2007)  
*The Chronicles of Narnia: Prince Caspian* (Andrew Adamson, 2008)  
*If You Are the One* (Xiaogang Feng, 2008)  
*Red Cliff* (John Woo, 2008)  
*Fast and Furious* (Justin Lin, 2009)  
*Avatar* (James Cameron, 2009)  
*District 9* (Neil Blomkamp, 2009)  
*Star Trek* (J.J. Abrams, 2009)  
*Harry Potter and the Half-Blood Prince* (David Yates, 2009)  
*The Chronicles of Narnia: The Voyage of the Dawn Treader* (Michael Apted, 2010)  
*Inception* (Christopher Nolan, 2010)  
*Jungle Book* (TV Series 2010- )  
*Harry Potter and the Deathly Hallows Part 1* (David Yates, 2010)  
*Fast Five* (Justin Lin, 2011)  
*Warriors of the Rainbow: Seediq Bale* (2011, Wei Te-sheng)  
*Love Is Not Blind* (HuanTao Teng, 2011)  
*Hugo* (Martin Scorsese, 2011)  
*Rise of the Planet of the Apes* (Rupert Wyatt, 2011)  
*Transformers: Dark of the Moon* (Michael Bay, 2011)  
*We Bought A Zoo* (Cameron Crowe, 2011)  
*Harry Potter and the Deathly Hallows Part 2* (David Yates, 2011)  
*Amazing Spider Man* (Marc Webb, 2012)  
*Life of Pi* (Ang Lee, 2012)  
*Let the Bullets Fly* (Jiang Wen, 2012)  
*Skyfall* (Sam Mendes, 2012)  
*Inception* (Christopher Nolan, 2012)

*The Hobbit: An Unexpected Journey* (Peter Jackson, 2012)  
*Fast & Furious 6* (Justin Lin, 2013)  
*Gravity* (Alfonso Cuarón, 2013)  
*World War Z* (Marc Forster, 2013)  
*The Hobbit: The Desolation of Smaug* (Peter Jackson, 2013)  
*Star Trek: Into Darkness* (J. J. Abrams, 2013)  
*Roco Kingdom: The Desire of Dragon* (Yu Shengjun, 2013)  
*Life After Pi* (Scott Leberecht, 2014)  
*Godzilla* (Gareth Edwards, 2014)  
*Transformers: Age of Extinction* (Michael Bay, 2014)  
*Beijing Love Story* (Chen Si Cheng, 2014)  
*Dawn of the Planet of the Apes* (Matt Reeves, 2014)  
*Guardians of the Galaxy* (James Gunn, 2014)  
*The Breakup Guru* (Deng Chao, 2014)  
*Gone with the Bullet* (Jiang Wen, 2014)  
*Paddington* (Paul King, 2014)  
*The Hobbit: The Battle of the Five Armies* (Peter Jackson, 2014)  
*Furious 7* (James Wan, 2015)  
*The Theory of Everything* (James March, 2015)  
*Jupiter Ascending* (Lana Wachowski and Lilly Wachowski, 2015)  
*Star Wars Episode VII: The Force Awakens* (J.J. Abrams, 2015)  
*Jurassic World* (Colin Trevorrow, 2015)  
*Impossible* (Sun Zhou, 2015)  
*Lost in Hong Kong* (Xu Zheng, 2015)  
*The Chronicles of the Ghostly Tribe* (Lu Chuan, 2015)  
*Monster Hunt* (Raman Hui, 2015)  
*The Jungle Book* (Jon Favreau, 2016)  
*The Secret* (Wong Chunchun, 2016)  
*Passengers* (Morten Tyldum, 2016)  
*The BFG* (Steven Spielberg, 2016)  
*Star Trek: Beyond* (Justin Lin, 2016)  
*Independence Day: Resurgence* (Roland Emmerich, 2016)  
*Fantastic Beasts and Where to Find Them* (David Yates, 2016)  
*A Monster Calls* (J.A. Bayona, 2016)

*Rogue One: A Star Wars Story* (Gareth Edwards, 2016)  
*War for the Planet of the Apes* (Matt Reeves, 2017)  
*The Fate of the Furious* (F. Gary Gray, 2017)  
*Once Upon a Time* (Zhao Xiaoding and Anthony LaMolinara, 2017)  
*Paddington 2* (Paul King, 2017)  
*Star Wars: Episode VIII: The Last Jedi* (Rian Johnson, 2017)  
*Alita: Battle Angel* (Robert Rodriguez, 2019)  
*Iron Sky: The Ark* (Timo Vuorensola, 2018)  
*The Three Body Problem* (Fan Fan Zhang, 2018)  
*Monster Hunt 2* (Raman Hui, 2018)  
*The Wandering Earth* (Guo Fan, 2019)  
*Star Wars: Episode IX: The Rise of Skywalker* (J.J. Abrams, 2019)

**References:**

Allen, M. (2002) "The Impact of Digital Technologies on Film Aesthetics", in D. Harries (ed.) *The New Media Book*, BFI: Publishing: London.

Aranburu, A. (2017). The Film Industry in China: Past and Present. *Journal of Evolutionary Studies in Business*, 2(1), pp.1-28.

Base-FX. (2017). *Shows - Leading The Revolution*. [online] Available at: <http://www.base-fx.com/shows/> (Accessed 7 Nov. 2017).

Bazin, A. (2005). *What is Cinema?* Berkeley, Los Angeles and London: University of California Press.

BECTU. (2016). *Bare necessities missing for workers at MPC - BECTU*. Available at: <https://www.bectu.org.uk/news/2575> (Accessed 5 Oct. 2017).

Belton, J. (2002). Digital Cinema: A False Revolution. *Leonardo Journal*, 100, 98-114.

Belton, J. (2012) 'Introduction: Digital Cinema', *Film History: An International Journal*, 24(1), 131-134.

Berlina, T. (2016). *Hollywood Aesthetics: Pleasure in American Cinema*. New York: Oxford Press.

Berton, J. A. (1990). 'Film Theory for the Digital World-Connecting the masters to the new Digital Cinema', *Leonardo*, 5-11.

Bickman, L. (1997). *The sage handbook of applied social research methods*, Sage Publications: CA and Thousand Oaks.

Bizony, P. (2001). *Digital Domain: the leading edge of digital visual effects*, Arnold: London.

## References

- Bolter, J. and Grusin, R. (2003). *Remediation*. Cambridge, Mass.: MIT Press.
- Bordwell, D. (1985). *Narrative in the Fiction Film*. Madison: The University of Wisconsin.
- Bordwell, D. (1999). *On the History of Film Style*. London: Harvard University Press.
- Bolter and Gromala. (2003). *Windows and Mirrors: Interaction Design, Digital Art, and the Myth of Transparency*, The MIT Press: Cambridge, MA.
- Bourdieu, P. (1993). *The Field of Cultural Production: Essays on Art and Literature*, Polity Press: Cambridge.
- Box Office Mojo. (2012). *Hugo – Box Office Mojo*  
Available at: <https://www.boxofficemojo.com/release/r12438497793/> (Accessed 1 Feb. 2020).
- Box Office Mojo. (2014). *Transformers: Age of Extinction (2014) - Box Office Mojo*. Available at: <http://www.boxofficemojo.com/movies/?id=transformers4.htm> (Accessed 3 Dec. 2017).
- Box Office Mojo. (2016). *Independence Day: Resurgence (2016) - Box Office Mojo*. Available at: <http://www.boxofficemojo.com/movies/?id=id42.htm> (Accessed 9 Dec. 2017).
- Bromley, D. (1986). *The case study method in psychology and related disciplines*, Wiley: Chichester, Great Britain.
- Brinkmann, R. (2008). *The Art and Science of Digital Compositing*, Morgan Kaufmann Publications: the U.S.
- Buchanan, D.A. and Huczynski (2010). *Organizational Behaviour, Seventh Edition*, Pearson Education Limited.
- Byrd, W. (1991). *The Market Mechanism and Economic Reforms in China*. Armonk, N.Y.: M.E. Sharpe.

## References

- Cai, S. (2017). *Contemporary Chinese Films and Celebrity Directors*. Singapore: Palgrave Macmillan.
- Callon, M., Law, J. and Rip, A. (1986). *Mapping the dynamics of science and technology*. Basingstoke: Macmillan.
- Calzетtoni, F. and Parker, S. (1995). *The Lumière Brothers and the Cinema*. London: Belitha.
- Castells, M. (1996). *The Rise of the Network Society*, Blackwell Publishers: UK.
- Castells, M. (2000). *The Rise of the Network Society, The Information Age: economy, society and culture*, 2nd ed., Oxford: Blackwell.
- Castells, M and Zalom, C (2004). *The Network Society: a Cross-Cultural Perspective*, Edward Elgar: Cheltenham, UK and Northampton, MA, USA.
- Castells, M. Cardose, G. and Soete, L. (2006). *The Network Society From Knowledge to Policy*, Center for transatlantic Relations: Washington, DC, USA.
- Castells, M. (2010). *The Rise of the Network Society, The Information Age*, 2nd ed., Wiley-Blackwell: Chichester.
- Cavell, S. (1979). *The World Viewed: Reflections on the Ontology of Film*, Harvard University Press: the U.S. and London.
- China Film Stellar. (2017). *China Film Stellar, About us*. Available at: <http://www.zyxmmovie.com/other/about.html> (Accessed 4 Dec. 2017).
- China Film Digital Cinema Group. (2011). *About Us*. Available at: <http://yx.digifilm.com.cn/index.php/Yxabout/index> (Accessed 3 Dec. 2017).
- China SARFT. (2004). *Guidelines for the Development of Digital Cinema*. Available at: <http://dy.chinasarft.gov.cn/html/www/article/2011/012d8290906654454028819e2d789a1d.html> (Accessed 3 Apr. 2017).

## References

- Cieri, S., Muraca, A., Schwank, A., Preti, F. and Micilotta, T. (2016). The Jungle Book: art-directing procedural scatters in rich environments. [online] Available at: <http://dl.acm.org/citation.cfm?id=2947692>
- Cooke, P. (2007). *World Cinema's Dialogues with Hollywood*, Palgrave Macmillan: Basingstoke.
- Cram, C. (2007). Digital Cinema: the role of visual effects supervisor. *Film History: an International Journal*, 24(2), 169-189.
- Croteau, D. and Hoynes, W. (2003). *Media Society: Industries, Images and Audience*. London: Sage Publication.
- Daly, K. M. (2010). 'How Cinema Is Digital' in Einav, G., ed. *Transitioned Media: a Turning Point into the Digital Realm*, 135-147.
- Deuze, M. (2007). *Media Work*, Polity Press: Cambridge.
- Davise, D. (2011). *Digital Technology, Indexicality, and Cinema* *Rivista di estetica*, 51(1), 45-60.
- Denzin and Lincoln. (1998). *Collecting and Interpreting Qualitative Material*, Sage Publications: London and New Delhi.
- Denzin and Lincoln. (2005). *The SAGE Handbook of Qualitative Research*, Sage Publications: U.S.A.
- Dijk, J. v. (1999). *The Network Society: Social Aspects of New Media*, SAGE: London.
- Dwyer, T. (2010). *Media Convergence*. Berkshire: Open University Press.
- Erickson, J. (2001). *Rock Formations and Unusual Geological Structures*. 2nd ed. New York: Facts on File.

## References

Estall, R. and Buchanan, R. O. (1961). *Industrial activity and economic geography: a study of the forces behind the geographical location of productive activity in manufacturing industry*, Hutchinson: London.

Ezra, E. (2000). *Georges Méliès*. Manchester: Manchester University Press.

Failles, I (2012). Life of Pi: A tiger's tale. *FX-Guide* Available at: <https://www.fxguide.com/featured/life-of-pi/>

Fairservice, D. (2001). *Film Editing: History, Theory and Practice*. Manchester: Manchester University Press.

Feng, G. (2017). The dynamics of the Chinese film industry: factors affecting Chinese audiences' intentions to see movies. *Asia Pacific Business Review*, 23(5), pp.658-676.

Finney, A. (2010). *The International film Business: A market guide beyond Hollywood*, Routledge: London and New York.

Flew, T. (2007). *Understanding global media*, Palgrave Macmillan: the UK and New York.

Flick, Kardorff and Steinke. (2004) *A Companion to Qualitative Research*, Sage Publications: London.

Fradley, M. (2010). 'The Contemporary Hollywood Film Industry', *Film Quarterly*, 63(4), 80-81.

Frei, V. (2017). *The Jungle Book: Adam Valdez - VFX Supervisor - MPC - The Art of VFX*. The Art of VFX. Available at: <http://www.artofvfx.com/the-jungle-book-adam-valdez-vfx-supervisor-mpc/> (Accessed 2 April. 2017).

Frye, B. L. (2006). 'New digital cinema: Reinventing the moving image', *Cineaste*, 31(3), 78-78.

Fuller, M. (2008). *Software study*, The MIT Press: Cambridge, London and Massachusetts.



## References

FX-Guide. (2011). *Hugo: a study of modern inventive visual effects*. Available at: <https://www.fxguide.com/featured/hugo-a-study-of-modern-inventive-visual-effects/>

(Accessed 5 Oct. 2017).

FX-Guide. (2015). *Unionizing efforts in the UK*. Available at: <https://www.fxguide.com/quicktakes/unionizing-efforts-in-the-uk/> (Accessed 9 Jan. 2017).

FX-Guide. (2016). *Part 1: Rogue One shows its Force*. Available at: <https://www.fxguide.com/featured/part-1-rogue-one-shows-its-force/> (Accessed 16 Jun. 2017).

Gallagher, J. (1989). *Film Directors on Directing*. New York: Greenwood Press.

Gibson, P. C. and Hill, J. (2000). *World Cinema: Critical Approaches*, Oxford University Press: Oxford.

Giralt, G. (2010). Realism and realistic representation in the digital age. *Journal of film and video*. 62(3), 3-16.

Global Times. (2016). *Chinese audiences unhappy with clumsy product placement - Global Times*. Available at: <http://www.globaltimes.cn/content/991371.shtml> (Accessed 15 Mar. 2017).

Goulekas, K. (2001). *Visual Effects in a Digital World*. London: Morgan Kaufmann.

Grau, O. (2007). *Media Art Histories*, MIT Press: New York.

Gress, J. (2018). *Digital Visual Effects and Compositing*. US: Pearson Education.

Guynn, W. (2010). *The Routledge Companion to Film History*, Routledge: UK.

Haastrup, H. K. (1998). 'Contemporary Hollywood cinema', *Kosmorama*, (222), 102-104.

## References

- Hamid, R. (2006). 'The films of Tim Burton: Animating live action in contemporary Hollywood', *Cineaste*, 31(4), 92-94.
- Hamlyn, N. (2003). *Film Art Phenomena*, British Film Institution: London.
- Hamus-Vallee, R. (2002). 'Manipulating the pixels - The digital retouching of cinema', *Revue D Esthetique*, (41), 153-160.
- Handy, C. (1981). *Understanding Organizations, Penguin education*, 2nd ed., Penguin Books: Harmondsworth.
- Harries, D. (2002). *The New Media Book*, London: British Film Institute.
- Hassan, R. and Purser, R. E. (2007). *24/7: time and temporality in the network society*, Stanford Business Books, Stanford, Calif.: Stanford Business Books.
- Herbert, T. (1976). *Dimensions of Organizational Behaviour*, Macmillan: New York.
- Herman, E. (2001). *The global media: the new missionaries of corporate capitalism*, Continuum: London.
- Hillier, J. (2000). 'Contemporary Hollywood Cinema', *Screen*, 41(2), 253-256.
- Hinde, S., Smith, T., & Gilchrist, I. (2018). Does narrative drive dynamic attention to a prolonged stimulus? *Cognitive Research: Principles and Implications*, 3(45). Available at: <https://www.doi.org/10.1186/s41235-018-0140-5> (Accessed 1 Feb 2020).
- Holstein and Grubrium. (1995). *The Active Interview*, Sage Publications: London and New Delhi.
- Holt, F. and Lapenta, F. (2010). Introduction: Autonomy and Creative Labour. *Journal for Cultural Research*, 14(3), pp.223-229.

## References

Hozic, A. (2001). *Hollyworld: space, power, and fantasy in the American Economy*, Cornell University Press: Ithaca.

HPRC. (2012). *The History of the People's Republic of China: the innovation of film distribution and exhibition and establishment of Cinema Chain System*. Available at: [http://www.hprc.org.cn/leidaxinxi/whjywj/201210/t20121023\\_202087.html](http://www.hprc.org.cn/leidaxinxi/whjywj/201210/t20121023_202087.html) (Accessed 4 Nov. 2017).

Iosifidis, P. (2010). Pluralism and Concentration of Media Ownership: Measurement Issues. *Javnost - The Public*, 17(3), pp.5-21.

Jacobs, L. (1969). *The emergence of film art: the evolution and development of the motion picture as an art, from 1900 to the present Front Cover*. New York: W W Norton & Co Inc.

Jenkins, H. (2006). *Convergence Culture: Where old and new media collide*. London: New York University Press.

Jones, C., Lorenzen, M. and Sapsed, J. (2015). *Oxford Handbook of Creative Industries*. Oxford: Oxford University Press.

Kackman, Binfield, Payne, Perlman and Sebok (2010). *Flow TV: Television at the age of media convergence*. Oxon: Routledge.

Kaplan. (2009). 'Toward Interdisciplinary Film Studies', *Cinema Journal*, 49(1), 187-191.

Kawashima, N. (2011). 'Are the global media and entertainment conglomerates having an impact on cultural diversity? A critical assessment of the argument in the case of the film industry', *International Journal of Cultural Policy*, 17(5), 475-489.

Kehr, D. (2006). 'New digital cinema: Reinventing the digital image', *Film Comment*, 42(1), 77-77.

## References

- Keil, C. (2002). *Early American cinema in transition*. Madison, Wis.: University of Wisconsin Press.
- Kerlow, I. (2009). *The art of 3D computer animation and effects*. Hoboken, N.J.: John Wiley & Sons.
- Kerr, P. (1986). *The Hollywood Film Industry*, Routledge and Kegan Paul plc: London.
- Kiwitt, P. (2012). 'What Is Cinema in a Digital Age? Divergent Definitions from a Production Perspective', *Journal of Film and Video*, 64(4), 3-22.
- Kracauer, S. (1997). *Theory of film: The Redemption of Physical Reality*, Oxford University Press: London and New York.
- Krämer, P. and British Film Institute. (2007). *The Big Picture: Hollywood cinema from Star Wars to Titanic*, London: British Film Institute.
- Kuleshov, V. (1974). *Kuleshov on Film*, University of California Press: Berkeley.
- Kuperberg, M. (2012). *Guide to Computer Animation*. Oxford: Focal Press.
- Lambert, N. (2011). 'From Imaginal to Digital: Mental Imagery and the Computer Image Space', *Leonardo*, 44(5), 439-443.
- Lanier, L. (2012). *Digital Compositing with Nuke*. London: Focal Press.
- Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford University Press: Oxford.
- Lawson-Borders (2006). *Media Organizations and Convergence: Case Studies of Media Convergence Pioneers*. Mahwah: Lawrence Erlbaum Associates.
- Le Grice, M. (2001). *Experimental cinema in the digital age*, BFT: London.

## References

- Liemt, G. V. (1992). *Industry on the move: causes and consequences of international relocation in the manufacturing industry*, International Labour Office: Geneva.
- Lievrouw and Livingstone. (2009). *New Media*, Sage: London.
- Lindsay, V. (1922). *The Art of Moving Picture*, Norwood Press: U.S.A.
- Lister, Dovey, Giddings, Grant and Kelly. (2009). *New Media A Critical Introduction*, Routledge: Abingdon.
- Lukinbeal, C. and Zimmermann, S. (2006). 'Film geography: A new subfield', *Erdkunde*, 60(4), 315-325.
- Lu, Y. (2016). The malling of the movies: Film exhibition reforms, multiplexes, and film consumption in the new millennium in urban China. *Journal of Chinese Cinemas*, 10(3), pp.205-227.
- Malina, R. F. (1990). 'Digital image, digital cinema – the work of art in the age of post mechanical reproduction', *Leonardo*, 33-38.
- Maltby, R. (2003). *Hollywood Cinema*, Blackwell Publishing, New York
- Manovich, L. (2001). *The language of new media*, The MIT Press: London.
- Manovich, L. (2007). 'Understanding Hybrid Media' (Viewable at [www.manovich.net](http://www.manovich.net).)
- Manovich, L. (2008). *Software Takes Command*, (Viewable at web [http://softwarestudies.com/softbook/manovich\\_softbook\\_11\\_20\\_2008.pdf](http://softwarestudies.com/softbook/manovich_softbook_11_20_2008.pdf))
- Marzol Aranburu, A. (2016). *Creative Industries in Developing Countries. The Film Industry in China*. [online] Hdl.handle.net. Available at: <http://hdl.handle.net/2445/101724> (Accessed 3 Nov. 2017).
- Matthews, P. (1998). 'Contemporary Hollywood cinema', *Sight and Sound*, 8(11), 32-32.

## References

- McClellan, S. (2008). *Digital Storytelling: The Narrative Power of Visual Effects in Film*, The MIT Press: US.
- McDonald, P. and Wasko, J. (2011). *The contemporary Hollywood film industry*. Malden, MA (u.a.): Blackwell.
- McLuhan, M. (1968). *Understanding media: the extension of man*, McGraw-Hill: New York.
- Mengniu Dairies. (no date). *About us: Cooperate Profile*. Available at: [http://www.mengniuir.com/html/about\\_profile.php](http://www.mengniuir.com/html/about_profile.php) (Accessed: 16 Sep. 2017).
- Mengniu Dairies. (2018). *China Mengniu Dairy Company Limited*. Available at: [http://www.mengniuir.com/html/ir\\_highlights\\_ar.php](http://www.mengniuir.com/html/ir_highlights_ar.php) (Accessed 3 Dec. 2017).
- Merriam, S. (2009). *Qualitative Research A Guide to Design and Implementation*, Jossey Bass: San Francisco.
- Metz, C. (1974). *Film Language: A Semiotics of the Cinema*, Oxford University Press: the UK.
- Meyer-Clement, E. (2016). *Party Hegemony and Entrepreneurial Power in China*. Routledge: London.
- Miller, T. (2005). *Global Hollywood 2*, BFI: London.
- Montgomery, L. (2010). *China's Creative Industries*. Cheltenham: Edward Elgar.
- Moul, C. (2005). *A Concise Handbook of Movie Industry Economics*, Cambridge University Press: The United States.
- Murray, S. and Australian Film Commission. (1994) *Australian Cinema*, St. Leonards: N.S.W.
- Nakamura, L. (2009). 'Digital media in Cinema Journal, 1995-2008', *Cinema Journal*, 49(1), 154-160.

## References

- Neale, S. and Smith, M. (1998). *Contemporary Hollywood Cinema*. Oxon: Routledge.
- News.jnnc. (2017). *The delay of The Three Body Problem*. Available at: <http://news.jnnc.com/ent/2017/1215/617978.shtml> (Accessed 5 Dec. 2017).
- Nowell-Smith, G. (1996). *The Oxford History of World Cinema*, Oxford University Press: Oxford and New York.
- Okun and Zwerman (2013). *The VES handbook of visual effects: Industry Standard VFX Practice and Procedures*. Oxon: Focal Press.
- O'Regan, T. (1996) *Australian National Cinema, National cinemas series*, Routledge: London.
- Pan, G. (2015). *Social and biological implications of Confucianism*. London: Springer.
- Patton, M. (1980). *Qualitative Evaluation Methods*, Sage Publications: London.
- Patton, M. (2002). *Qualitative Evaluation Methods Third Edition*, Sage Publications: London.
- Perez, G. (1998). *The Material Ghost*, The Johns Hopkins University Press: U.S.A.
- Philpot, J. (2011). 'The Contemporary Hollywood Film Industry', *Journal of Film and Video*, 63(1), 71-72.
- Pick, A. and Narraway, G. (2013). *Screening nature*. Oxford: Berghahn Books.
- Pintea, P. (2004). *Special effects: an oral history*, Harry N. Abrams, Inc.: London
- Pitts, V.T. (2011). *Technologies of Culture: Digital Feature Filmmaking in New Zealand*, *New Cinemas: Journal of Contemporary Film*, 9 (1), 3-17
- Pixomondo. (2016). *Creative*. Available at: <http://www.pixomondo.com/creative/> (Accessed 3 Jan. 2018).

## References

- Popple, S. and Kember, J. (2004). *Early cinema*. London: Wallflower.
- Prince, S. (1996). True Lies: Perceptual Realism, Digital Images, and Film Theory. *Film Quarterly*, 49(3), pp.27-37.
- Prince, S. (2004). 'The Emergence of Filmic Artefacts: Cinema and cinematography in the digital era'. *Film Quarterly* 57 (3), 24-33.
- Prince, S. (2011). *Digital Visual Effects in Cinema: The Seduction of Reality*, Rutgers University Press, US.
- Purse, L. (2007). 'Digital heroes in contemporary Hollywood: Exertion, identification, and the virtual action body', *Film Criticism*, 32(1), 5-25.
- Purse, L. (2013). *Digital Imaging in Popular Cinema*, Edinburgh University Press: Edinburgh.
- Rabiger, M. and Hurbis-Cherrier, M. (2013). *Directing. Film techniques and aesthetics. 5th, rev. ed.* Oxford: Focal Press.
- Raw, L. (2010) 'Cinema in the Digital Age', *Journal of Popular Culture*, 43(4), 910-911.
- Rayner and Jonathan (2000). *Contemporary Australia Cinema: An Introduction*, Manchester University Press Manchester and New York.
- Robinson, D. (1993). *George Méliés: Father of film fantasy*. London: Museum of the Moving Image.
- Rodowick, D. (2007). *The virtual life of film*. Cambridge, Mass.: Harvard University Press.
- Roger B. Wyatt, (1999). The emergence of digital cinema. *Computers and the Humanities* 33-4
- Rombes, N. (2009). *Cinema in the Digital Age*, Wall-Flower Press: New York.



## References

Rosenthal, A. (2001). 'Contemporary Hollywood cinema', *Film Quarterly*, 54(4), 49-50.

Ross, S. (2012). 'Invitation to the Voyage: The Flight Sequence in Contemporary 3D Cinema', *Film History: An International Journal*, 24(2), 210-220.

Russell, C. (2004). New Media and Film History: Walter Benjamin and the Awakening of Cinema. *Cinema Journal*, 43(3), 81-85.

Schatz, T. (2004). *Hollywood: Cultural dimensions: ideology, identity and cultural industry studies*, Routledge: London.

Sebag-Montefiore, C and Zeitchik, S (2012). Chinese pay for product placement in Hollywood movies. Available at: <http://www.citethemrightonline.com/web-pages-with-individual-authors>

Seymour, M. (2011) Hugo: a study of modern inventive visual effects, FX-Guide. Available at: <https://www.fxguide.com/xfeatured/hugo-a-study-of-modern-inventive-visual-effects/?highlight=hugo>

Seymour, M. (2013) Gravity: vfx that's anything but down to earth, FX-Guide. Available at: <https://www.fxguide.com/xfeatured/gravity/>

Seymour, M. (2016). Out of the pages and into The Jungle Book. FX-Guide. Available at: <https://www.fxguide.com/featured/out-of-the-pages-and-into-the-jungle-book/>

Shail, R. (2007). *British film directors: a critical guide*, Edinburgh University Press: Edinburgh.

Shaviro, S. (2010). *Post-Cinematic Affect*, Zero Books: Ropley.

Silverman, D. (2004). *Qualitative Research Theory, Method and Practice*, Sage Publication: London and New Delhi.

South Eastern University. (2016). *Intercultural Communication: High and Low Context Cultures*. Available at: <http://online.seu.edu/high-and-low-context-cultures/> (Accessed 5 Nov. 2017).

## References

Stalder, F. (2006). *Manuel Castells: the Theory of the Network Society, Key Contemporary Thinkers*, Polity: Cambridge.

Street, S. (1997). *British National Cinema*. Oxon: Routledge.

Street, S. (2009). *British National Cinema, National Cinemas*, 2nd ed., Routledge: London and New York.

Stringer, J. (2003). *Movie Blockbusters*, Routledge: London and New York.

Su, W. (2016). *China's encounter with global Hollywood*. USA: University Press of Kentucky.

Taylor, C and Gibbs, G R. (2010). What is Qualitative Data Analysis (QDA)? (Accessed via Online QDA Website: [http://www.onlineqda.hud.ac.uk/Intro\\_QDA/what\\_is\\_qda.php](http://www.onlineqda.hud.ac.uk/Intro_QDA/what_is_qda.php)).

Tencent. (2017). About Tencent. Available at <https://www.tencent.com/en-us/abouttencent.html> (Accessed: 16 Sep. 2017)

Tencent. (2017). Tencent - Investor Relations. Available at: <https://www.tencent.com/en-us/investor.html> (Accessed 10 Sep. 2017).

The Hobbit VFX Breakdown, 2013, Online Video, (Accessed 19 Oct 2013), <http://www.youtube.com/watch?v=HFzRR5LJgjs>

Thomas, F. and Johnston, O. (1981). *Illusion of Life: Disney Animation*. New York: Walt Disney Publications.

Thomson-Jones, K (2008). *Aesthetics and Film*, Continuum international publishing group: London.

Thompson, K. (1985). *Exporting Entertainment America in the World Film Market 1907-34*. BFI Publishing: London.

## References

- Thompson, P., Parker, R. and Cox, S. (2015). Interrogating Creative Theory and Creative Work: Inside the Games Studio. *Sociology*, 50(2), pp.316-332.
- Thussu, D. (2007). *Media on the move: Global Flow and Contra-Flow*, Routledge: London and New York.
- Toyne, P. (1974). *Organisation, location and behaviour: decision-making in economic geography*, Macmillan: London.
- Turner, B. (2016). *The new Blackwell companion to social theory*. Chichester, West Sussex: Wiley Blackwell.
- Turnock (2012). 'The ILM Version: Recent Digital Effects and the Aesthetics of 1970s Cinematography', *Film History: An International Journal*, 24(2), 158-168.
- Umney, C. and Kretsos, L. (2015). "That's the Experience". *Work and Occupations*, 42(3), pp.313-334.
- Uva, C. (2002). 'Scenarios for digital cinema', *Ponte*, 58(5), 125-133.
- Veny, D. (2004). *Hollywood Economics How extreme uncertainty shapes the film Industry*. Routledge: London.
- VFX Forum. (2016). Fantastic Beasts but where to find Crew Credits? - VFX Forum. Available at: <http://vfxforum.org/2016/12/fantastic-beasts-find-crew-credits/> (Accessed 6 Jun. 2017).
- VFX Forum. (2016). "Statutory redundancy"? For Oscar-winners? Really? Available at: <https://vfxforum.org/2017/04/mpc-offer-absolute-minimum-redundancy-payments/> (Accessed 3 Dec. 2017).
- Vizcarrondo, T. (2013). Measuring Concentration of Media Ownership: 1976–2009. *International Journal on Media Management*, 15(3), pp.177-195.
- Webster, F. (2006). *Theories of Information Society*, Routledge: Abingdon.

## References

- Westwell and Kuhn. (2015). Pro-filmic event - Oxford Reference. Available at: <http://www.oxfordreference.com/view/10.1093/acref/9780199587261.001.0001/acref-9780199587261-e-0561> (Accessed 8 Feb. 2017).
- Whissel, K. (2010). 'The Digital Multitude', *Cinema Journal*, 49(4), 90-110.
- Wicuslab. (2014). EDL's and CDL's in a basic VFX Pipeline - WicusLabWicusLab. Available at: <https://wicuslab.com/edl-cdl-in-vfx-pipeline/> (Accessed 5 May 2017).
- Willemen, P. (2013). 'Indexicality, fantasy and the digital', *Inter-Asia Cultural Studies*, 14(1), 110-135.
- Williams, M. (1999). 'Contemporary Hollywood cinema', *Historical Journal of Film Radio and Television*, 19(1), 143-144.
- Willis. (2005). *New Digital Cinema: Reinventing the Moving Image*, Wallflower Press: UK.
- Wood, A. (2007). *Digital Encounters*, Routledge: London and New York.
- Wood, A. (2008). Proliferating Connections and Communicating Convergence. *The Fibreculture Journal*, 13.
- Wood, A. (2011). 'Digital afx: digital dressing and affective shifts in Sin City and 300', *New Review of Film and Television*, 9(3), 283-295.
- Wood, A. (2012). Where Codes Collide: The Emergent Ecology of Avatar. *Animation* 309 (7).
- Wood, A. (2015). *Software, Animation and the Moving Image: What's in the Box?* Basingstoke: Palgrave Macmillan.
- Wood, M., Miller, G. and Mitchell, D. (1996). *Cinema of unease: 40,000 years of dreaming, The century of cinema New Zealand and Australia*, Connoisseur/Academy Video from the British Film Institute: London.

## References

- Wright, S. (2008). *Compositing Visual Effects: Essentials for the Aspiring Artist*, Focal Press: Oxford, UK.
- Xu, G. (2007). *Sinascape: Contemporary Chinese Cinema*, Lanham: Rowman & Littlefield.
- Yili. (no date). Our Products. Available at:  
<http://www.yili.com/en/rest/reception/products/list?categoryId=24> (Accessed: 16 Sep. 2017).
- Yili. (2017). Yili--Investor Relations. Available at:  
<http://www.yili.com/en/rest/reception/articles/list?categoryId=5> (Accessed 3 Dec. 2017).
- Yeh, E. and Davis, D. (2008). Re-nationalizing China's film industry: case study on the China Film Group and film marketization. *Journal of Chinese Cinemas*, 2(1), pp.37-51.
- Zhang, P. (2003). The Theatre Chains: The Key of film Distribution and Exhibition Reforms. *Film Art*, 290(3), pp.14-16.
- Zhang, Y. (2004). *Chinese National Cinema*, Routledge: London.
- Zhu, Y. (2002). 'Chinese Cinema's Economic Reform from the mid-1980s to the mid-1990s', *Journal of Communication*, 52(4), 905-921.
- Zhu, Y. (2010). 'Commercialization and Chinese Cinema's Post-wave', *Consumption Markets & Culture*, 5(3).
- Zhu, Y. and Rosen, S. (2010). *Art, Politics, and Commerce in Chinese Cinema*. Hong Kong: Hong Kong University Press.
- Zinman. (2012). 'Digital's Analog, Experimental Past', *Film History: an International Journal*, 24(2), 131-134.
- Zuvela, D. (2012). 'A little light teasing: Some special affects in avant-garde cinema', *Journal of Media & Cultural Studies*, 26(4).

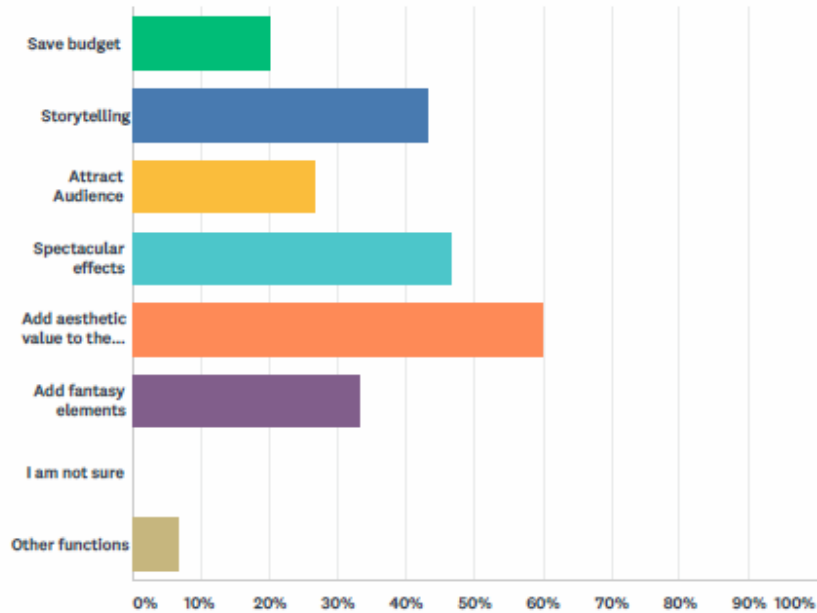
## References

Zwerman, S. and Okun, J. (2014). *The VES Handbook of Visual Effects*. Hoboken: Taylor and Francis.

## Appendix A: Survey - Digital compositing in contemporary popular cinema

Q1 \*What do you think are the main functions of photorealistic digital compositing in contemporary popular cinema?

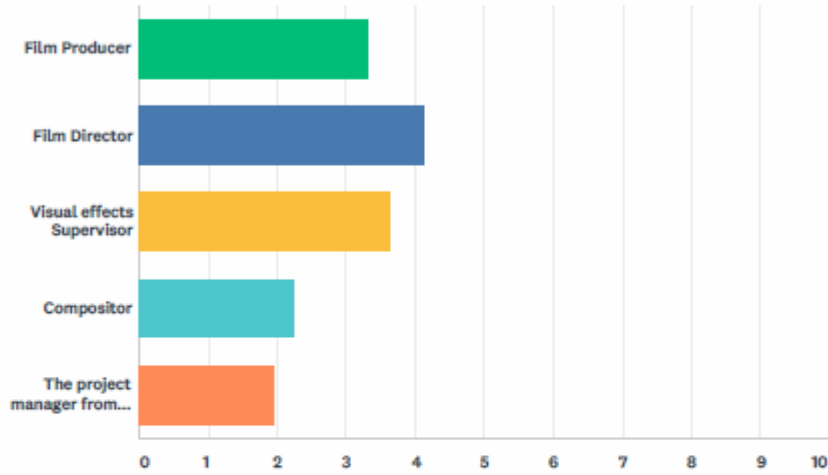
Answered: 30 Skipped: 1



| ANSWER CHOICES                   | RESPONSES |    |
|----------------------------------|-----------|----|
| Save budget                      | 20.00%    | 6  |
| Storytelling                     | 43.33%    | 13 |
| Attract Audience                 | 26.67%    | 8  |
| Spectacular effects              | 46.67%    | 14 |
| Add aesthetic value to the scene | 60.00%    | 18 |
| Add fantasy elements             | 33.33%    | 10 |
| I am not sure                    | 0.00%     | 0  |
| Other functions                  | 6.67%     | 2  |
| Total Respondents: 30            |           |    |

Q2 \*Whose ideas are most influential for the final look of composition?  
 (The following answer options is a ranked list, with 1 being most important and 6 least.)

Answered: 28 Skipped: 3

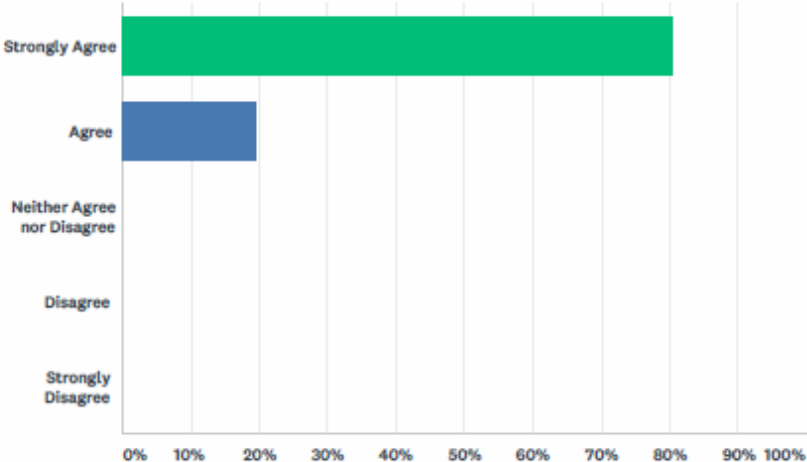


|   | 1            | 2            | 3            | 4            | 5            | N/A         | TOTAL | SCORE |
|---|--------------|--------------|--------------|--------------|--------------|-------------|-------|-------|
| Film Producer                                   | 17.86%<br>5  | 17.86%<br>5  | 39.29%<br>11 | 10.71%<br>3  | 7.14%<br>2   | 7.14%<br>2  | 28    | 3.31  |
| Film Director                                   | 64.29%<br>18 | 10.71%<br>3  | 10.71%<br>3  | 3.57%<br>1   | 10.71%<br>3  | 0.00%<br>0  | 28    | 4.14  |
| Visual effects Supervisor                       | 7.14%<br>2   | 60.71%<br>17 | 21.43%<br>6  | 10.71%<br>3  | 0.00%<br>0   | 0.00%<br>0  | 28    | 3.64  |
| Compositor                                      | 10.71%<br>3  | 0.00%<br>0   | 14.29%<br>4  | 50.00%<br>14 | 21.43%<br>6  | 3.57%<br>1  | 28    | 2.26  |
| The project manager from visual effects company | 0.00%<br>0   | 10.71%<br>3  | 10.71%<br>3  | 17.86%<br>5  | 35.71%<br>10 | 25.00%<br>7 | 28    | 1.95  |



Q3 \*Communication between the visual effects company and film director is very important for the quality of digital compositing

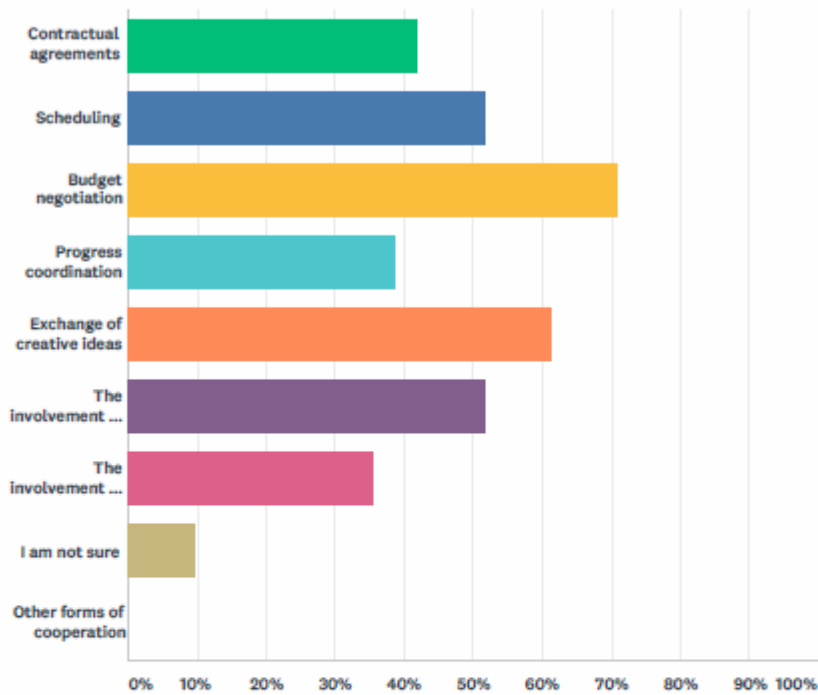
Answered: 31 Skipped: 0



| ANSWER CHOICES             | RESPONSES |    |
|----------------------------|-----------|----|
| Strongly Agree             | 80.65%    | 25 |
| Agree                      | 19.35%    | 6  |
| Neither Agree nor Disagree | 0.00%     | 0  |
| Disagree                   | 0.00%     | 0  |
| Strongly Disagree          | 0.00%     | 0  |
| TOTAL                      |           | 31 |

## Q4 \*What are the forms of cooperation between composing and production companies that impact significantly on the final film?

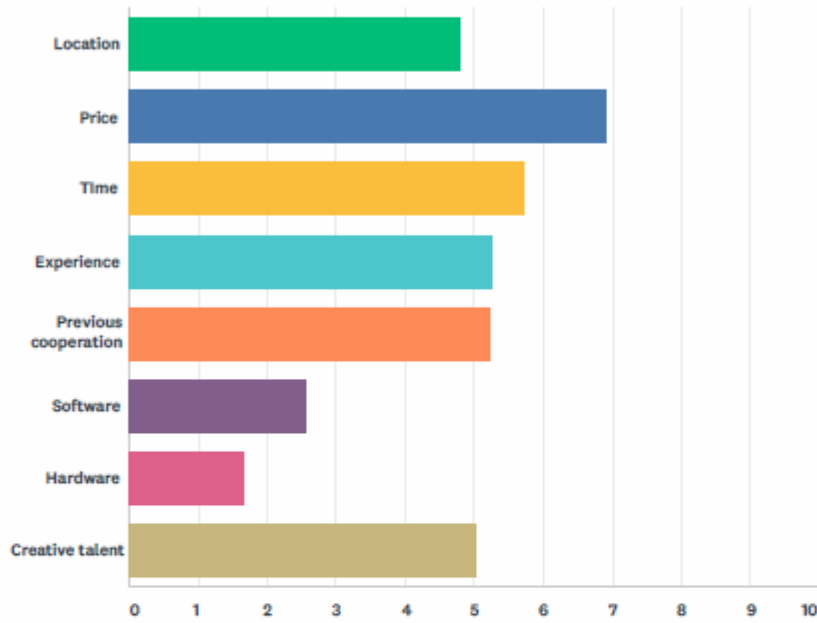
Answered: 31 Skipped: 0



| ANSWER CHOICES  | RESPONSES |
|---|-----------|
| Contractual agreements  | 41.94% 13 |
| Scheduling  | 51.61% 16 |
| Budget negotiation  | 70.97% 22 |
| Progress coordination   | 38.71% 12 |
| Exchange of creative ideas  | 61.29% 19 |
| The involvement of composing companies in production period       | 51.61% 16 |
| The involvement of production companies in post-production period | 35.48% 11 |
| I am not sure   | 9.68% 3   |
| Other forms of cooperation  | 0.00% 0   |
| Total Respondents: 31   |           |

Q5 \*In your experience, how are decisions made to contract different transnational visual effects companies for single films? (The following answer options is a ranked list, with 1 being most important and 8 least.If you think certain choices if not relevant, please choose N/A)

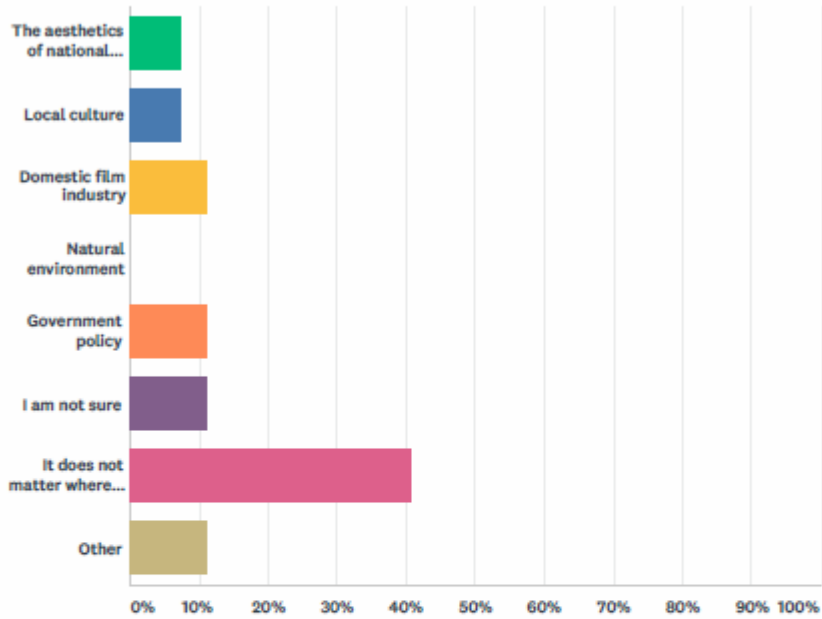
Answered: 25 Skipped: 6



|                      | 1            | 2           | 3           | 4           | 5           | 6           | 7            | 8            | N/A         | TOTAL | SCORE |
|----------------------|--------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|-------------|-------|-------|
| Location             | 12.00%<br>3  | 12.00%<br>3 | 4.00%<br>1  | 16.00%<br>4 | 8.00%<br>2  | 20.00%<br>5 | 0.00%<br>0   | 8.00%<br>2   | 20.00%<br>5 | 25    | 4.80  |
| Price                | 44.00%<br>11 | 24.00%<br>6 | 16.00%<br>4 | 12.00%<br>3 | 4.00%<br>1  | 0.00%<br>0  | 0.00%<br>0   | 0.00%<br>0   | 0.00%<br>0  | 25    | 6.92  |
| Time                 | 12.00%<br>3  | 28.00%<br>7 | 12.00%<br>3 | 8.00%<br>2  | 28.00%<br>7 | 4.00%<br>1  | 0.00%<br>0   | 0.00%<br>0   | 8.00%<br>2  | 25    | 5.74  |
| Experience           | 4.00%<br>1   | 12.00%<br>3 | 28.00%<br>7 | 32.00%<br>8 | 12.00%<br>3 | 0.00%<br>0  | 4.00%<br>1   | 4.00%<br>1   | 4.00%<br>1  | 25    | 5.25  |
| Previous cooperation | 8.00%<br>2   | 16.00%<br>4 | 20.00%<br>5 | 12.00%<br>3 | 12.00%<br>3 | 16.00%<br>4 | 4.00%<br>1   | 0.00%<br>0   | 12.00%<br>3 | 25    | 5.23  |
| Software             | 4.00%<br>1   | 0.00%<br>0  | 0.00%<br>0  | 4.00%<br>1  | 4.00%<br>1  | 8.00%<br>2  | 64.00%<br>16 | 4.00%<br>1   | 12.00%<br>3 | 25    | 2.55  |
| Hardware             | 0.00%<br>0   | 0.00%<br>0  | 0.00%<br>0  | 0.00%<br>0  | 0.00%<br>0  | 24.00%<br>6 | 4.00%<br>1   | 48.00%<br>12 | 24.00%<br>6 | 25    | 1.68  |
| Creative talent      | 16.00%<br>4  | 8.00%<br>2  | 20.00%<br>5 | 12.00%<br>3 | 24.00%<br>6 | 12.00%<br>3 | 0.00%<br>0   | 8.00%<br>2   | 0.00%<br>0  | 25    | 5.04  |

Q6 \*Which of the following factors related to the location of a digital compositing company influence the aesthetics of the film?

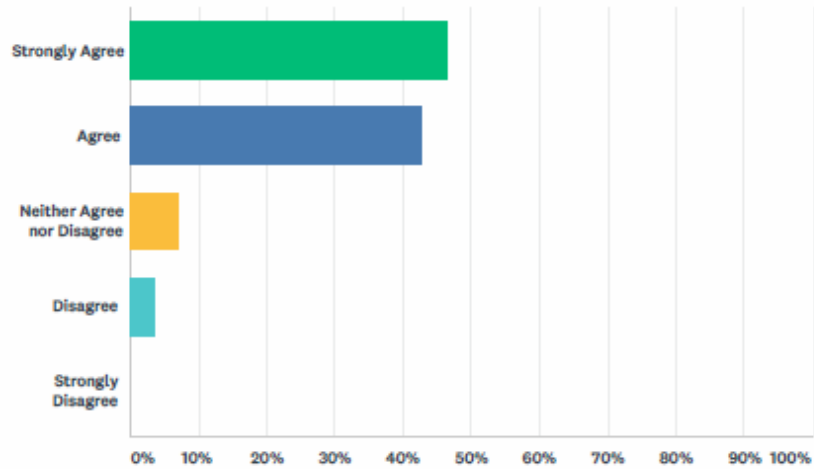
Answered: 27 Skipped: 4



| ANSWER CHOICES                          | RESPONSES |           |
|---|-----------|-----------|
| The aesthetics of national cinema       | 7.41%     | 2         |
| Local culture                           | 7.41%     | 2         |
| Domestic film industry                  | 11.11%    | 3         |
| Natural environment                     | 0.00%     | 0         |
| Government policy                       | 11.11%    | 3         |
| I am not sure                           | 11.11%    | 3         |
| It does not matter where the company is | 40.74%    | 11        |
| Other                                   | 11.11%    | 3         |
| <b>TOTAL</b>                            |           | <b>27</b> |

Q7 \*Communication between different visual effects companies when they are working for a film impacts the quality of compositing.

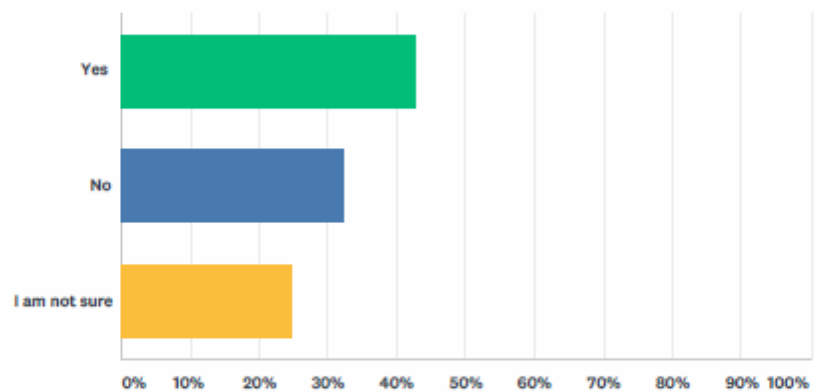
Answered: 28 Skipped: 3



| ANSWER CHOICES             | RESPONSES |    |
|----------------------------|-----------|----|
| Strongly Agree             | 46.43%    | 13 |
| Agree                      | 42.86%    | 12 |
| Neither Agree nor Disagree | 7.14%     | 2  |
| Disagree                   | 3.57%     | 1  |
| Strongly Disagree          | 0.00%     | 0  |
| TOTAL                      |           | 28 |

Q8 \*Do you believe that an international agreed standard for digital compositing practice is necessary for the global film industry?

Answered: 28 Skipped: 3



| ANSWER CHOICES | RESPONSES |    |
|----------------|-----------|----|
| Yes            | 42.86%    | 12 |
| No             | 32.14%    | 9  |
| I am not sure  | 25.00%    | 7  |
| TOTAL          |           | 28 |

Q9 \*What are the three most important issues facing digital visual effects companies in the film industry?.

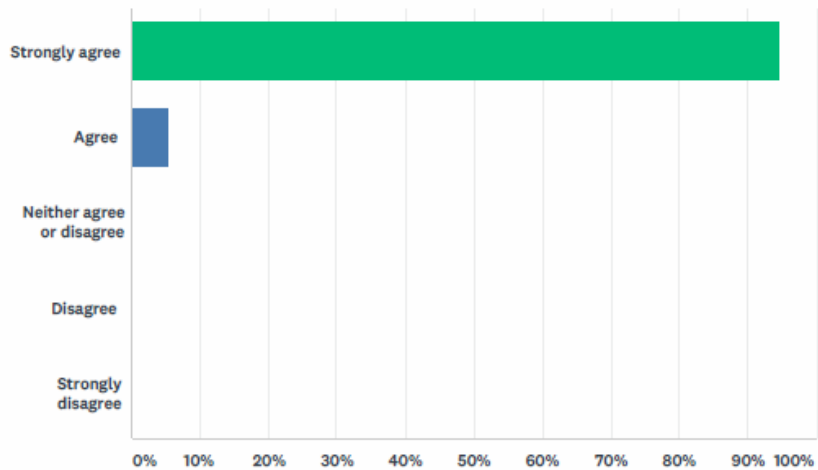
Answered: 27 Skipped: 4

| ANSWER CHOICES | RESPONSES |    |
|----------------|-----------|----|
| 1              | 100.00%   | 27 |
| 2              | 96.30%    | 26 |
| 3              | 81.48%    | 22 |

## Appendix B: Survey - Digital visual effects in contemporary Hollywood cinema part 1

Q1 To what extent do you agree communication between the digital visual effects company and film director is very important for the aesthetics of digital visual effects?

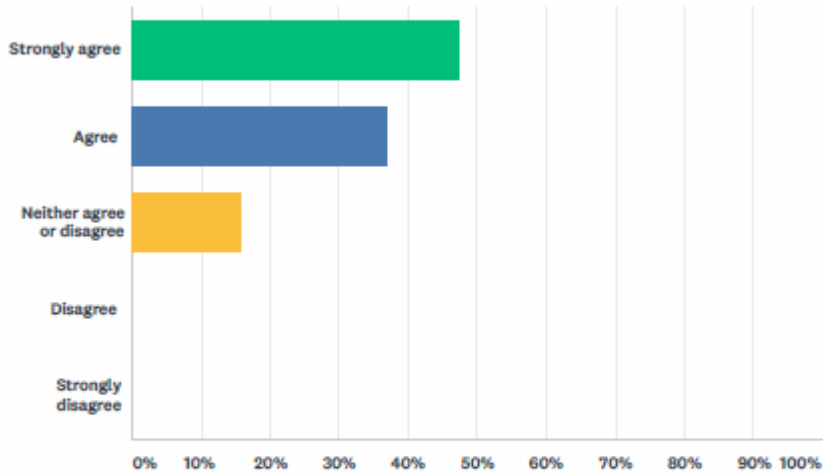
Answered: 19 Skipped: 0



| ANSWER CHOICES            | RESPONSES |           |
|---------------------------|-----------|-----------|
| Strongly agree            | 94.74%    | 18        |
| Agree                     | 5.26%     | 1         |
| Neither agree or disagree | 0.00%     | 0         |
| Disagree                  | 0.00%     | 0         |
| Strongly disagree         | 0.00%     | 0         |
| <b>TOTAL</b>              |           | <b>19</b> |

Q2 To what extent do you agree that communication between different digital visual effects companies when they are working for a film impacts the aesthetics of digital visual effects?

Answered: 19 Skipped: 0

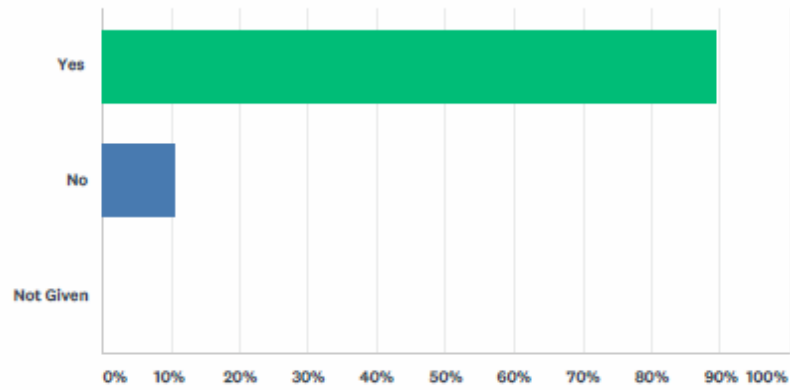


| ANSWER CHOICES            | RESPONSES |           |
|---------------------------|-----------|-----------|
| Strongly agree            | 47.37%    | 9         |
| Agree                     | 36.84%    | 7         |
| Neither agree or disagree | 15.79%    | 3         |
| Disagree                  | 0.00%     | 0         |
| Strongly disagree         | 0.00%     | 0         |
| <b>TOTAL</b>              |           | <b>19</b> |



Q3 As part of your work in the digital visual effects industry do you communicate your ideas to colleagues from different countries?

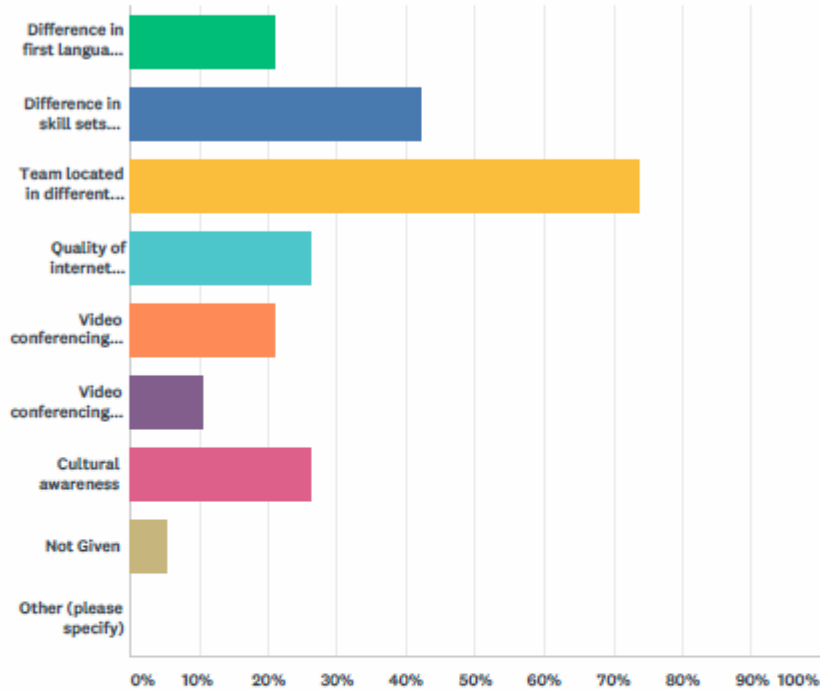
Answered: 19 Skipped: 0



| ANSWER CHOICES | RESPONSES |    |
|----------------|-----------|----|
| Yes            | 89.47%    | 17 |
| No             | 10.53%    | 2  |
| Not Given      | 0.00%     | 0  |
| TOTAL          |           | 19 |

Q4 What do you think are the factors that impact the effectiveness of communication within the digital visual effects team working for a single Hollywood film? (You can choose more than one answer)

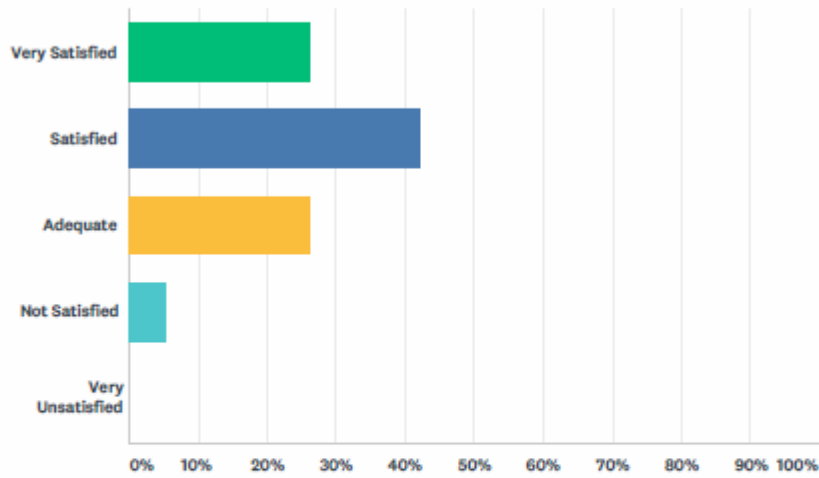
Answered: 19 Skipped: 0



| ANSWER CHOICES                               | RESPONSES |    |
|--|-----------|----|
| Difference in first language within the team | 21.05%    | 4  |
| Difference in skill sets within the team     | 42.11%    | 8  |
| Team located in different time zones         | 73.68%    | 14 |
| Quality of internet connection               | 26.32%    | 5  |
| Video conferencing technology                | 21.05%    | 4  |
| Video conferencing skills                    | 10.53%    | 2  |
| Cultural awareness                           | 26.32%    | 5  |
| Not Given                                    | 5.26%     | 1  |
| Other (please specify)                       | 0.00%     | 0  |
| <b>Total Respondents: 19</b>                 |           |    |

### Q5 How satisfied are you with the communication technology available to you in the current Hollywood digital visual effects industry?

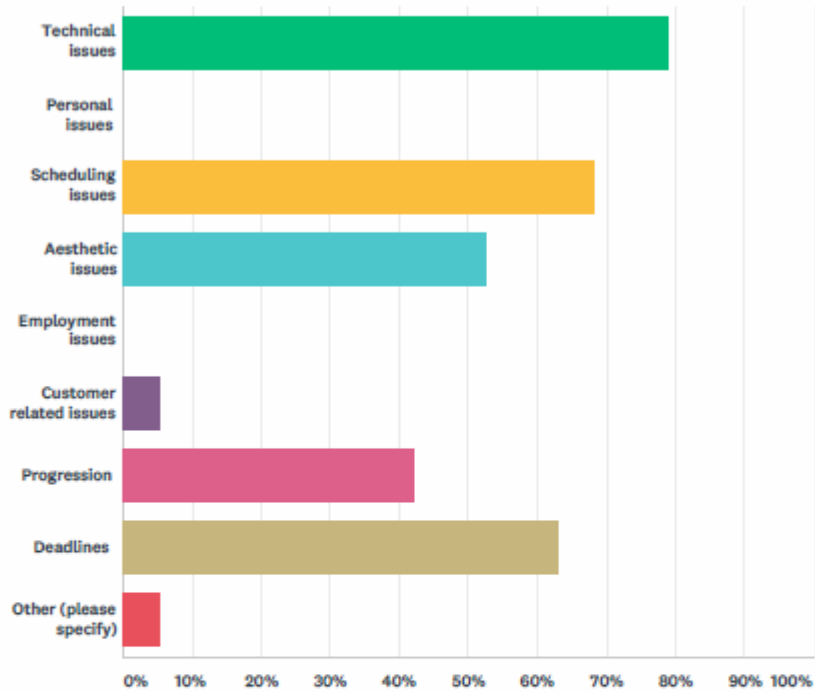
Answered: 19 Skipped: 0



| ANSWER CHOICES   | RESPONSES |           |
|------------------|-----------|-----------|
| Very Satisfied   | 26.32%    | 5         |
| Satisfied        | 42.11%    | 8         |
| Adequate         | 26.32%    | 5         |
| Not Satisfied    | 5.26%     | 1         |
| Very Unsatisfied | 0.00%     | 0         |
| <b>TOTAL</b>     |           | <b>19</b> |

Q6 What are the key issues that need to be communicated within the team when working on Hollywood digital visual effects projects?(You can choose more than one answer)

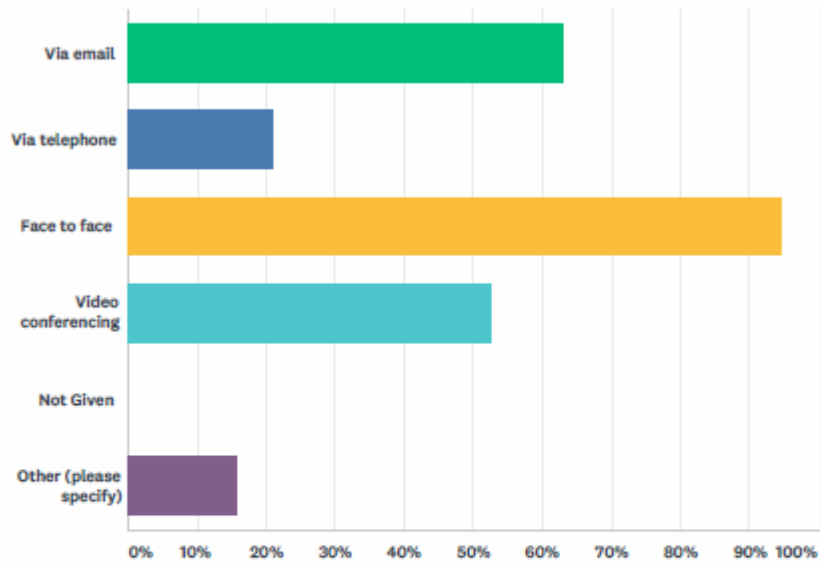
Answered: 19 Skipped: 0



| ANSWER CHOICES          | RESPONSES |    |
|-------------------------|-----------|----|
| Technical issues        | 78.95%    | 15 |
| Personal issues         | 0.00%     | 0  |
| Scheduling issues       | 68.42%    | 13 |
| Aesthetic issues        | 52.63%    | 10 |
| Employment issues       | 0.00%     | 0  |
| Customer related issues | 5.26%     | 1  |
| Progression             | 42.11%    | 8  |
| Deadlines               | 63.16%    | 12 |
| Other (please specify)  | 5.26%     | 1  |
| Total Respondents: 19   |           |    |

Q7 In which way do you normally receive feedback on your work? (You can choose more than one answer)

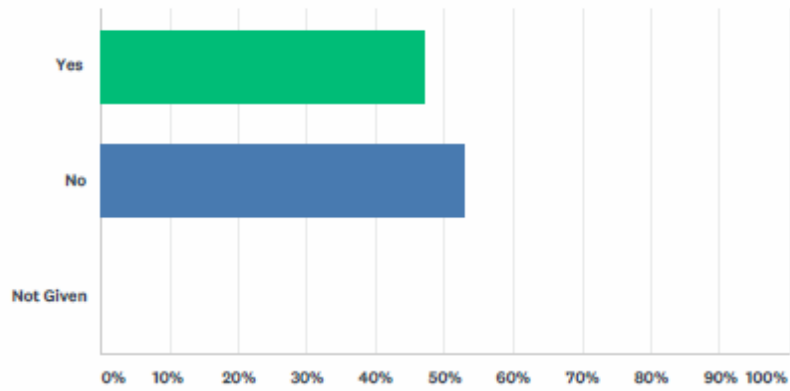
Answered: 19 Skipped: 0



| ANSWER CHOICES         | RESPONSES |    |
|------------------------|-----------|----|
| Via email              | 63.16%    | 12 |
| Via telephone          | 21.05%    | 4  |
| Face to face           | 94.74%    | 18 |
| Video conferencing     | 52.63%    | 10 |
| Not Given              | 0.00%     | 0  |
| Other (please specify) | 15.79%    | 3  |
| Total Respondents: 19  |           |    |

### Q8 Has your career in the digital visual effects industry ever meant you had to move to another country?

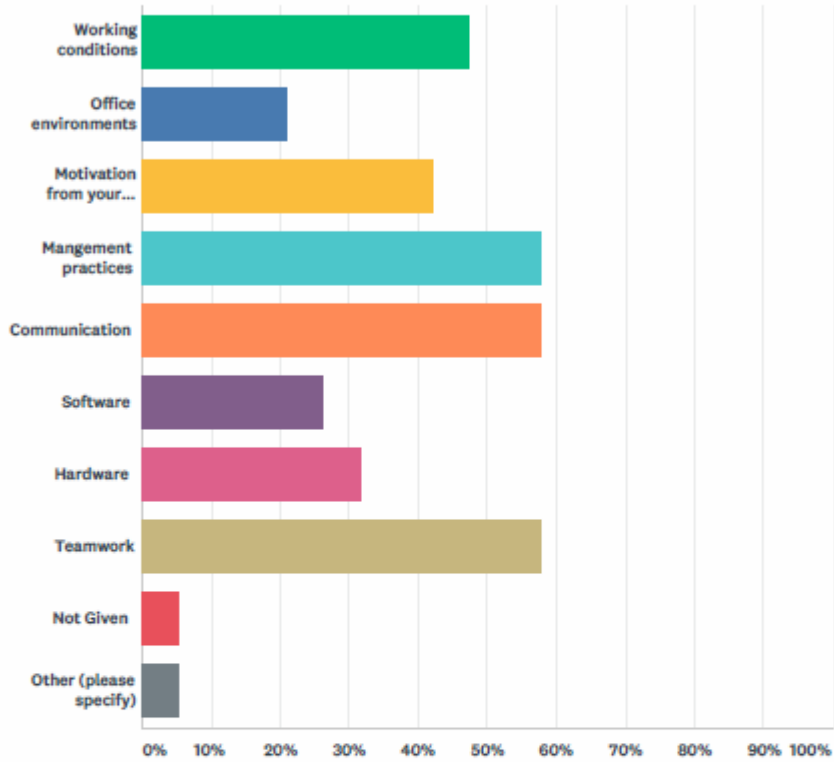
Answered: 17 Skipped: 2



| ANSWER CHOICES | RESPONSES |    |
|----------------|-----------|----|
| Yes            | 47.06%    | 8  |
| No             | 52.94%    | 9  |
| Not Given      | 0.00%     | 0  |
| TOTAL          |           | 17 |

Q9 What are the main factors affecting your creativity when working for digital visual effects in Hollywood films? (You can choose more than one answer)

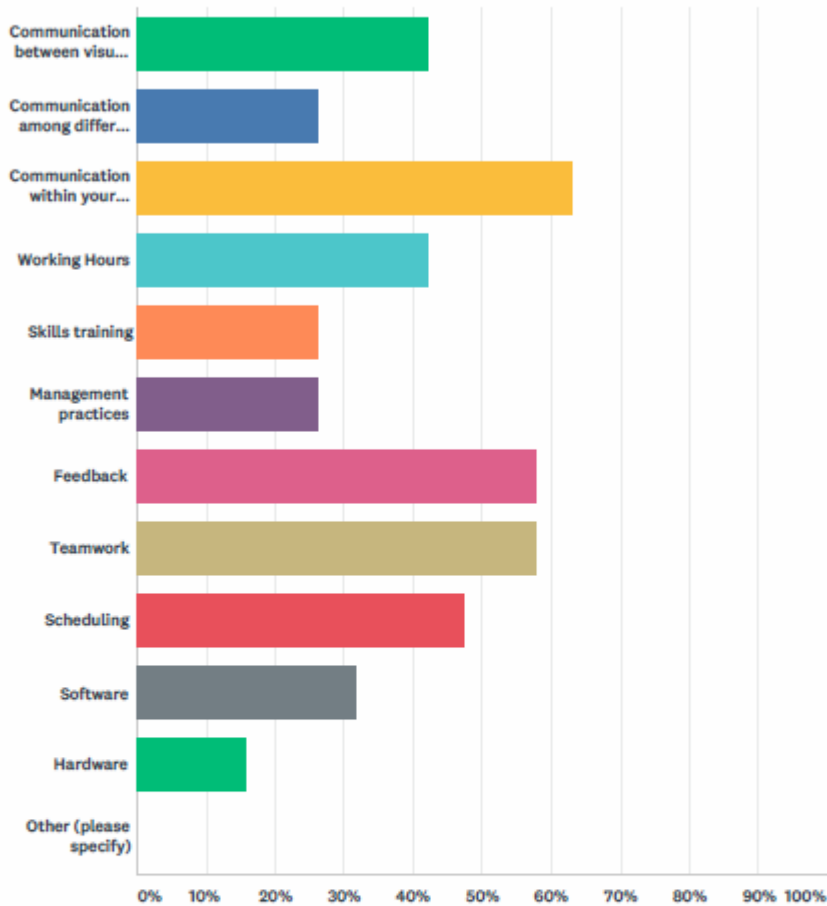
Answered: 19 Skipped: 0



| ANSWER CHOICES               | RESPONSES |    |
|------------------------------|-----------|----|
| Working conditions           | 47.37%    | 9  |
| Office environments          | 21.05%    | 4  |
| Motivation from your company | 42.11%    | 8  |
| Mangement practices          | 57.89%    | 11 |
| Communication                | 57.89%    | 11 |
| Software                     | 26.32%    | 5  |
| Hardware                     | 31.58%    | 6  |
| Teamwork                     | 57.89%    | 11 |
| Not Given                    | 5.26%     | 1  |
| Other (please specify)       | 5.26%     | 1  |
| Total Respondents: 19        |           |    |

**Q10 What are the main factors affecting the efficiency of your individual performance when working for digital visual effects in Hollywood films?  
(You can choose more than one answer)**

Answered: 19 Skipped: 0



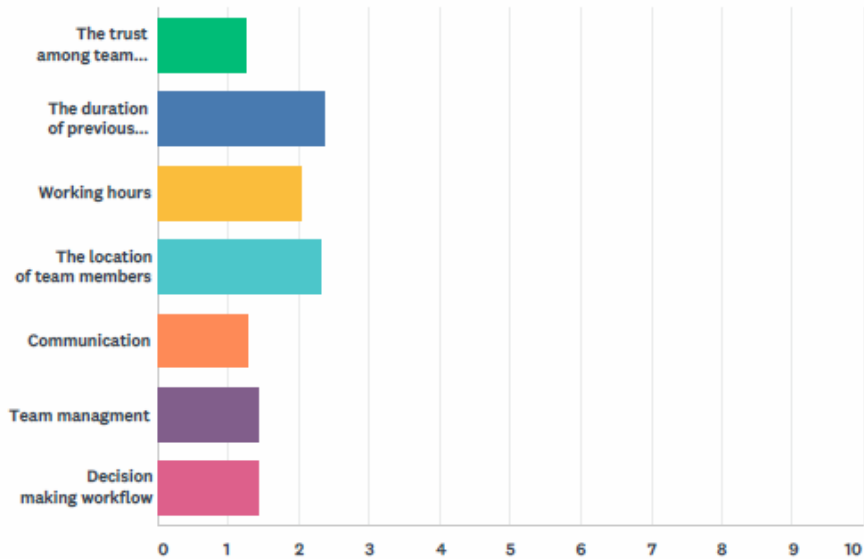
| ANSWER CHOICES  | RESPONSES |    |
|---|-----------|----|
| Communication between visual effects companies and Hollywood studios            | 42.11%    | 8  |
| Communication among different visual effects companies working for single films | 26.32%    | 5  |
| Communication within your visual effects company                                | 63.16%    | 12 |
| Working Hours   | 42.11%    | 8  |
| Skills training   | 26.32%    | 5  |
| Management practices  | 26.32%    | 5  |
| Feedback  | 57.89%    | 11 |
| Teamwork  | 57.89%    | 11 |
| Scheduling  | 47.37%    | 9  |
| Software  | 31.58%    | 6  |
| Hardware  | 15.79%    | 3  |
| Other (please specify)  | 0.00%     | 0  |
| <b>Total Respondents: 19</b>  |           |    |



## Appendix C: Survey - Digital visual effects in contemporary Hollywood cinema part 2

Q1 How important are the following factors for the efficiency of teamwork in the current Hollywood digital visual effects industry?

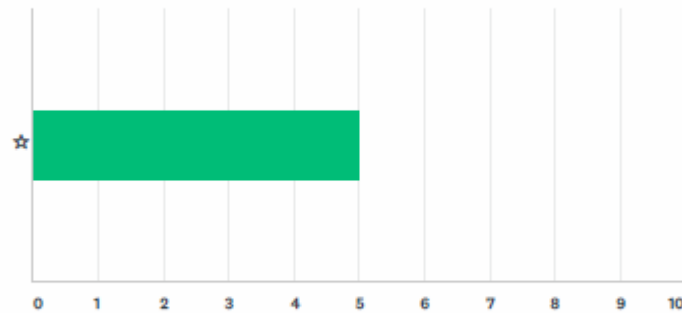
Answered: 19 Skipped: 0



|  | VERY IMPORTANT | IMPORTANT   | NEITHER IMPORTANT NOR UNIMPORTANT | NOT IMPORTANT | NOT IMPORTANT AT ALL | TOTAL | WEIGHTED AVERAGE |
|--|----------------|-------------|-----------------------------------|---------------|----------------------|-------|------------------|
| The trust among team members           | 78.95%<br>15   | 15.79%<br>3 | 5.26%<br>1                        | 0.00%<br>0    | 0.00%<br>0           | 19    | 1.26             |
| The duration of previous collaboration | 15.79%<br>3    | 36.84%<br>7 | 42.11%<br>8                       | 5.26%<br>1    | 0.00%<br>0           | 19    | 2.37             |
| Working hours                          | 26.32%<br>5    | 47.37%<br>9 | 21.05%<br>4                       | 5.26%<br>1    | 0.00%<br>0           | 19    | 2.05             |
| The location of team members           | 27.78%<br>5    | 27.78%<br>5 | 27.78%<br>5                       | 16.67%<br>3   | 0.00%<br>0           | 18    | 2.33             |
| Communication                          | 72.22%<br>13   | 27.78%<br>5 | 0.00%<br>0                        | 0.00%<br>0    | 0.00%<br>0           | 18    | 1.28             |
| Team management                        | 57.89%<br>11   | 42.11%<br>8 | 0.00%<br>0                        | 0.00%<br>0    | 0.00%<br>0           | 19    | 1.42             |
| Decision making workflow               | 63.16%<br>12   | 31.58%<br>6 | 5.26%<br>1                        | 0.00%<br>0    | 0.00%<br>0           | 19    | 1.42             |

## Q2 To what extent do you feel valued by the Hollywood film studios whose films you have worked for?

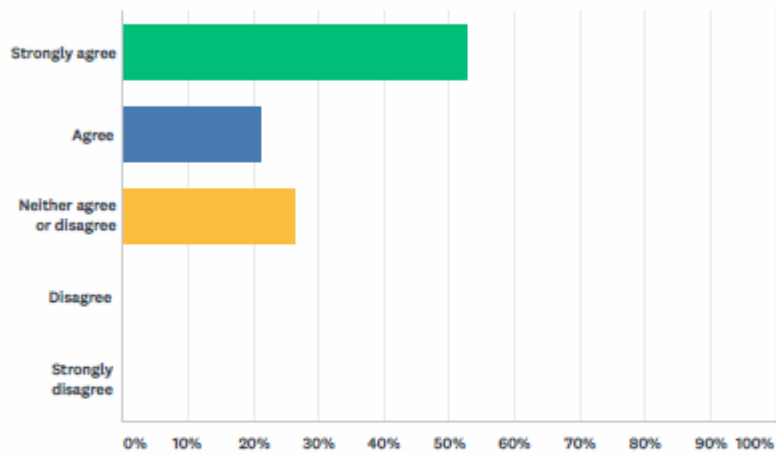
Answered: 19 Skipped: 0



|   | 1     | 2      | 3      | 4     | 5      | 6      | 7     | 8      | 9     | 10    | N/A    | TOTAL | WEIGHTED AVERAGE |
|---|-------|--------|--------|-------|--------|--------|-------|--------|-------|-------|--------|-------|------------------|
| ☆ | 5.26% | 10.53% | 10.53% | 5.26% | 10.53% | 21.05% | 5.26% | 15.79% | 0.00% | 0.00% | 15.79% | 19    | 5.               |
|   | 1     | 2      | 2      | 1     | 2      | 4      | 1     | 3      | 0     | 0     | 3      |       |                  |

## Q3 To what extent do you agree that the digital visual effects related tax incentive policies are important for how decisions are made to contract different digital visual effects companies for single films?

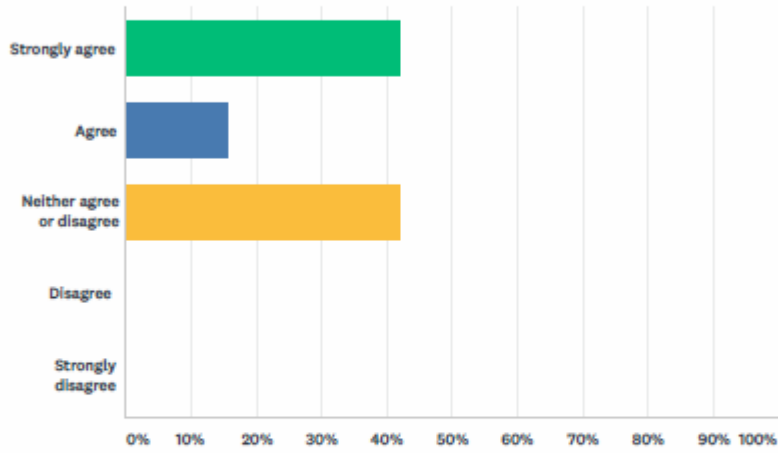
Answered: 19 Skipped: 0



| ANSWER CHOICES            | RESPONSES |    |
|---------------------------|-----------|----|
| Strongly agree            | 52.63%    | 10 |
| Agree                     | 21.05%    | 4  |
| Neither agree or disagree | 26.32%    | 5  |
| Disagree                  | 0.00%     | 0  |
| Strongly disagree         | 0.00%     | 0  |
| TOTAL                     |           | 19 |

**Q4 To what extent do you agree that the contractual relationship between digital visual effects companies and the Hollywood studios is affecting the practice of digital visual effects companies?**

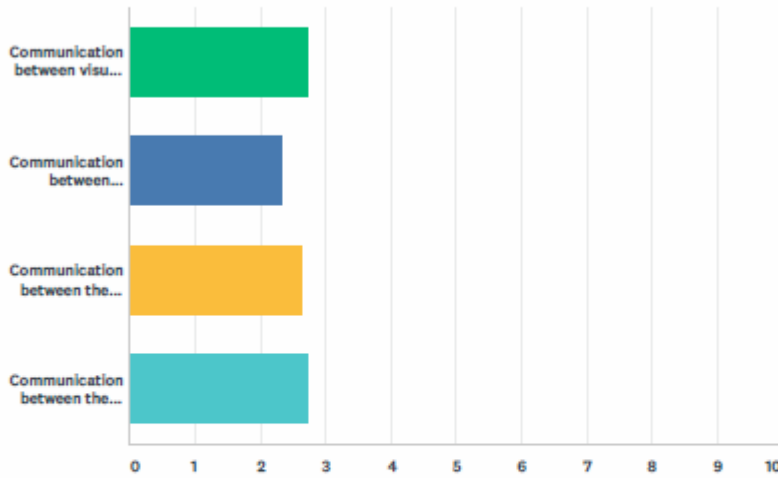
Answered: 19 Skipped: 0



| ANSWER CHOICES            | RESPONSES |           |
|---------------------------|-----------|-----------|
| Strongly agree            | 42.11%    | 8         |
| Agree                     | 15.79%    | 3         |
| Neither agree or disagree | 42.11%    | 8         |
| Disagree                  | 0.00%     | 0         |
| Strongly disagree         | 0.00%     | 0         |
| <b>TOTAL</b>              |           | <b>19</b> |

### Q5 How would you rate these area of the current Hollywood digital visual effects?

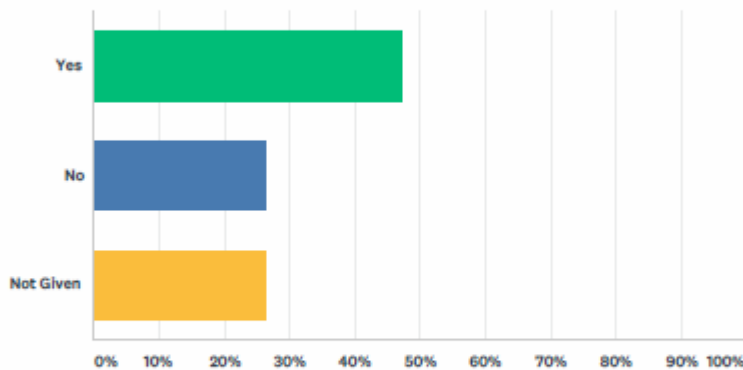
Answered: 19 Skipped: 0



|   | EXCELLENT   | GOOD         | AVERAGE     | BELOW AVERAGE | POOR        | TOTAL | WEIGHTED AVERAGE |
|---|-------------|--------------|-------------|---------------|-------------|-------|------------------|
| Communication between visual effects companies and the Hollywood studios                | 5.26%<br>1  | 31.58%<br>6  | 47.37%<br>9 | 15.79%<br>3   | 0.00%<br>0  | 19    | 2.74             |
| Communication between different visual effects companies working for single films       | 5.26%<br>1  | 63.16%<br>12 | 26.32%<br>5 | 5.26%<br>1    | 0.00%<br>0  | 19    | 2.32             |
| Communication between the director and visual effects companies                         | 5.26%<br>1  | 42.11%<br>8  | 42.11%<br>8 | 5.26%<br>1    | 5.26%<br>1  | 19    | 2.63             |
| Communication between the branches of a visual effects company with different locations | 10.53%<br>2 | 47.37%<br>9  | 10.53%<br>2 | 21.05%<br>4   | 10.53%<br>2 | 19    | 2.74             |

### Q6 Do you think increasing the number of clients from world popular film industries would be beneficial for the digital visual effects company you work for?

Answered: 19 Skipped: 0



| ANSWER CHOICES | RESPONSES |    |
|----------------|-----------|----|
| Yes            | 47.37%    | 9  |
| No             | 26.32%    | 5  |
| Not Given      | 26.32%    | 5  |
| TOTAL          |           | 19 |