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A critical analysis of the production pipeline developed for the Bun and Bunee short format animation series with reference to local production norms

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Masters of Arts: Digital Animation (By Coursework and Research report)

Research report

A critical analysis of the production pipeline developed for the *Bun and Bunee* short format animation series with reference to local production norms.

Ntombikayise Buthelezi

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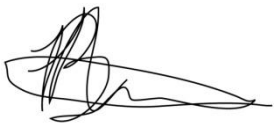
University of the Witwatersrand

31 October 2014

Supervisor: Pippa Tshabalala

DECLARATION

I hereby declare that the content of this research report is my own unaided work. It is submitted in partial fulfilment towards the Degree of Masters of Arts in the field of Digital Animation by Coursework and Research Report in the Faculty of Humanities, University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any other degree or examination at any other university.



_____ _____

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322769

__31st__day of__October__2014.

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CHAPTER ONE: INTRODUCTION

This research report critically examines CGI[1] animated short format[2] series production norms and pipelines. The goal is to identify production methods which improve local CGI animation production processes.

In order to identify production improvement methods, the initiation; set up and resolution of the CGI pipeline will be probed. Furthermore the time and money saving effects of the careful control of pre-production, production and post-production will be examined.

The production pipeline of *Bun and Bunee* will be used as the case study. This animated short will be used because its production pipeline has small, yet consistent practices which lead to a smooth running and time conserving production. Furthermore this series is locally produced; therefore the knowledge that can be derived from this case study has practical integration possibilities for other local studios.

[1] In the *Oxford Dictionary of Computing* CGI is cited as the abbreviation for Computer Graphics Interface. It is the interface technique for dialogue with graphical devices. Computer animation is said to be the use of computer graphics to manipulate objects and create the illusion of animated movement (Illingworth 68; 95). CGI animation is therefore the creation of animation using computer graphics. CGI animation is often used interchangeably with 3D animation, when 3D refers to the creation of animation using a computer, not when it refers to 3D objects being used in other animation types such as pixilation and clay animation.

[2] For the purposes of this research paper short format animation refers to animated works which are shorter than 5minutes in length.

The positive production practices of the *Bun and Bunee* project will be examined in comparison to general production norms[3], and to the specialized production practices of other studios, in order to create a 'best practices' template.

A FLEDGLING TOPIC

The fledgling topic of animation production does not have an agreed upon 'best practices' template. Catherine Winder, a Los Angeles based animation executive, producer and consultant; and Zahra Dowlatabadi, an animation producer and consultant also based in Los Angeles, are the co-authors of *Producing Animation*. This is a book on the production processes involved in creating an animation. The pair proposes that "although there are many well-written and useful books that discuss the technical process and art of animation; there is nothing available that outlines the actual nuts and bolts of producing for major animation studios and distributors" (1). Thus for scholars seeking information on the production process there is nothing readily available, unless they research each process of production autonomously from more technical "how to" books.

[3] Production norms refer to those parts of production which are essential to the process and cannot be eliminated. An example of this would be the rigging process. Though a CGI character can be rigged through a number of different processes, the fact remains that for it to be animated well it is necessary that there be some type of rig in place.

Winder and Dowlatabadi argue that a 'best practices' evaluation approach is not possible because there are constant technological advances and because production differs from studio to studio (3). Production does differ from studio to studio, and the production improvement tactics to be discussed in this paper may not work well for all studios for various reasons including budget constraints and the need to train people for the use of new tools. However to suggest that a 'best practices' approach is impossible is a sweeping statement. There are in fact certain production steps which have to be completed for the successful creation of a CGI animation. These steps which will be discussed in this paper are what I submit to be 'best practices'. It is these steps which will, for the purposes of this paper, be referred to as production norms.

The production practices of feature length animations and other types of animation formats will be discussed. This is because there are production practices which overlap and are relevant regardless of animation length. Additionally, the volume of literature specific to short form animation production is sparse.

According to Dane Edward Bettis, a Master of Science in Visualization Sciences student at Texas A&M University, there are several examples of the incompleteness of documentation on the

topic [of animation production] (8). A recent animation scholar like me, Bettis found that there is a lack of animation production theory and thus wrote a thesis on this topic in an attempt to add to this area of knowledge. He remarks that although animation professionals circulate between studios, there is currently no academic archetype of pipeline practices amongst the animation industry (Bettis 8).

This research paper, much like Bettis' is the outcome of this lack of theory on animation production practices. This research is motivated by the gap in comprehensive animation production pipeline knowledge that I felt post-animation school. This is however rapidly changing.

Acclaimed animation scholar Paul Wells explains this phenomenon best in his book titled *Basics animation: Scriptwriting* (2007). He states:

> Simultaneously, there has also been a growth in books about animation studies and practice, and indeed, other forms of writing for and about the contemporary media. This is largely a response to the expanding opportunities at various levels of media and cultural production. Crucially, it also signifies a recognition that

> there remains a need to embrace the core skills and knowledge still required to undertake creative work. (sic) (7)

Consequently although this gap in theory exists, animation scholars are recognising this and there is an increase of scholarship on animation practice and art.

Winder and Dowlatabadi's *Producing Animation* is an example of this gap in scholarship on animation production pipelines. It is an exceptional treatment of a topic that has barely been documented and which still needs literature that encompasses a wider area of theory. It is however somewhat limited in scope (Bettis 8).

While discussing Winder and Dowlatabadi's *Producing Animation* Bettis argues that one of its limitations is that "Winder's treatment presents practices, departments, workflows, and titles specific to Blue Sky[4] as if they were standard to the industry" (Bettis 9). This book is however one of very few which examines this topic specifically and one cannot write about animation production without consulting it. Also because one commonly writes about what they know Winders subjectivity is to be expected, as a former Blue Sky Studio employee she would therefore write in relation to

[4] Blue Sky Studios is an animation company founded in February 1986 by Alison Brown, David Brown, Michael Ferraro, Carl Ludwig, Dr. Eugene Troubetzkoy and Chris Wedge. It has created animation features such as *Ice Age* (2002), *Robots* (2005), and *Rio* (2011) (Blue Sky Studios).

their production practices.

An attempt to add to this limited literature, and to the growing conversation on animation production, is one of the driving forces behind this research paper.

Existing literature on animation production will be analyzed, including the production of feature length animation as this is the most readily available literature on animation production. This will allow for this research to be situated in relation to existing practices.

CASE STUDY

In addition to an examination of the existing literature *Bun and Bunee's* production pipeline will be used to draw attention to those things which can be learned from looking at a specific case. *Bun and Bunee's* methods of production account for its success as an animated short series, making it an ideal case study. Robert E. Stake, author of the chapter "Case Studies" in *Handbook of qualitative research 2nd edition* submits: "As a form of research, case study is defined by interest in individual cases, not by the methods of inquiry used" (435). The individual case of the success of the *Bun and Bunee* production pipeline can serve as an example of positive production practices in local studios.

The examination of generic production norms allows for exploration of the case study subject through a 'generalized' scope because "how we learn from the singular case is related to how the case is like and unlike other cases (i.e., comparisons)" (Stake 442). Although the case study method recognizes the effect context has on production, it focuses rather on that which can be learned from a single case (Stake 436).

RESEARCH METHODOLOGY

As literature on the production of short form animation is limited, even more so when it comes to South African productions, another method of qualitative research that is a key approach to gathering vital information will be used - interviews.

Andrea Fontana and James H. Frey, co-authors of the chapter "The interview: From structured questions to negotiated text" in *Handbook of qualitative research 2nd edition*, propose that information received via the interview process is a direct result of context, interaction and relation. The result therefore is a combination of accurate accounts and responses from the interviewee (647). If the participant is not comfortable with the questions or even the environment whilst being interviewed it can greatly alter the results.

It can be argued that context affects most things however, including written literature. Ergo although interviews may not be completely accurate as they can be affected by a number of factors. They are nonetheless a valid way of gaining essential insider information from people who are currently working in the field.

By virtue of animation being a constantly evolving medium, with its tools and modes of working invariably improving, creators of animations can be secretive about their manner of working. On the matter of the secrecy of animators and film makers Bettis submits that:

> …film makers can be secretive, especially concerning visual effects, proprietary software and whatever else they believe are intellectual innovations or unique practices. They seem to view their secrecy as a competitive advantage. Their reluctance to share such knowledge extends to discussions of their production pipelines. (sic)(Bettis 8)

As a result, when conducting interviews with industry professionals it is imperative to discuss matters of privacy. Clifford G. Christians, author of the chapter "Ethics and politics in qualitative research" in *Handbook of qualitative research 2nd edition*, asserts that when conducting qualitative research four things are essential: informed consent; lack of deception; privacy and confidentiality; and

accuracy (140). In an industry which can be extremely secretive about their production pipelines, maintaining trust with interviewees is the key to collecting a substantial amount of valuable information.

A qualitative research approach has been used, and interviews were conducted in a semi-structured format. Face-to-face interviews have been conducted, where possible. This is "more resource intensive and time consuming… but this collection method suggests that greater importance is placed on the research topics" (Winder and Dowlatabadi 71). It is for that reason that face-to-face interviews usually result in a higher rate of response. The data collected is therefore richer and more in-depth (Winder and Dowlatabadi 71).

Full access to the *Bun and Bunee* production pipeline document has been granted to me, and it serves as an invaluable part of this research. In addition to this several members of the production team have been interviewed. These interviewees include: Amanda Goosen-Director and Associate Producer; Paul Meyer- Executive Producer and owner of Luma Creative Studios and Bronwyn Horne- 3D Animator.

More and more animation scholars, including acclaimed

animation scholar Paul Wells, are entering into the conversation of animation production. These scholars are realizing that the structure of a production has a larger effect on the final product than it had previously been given credit for. They are also recognizing the benefit of the collective in a production, over the previously more elevated positions such as animators. This study is therefore at the cusp of this transformation- joining a conversation that is only at its inception.

It is significant that this study be done now as the local animation industry is growing, in its entirety it however has not reached international quality standards quite yet. There are however certain studios that are succeeding in producing international quality work, such as Luma, Triggerfish and others. If South Africa is to enter and succeed in the international market it needs to streamline its production, minimize cost and maximize quality.

With this goal in mind, this research paper is structured in the following manner:

a) Traditional production practice-theory

This chapter looks at the three main production steps: pre-production; production; post-production. The processes in these

steps are examined- inspecting those processes that make up production norms. The shift of importance from post-production to pre-production is also explored.

b) Production improvement tools

Common practices and tools used in the improvement of production are looked at in this section. This includes technological tools, the customization of off the shelf[5] software, and the streamlining of certain production processes. Studio specific customizations are also examined, such as scripts/programs written for specific projects.

c) Case study

Luma as an animation studio is discussed, including its inception; its founders and its focus on the training of animators. The *Bun and Bunee* project is then discussed in detail.

d) Conclusion

Lessons learned on the streamlining of production and the case study will be discussed in this section of the paper.

[5] Also known as 'Turnkey software', off the shelf software is animation software which can be bought from various vendors for immediate use. Studios that use off the shelf software can purchase plug-ins to enhance the software's functionality (Kerlow 66).

CHAPTER TWO: TRADITIONAL PRODUCTION PRACTICE-THEORY

The conceptual definition of production pipelines which will be used for the purpose of this paper is formulated by Bettis, as the key finding of his thesis for a Master's of Science at Texas A&M University- *Digital Production Pipelines: Examining Structures and Methods in the Computer Effects Industry.* He contends that:

> A digital production pipeline must, by definition, utilize digital computing hardware and software to facilitate human work and collaboration for the overarching purpose of producing content for film. The digital production pipeline is not a structure, but rather a malleable set of components which can be arranged, configured, and adapted into new structures as needed. These malleable components are human groups with assigned task domains, and digital hardware and software systems. The human groups are normally referred to as departments or teams. The digital hardware and software systems are operating systems, software tools and applications, networks, processors, and storage. The digital production pipeline is the synergy of these two types of components into adaptable systems and structures. (sic)(iii)

This conceptual definition of production pipelines incorporates all 3D/CGI animation production forms. Albeit that production differs from studio to studio due to multiple reasons, including context; length; budget etc., it accounts for these variations by acknowledging that the mentioned components are adaptable.

PRODUCTION PHASES OUTLINE

As previously mentioned although there are multiple pipeline model options, there are fundamental processes in production which each production will have regardless of length, funding and context. Traditional animation production systems are made up of three core stages: Pre-production; Production and Post-production (Winder and Dowlatabadi 119).These three steps exist in most animations, including traditional 2D animation[6] and stop frame animation. Animation types such as experimental animation may however be produced without the use of a strictly outlined production pipeline. Examples of experimental animation include *Dot*s (1940) by Norman McLaren and *Automatic Writing* (2003) by William Kentridge.

[6] 2D animation in this instance is defined as what *The Collins Dictionary and Thesaurus in One Volume* cites as 'animated cartoon'. It is defined as "a film produced by photographing a series of gradually changing drawings, etc., which give the illusion of movement when the series is projected rapidly" (36).

These three sections can be sub-divided into the following steps.

1. Design

2. Modeling

3. Rigging

4. Surfaces (texture and colour)

5. Staging/workbook [story reel]

6. Animation

7. Lighting

8. Effects

9. Rendering

10. Composite

11. Touch up

12. Final Film/video output (Winder and Dowlatabadi 240).

For the purposes of this paper the production pipeline being used as the standard is that of Winder and Dowlatabadi, from their

book *Producing Animation*. Pre-production is made up of steps 1-5, production includes steps 6-8 and post-production comprises of steps 9-12 as listed above. This however is not the universal archetype. Figure 1, below, outlines the CGI production pipeline as summarized by Winder and Dowlatabadi in *Producing Animation*.

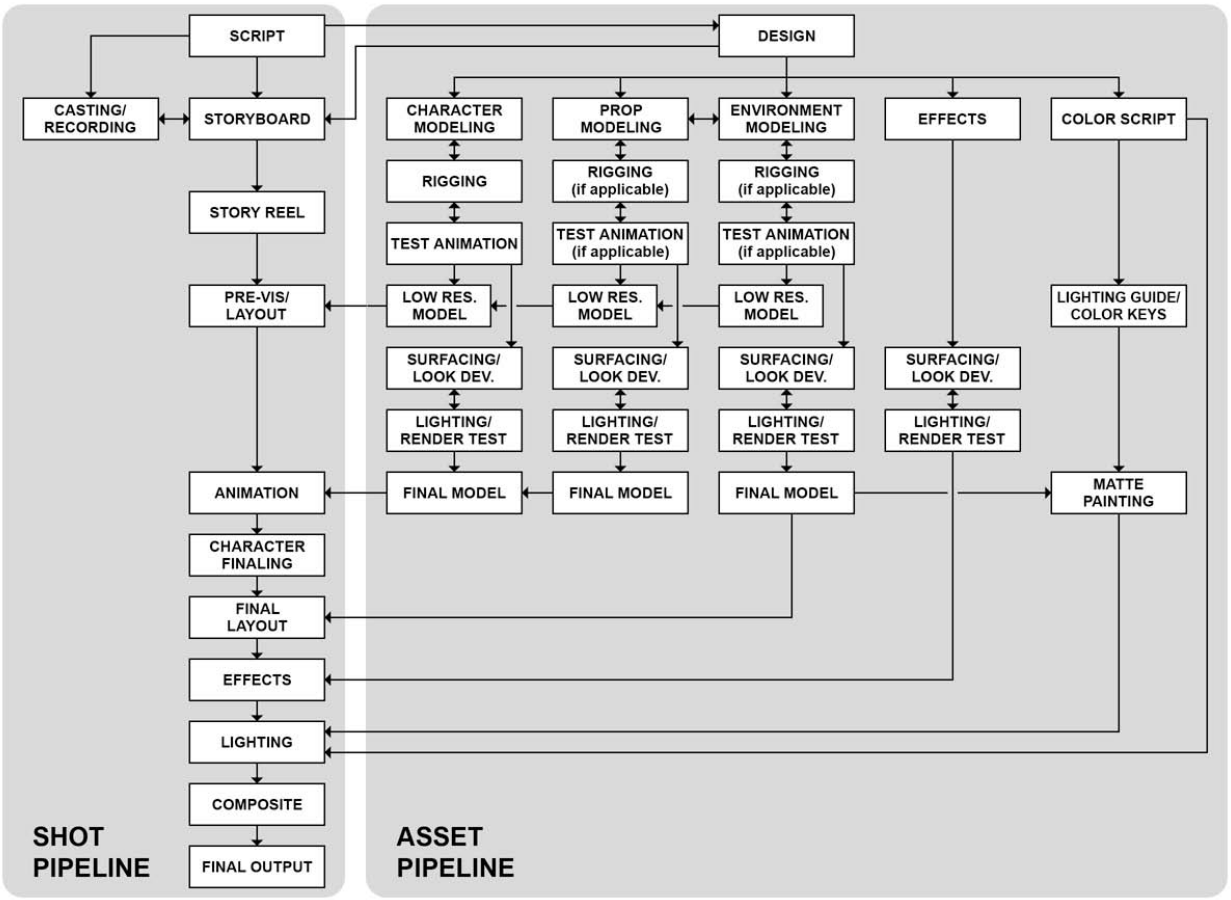


Figure 1: 3D CGI Production Pipeline (Winder and Dowlatabadi 250).

ANIMATION PRODUCTION SCHOLARSHIP

Animation scholarship has begun to migrate toward the recognition that a successful animation project is contingent upon multiple parts of production and not only the overtly animation related phases of production such as animating. This is according to Mark Langer, writer of “Institutional Power and the Fleischer Studios: The “Standard Production Reference” first published in the *Cinema Journal*. Langer adds that “more recent scholarship on animation has begun to stress what Raymond Williams has called the 'nature of a practice and then its conditions'... The recognition of the relation of a collective mode and an individual product” (4).

A focus on production methods and their effect on animation quality has increased. “Many scholars are now discovering what the animators had been maintaining all along - that the organization of the studio and its production methods were important determinants of the final product” (Langer 4). Animation scholars are now looking at how a reworking of traditional production methods can improve the running of a studio and/or animation project.

> Through this change in emphasis from biographical to institutional examination, contemporary methodology has brought scholars closer to recognizing contextual aspects of production always

> understood by practitioners of studio animation. These contextual aspects of production include not only technical factors (technology, production technique, etc.), but also both formal and informal organizational factors (hierarchy, job skills, interpersonal relations, etc.). (sic)(Langer 4)

Scholars are recognizing that previously neglected factors are in fact imperative to the success of a production. Previously animation scholars had placed the success of a production on directors or animators. It is now acknowledged that a well managed production pipeline, which in fact includes a number of factors, is where the success of a production lies. A successful pipeline therefore is one where the time and labour intensive parts of production can have more energy directed at them. It also seeks to find parts of production that will save on resources and time further down the production line, preventing problems before they occur.

Scholarship on this topic is increasing, however no complete book has been written on CGI production pipeline design. Even with the South African animation industry being relatively small, with animators circulating a limited number of studios, “no theoretical model of pipeline practices across the industry is known to exist” (Bettis 8). This is both local and global phenomenon.

Overall, most animation literature can be categorized as 'how-to books', explaining certain processes at length, but never really examining production pipeline practices and production improvement mechanisms. The meagre animation production pipeline theory that does exist is mainly based on feature-length animations, and is constructed on the models of very large, very successful studios such as Pixar and Blue Sky.

As previously stated Bettis infers that his research was motivated by the lack of agreement in the industry on what CGI production pipelines are, and that his thesis is an attempt to fill this gap. He also aims to assist "educated non-specialists" by providing them with a starting point to further explore this topic and to add to this area of research (Bettis 67).

This frame of reference of the medium of animation is necessary because as Wells states, "[animation] is represented in so many styles, techniques and technologies - hence, a coherent defining principle to embrace it would be useful" (2007, 12).

2.1 PRE-PRODUCTION

Isaac Kerlow, author of *The Art of 3D Computer animation and* Effects, submits that pre-production is the process of

conceptualization and planning which occurs before an animated project is produced (Kerlow 77-78). According to Bettis, “though now used throughout the pipeline, the computer is possibly least utilized in the story development stage, which still seems to be ruled by pencil and paper” (3). This story development phase is essential as the overall aesthetic look of a project is developed at this stage (Kerlow 78).

This phase of production is one of the cheaper parts of the production pipeline. It also sets the tone for the rest of production. Pre-production includes: story development; art direction and design (of characters and environment); layout; storyboards; vocal tracks ; animatic[7]; production planning and pre-problem-solving; modeling; texture-mapping; rigging; character set up.

Recently more attention has been awarded to pre-production processes such as writing, character design and story boarding. These processes are active in ensuring that high quality animations are the outcome, before any part of animation is embarked on. Wells contends that “It has become an industry adage in an era that has sometimes complacently invested in 'fixing it in the post' that

[7] An animatic is a story reel where the character is removed from the environment and can be moved around the environment independently, in order to have a more accurate product to animate from (Winder and Dowlatabadi 198). An animatic is also a rough representation of the final animation. It usually consists of a lot less action than the actual animation, but can be used for the accurate outlining of animation timing.

greater attention be given to creative problem-solving in pre-production"(2007, 7). He adds that this way of working emphasizes the creative and economic feasibility of this way of working (Wells: 2007, 7).

NARRATIVE

A good narrative can carry an animation. Although there are some instances where narrative is not essential, in technical animations for example, it is important in instances where storytelling is requisite. There have been instances where an animation is animated at a very low frame rate, or the character design is not necessarily visually appealing, but it is successful because of the strength of the story.

One example of this is the limited animation used in many Anime[8] projects. Initially developed because of limited resources, it has developed "into an expressive form with an extensive formal repertoire" (Kerlow 311). Examples include Osamu Tezuka's *Astro Boy*, which is enjoyable and popular because of an exciting

[8] Anime is a Japanese stylized 2D animation form. It consists of extreme caricatures and characters with extremely large eyes. Additionally it is animated using limited animation, which includes techniques such as an "abundance of motion holds; embellishment of static scenes with wind effects; minimal animation of facial expressions on static bodies; camera POVs [point of views] with extreme perspectives; looped character animation cycles over looped background motion; overlayed time-lapse motion; split-screen simultaneous parallel action; representation of motion and speed with swishing trail lines; and symbolic expression of emotional states through exaggerated sweating, blushing and trembling" (sic) (Kerlow 312).

narrative and also because of the use of the limited animation used in Anime.

A Majority of studios realize the importance of solid storytelling, and will spend a lot of time perfecting a narrative. At Pixar there is a five year cycle between when they make a new animated feature. During this time at least three years are set aside for perfecting the story and visualization before the animation begins. “This alone places much greater emphasis on the work of writers, divisers and creators in pre-production, and stresses their significance” (sic) (Wells: 2007, 15).

In narrative driven animation the story can be the most significant aspect as it determines many of the projects other features, such as style and aesthetics. In their paper entitled “Production and political economy in the animation industry: Why insourcing and outsourcing occur” presented at *DRUID Summer Conference 2004*, Ted Tschang and Andrea Goldstein propose that “It is also commonly observed that it is the story and style that has led to a particular film's success and not the technology” (5). Thus in narrative driven animations a solid story is essential. A well constructed story shortens the time it would take to create a story board and an animatic, saving production time.

CHARACTER AND ENVIRONMENT DESIGN

Once a competent story has been established characters and their environments can be created. Paul Meyer, Executive Producer on *Bun and Bunee* and founding partner at Luma, remarks that a well designed character is one whose characteristics are clear without a written or verbal explanation. The character's design needs to describe the character itself. "The design of a character, it should originate from the character's identity... So if a character is a nervous kind of person, it's got to look like that" (Meyer, Personal Interview).

Meyer substantiates that "the design of the character can also come from the nature of a character, or the function or purpose of a character or a brief from a client or the product that it represents or the message it communicates or the world it lives in" (Meyer, Personal Interview). He uses the example of a glass character, which would have certain characteristics inherent in it. For example it is transparent, how will you therefore show its features? Light would need to bend around it so you could see its edges (Meyer, Personal Interview).

The design of a character is an important step in production. It is here that issues of modeling, rigging and movement should be

considered and solved. Questions of how the character will deform if its features are too big or too scrawny should be answered here. The simplification of certain elements like hair to make the transition to 3D easier should also happen now.

It is also at this point that the studio should ensure that the design of the character coordinates with its target market and appeals to this group. Some studios, if there is a budget for this, may introduce the target audience to the characters to measure audience response. “People outside of the business don't know. Most animators don't know you don't create a show for everybody, you might think you're creating a show for everybody, but you're not” (Meyer, Personal Interview).

A clear focus on who the target audience is, is important for any animated project. It sets the tone of acceptable content. Also animated shows for adults may be geared more towards entertainment, though not always, and children’s content can be both entertainment and educational. Traditionally animated series would be targeted at children aged nine and below, now however target groups include teenagers, adults and the family (Tschang and Goldstein 2). Script writers should therefore be conscious of their

target group at all times, for the project to succeed with the intended group.

Ultimately “the strength of the show's design not only helps sell it, but also attracts artists to join the team and inspires them to do great work” (Winder and Dowlatabadi 164). Properly considered during the phase of pre-production, well designed characters make the processes of modeling; texturing; rigging and animating much easier. As Wells explains, animation is a labour-intensive process. As a result it is crucial that precise planning and preparation of materials be done forehand, so that the animation is completed economic and timely manner (15).

STORYBOARDING

Ideally production should not begin until all storyboarding is complete. This is because the storyboarding phase is one of the more low-cost parts of production, when compared to others. Additionally creating storyboards early assists in the translation of the story and script into images (Kerlow 79). It is therefore best to allocate more resources to this phase of production in order to avoid complications later on. If the narrative is predictable or inappropriate, it is at this point that those issues would be identified and resolved (Winder and Dowlatabadi 182-183).

Storyboarding traditionally consists of three stages. The first is thumbnails[9]. These drawings are quick and allow the storyboard artist to quickly make whatever changes the director dictates. Second is the rough pass, which consists of images much larger than thumbnails. These sketches have all the director and writer corrections included. Here camera angles and character placement are partially finalized. The rough pass is easier to comprehend for non-artists than thumbnails. At this point a rough animatic can be made. The last stage is the cleaned up storyboard, which has fully rendered panels consisting of all the details of the scene (Winder and Dowlatabadi 182-183).

The cleaned up storyboard is then used to develop backgrounds for shots[10] and scenes[11]. The vocal track is also recorded at this time. Frequently videos of the actors recording dialogue are taken to use as visual reference during animation. These visual aids assist animators with capturing facial expressions and minute nuances and mannerisms (Bettis 44).

After all the audio tracks are down an animatic can then be created, with dialogue; sound effects and music included. This

[9] Thumbnails are concise, miniature panels which are created in order to illustrate the action (Winder and Dowlatabadi 182).
[10] A shot is "a length of film taken by a single camera without breaks" (Collins 924). In CGI animation a virtual camera exists, which acts much like a real camera. Therefore a single shot in an animation is like a shot in film.
[11] A scene is a series of shots which create a unit of action (Collins 891).

animatic is used for timing of the final animation (Winder and Dowlatabadi 197).

PRODUCTION SCHEDULING AND CGI'S CYCLICAL NATURE

Winder and Dowlatabadi submit that a production schedule has to allow ample time for research and development, in order for there to be sufficient time for creative and technical iterations during pre-production. If not, the production becomes difficult to manage and begins to stagnate (Bettis 7).

CGI animation production is dissimilar to traditional 2D[12] animation production because it allows for a more 'cyclic' mode of production. Therefore aspects of production which would be costly to change in traditional 2D, for example the design of a character, can be changed in 3D even whilst later phases of production such as rigging have been completed.

Winder and Dowlatabadi advise those creating CGI animation to be realistic when developing a schedule, carefully considering what can be achieved in the available time. They substantiate that "If you are not able to evaluate the time needed per department,

[12] Contemporary 2D practices often make use of software and modern technology. In this text however traditional 2D animation refers to a series of hand drawn sketches which follow each other in succession in order to simulate natural movement. The process detailed here is a completely analogue one which does not include the use of software such as Toon Boom and Flash to assist with the animating process.

ask questions from reliable sources such as the director or the department head (if available)" (103). Open and honest communication between supervisors, producers and directors will assist all parties involved to accurately determine possible production time-consumption and resource-consumption.

Another factor to consider during production planning is what Winder and Dowlatabadi call "aesthetic requirements versus budgetary limitations" (165). They use the costume of a main character as their example. If said character were to have an intricate costume with lace and buttons for example, these elements would require additional drawing time during story-boarding and additional modeling and render time later. The studio would have to decide if the extra time and cost involved is worth incurring, to improve the final product. They would need to assess whether anything is gained from this design. Producers have to ask themselves if the show would be stylistically blemished if an unembellished costume was used instead, or if their budget could accommodate a more complex design (Winder and Dowlatabadi 165).

These aesthetic requirements need to factor in the needs of the target audience, the budget and the longevity of an animated series. Initially an elaborate design may be possible, but if a show

becomes more popular and more episodes are needed for example, would production be able to continue at the same quality if the show is aesthetically complex? These are questions which need to be answered before production begins.

RESEARCH AND DEVELOPMENT

Invariably every animation project will have its own particular conditions and will as a result have varied schedule lengths (Winder and Dowlatabadi 103). It is essential then that each studio is able to work within their limitations, keeping them in mind during all phases of production. Generally studios working on feature length animations and with larger budgets would have a Research and Development (R&D) department. This department works on solving problems before they occur, thus cutting production problems before they arise[13] (Bettis 50).

It is during the production planning phase where the R&D team begins developing tools for use further down the production line. Creating tools at this phase means no time will be wasted when these tools are required. Studios with larger budgets are able to

[13] The last auxiliary department in most studios is a Research and Development team. R&D is responsible to investigate new ways of solving problems, to create new tools, effects, programs or processes and to develop them into software for future studio use. The R&D team is tasked with solving problems anticipated in an upcoming production. A hypothetical example being "we're going to be dealing with wet fur for the first time, figure out some way to efficiently represent and control it in the computer" (Bettis 50).

invest more time and money to this phase of production. One example of this is Blue Sky. The studio invested heavily in the development of a single powerful proprietary application, a rendering system called CGI Studio from 1987 through early 90's. "One of Blue Sky's founders Eugene Troubetzkoy, who holds a degree in theoretical physics, was a pioneer of global illumination; CGI Studio is largely a result of his talents" (Bettis 28).

MODELING

Modeling refers to the process of constructing objects which are to be used in animating (Winder and Dowlatabadi 242). These objects include the characters, their environments and all the props that will be used.

Objects can be modeled in a number of ways. Firstly the drawn 2D designs can be digitized and modified on the computer to add volume and dimension. Secondly software like Maya and XSI Softimage can be used. These programs have "basic three-dimensional geometric shapes, also referred to as primitives" which can be modified to create objects (Winder and Dowlatabadi 242). Lastly maquettes[14] or sculptures can be scanned, the image

[14] A maquette is a sculptor's preliminary model or sketch (Google). In this instance it would be a small object which is modeled and then scanned to be used as a digital 3 dimensional model.

information would then be fed into the computer and an initial shape for the model would be created (Winder and Dowlatabadi 242).

It is also common practice to build proxies[15] at this early stage of production, so animators and riggers can begin with their parts of production whilst the final models are still being created (Kerlow 81).

The alternative to building a model is to buy a completed model. There are a number of websites which offer free models for download; however more complex models tend to be sold.

RIGGING

Characters and props (parts of the environment) that may need to move are then rigged[16]. A character can be rigged using forward kinematics[17] or inverse kinematics[18]. A properly rigged character will make the animation process smoother. After rigging, studios will

[15] Proxies are 'place holder' geometry. They are used in place of final models so animators can view what a scene will look like. They are often used in animatics.
[16] The rigging process entails of the adding of a skeleton to a model. This is done so that body parts can be connected and manipulated by animators (Winder and Dowlatabadi 243).
[17] Forward kinematics describes the movement of the joints of a skeleton attached in such a way that they move a bone chain. An example of this would be the movement of an arm from shoulder-to-elbow-to-wrist. This movement would begin at the root, rotating the shoulder first; the elbow would follow then the wrist, to get the hand into the appropriate position (Winder and Dowlatabadi 243).
[18] Inverse kinematics permits an animator to position the hand (for example) anywhere in the space. The computer then calculates the rotation and position of the upper arm; forearm and elbow, connecting them to the shoulder (Winder and Dowlatabadi 243).

pass the rigged character to the animators to test, to see if it will 'break'. The character needs to move proportionately and the skin and clothing should not warp from movement. The riggers will therefore at times return models to the modelers if it is essential to amend the model to allow for smoother movement (Winder and Dowlatabadi 243). This again reflects the cyclical nature of the CGI animation pipeline.

Once the rigs are finalized the characters are skinned. This is to ensure no deformation takes place during movement. It is here that muscle formation and skin coverage is done, to ensure the correct parts of 'skin' are attached to their correct coordinating 'bones' (Winder and Dowlatabadi 243-244). For example when a character clutches his fist, his knuckle skin should not slide unnaturally off the knuckles. It should remain at the same place as when the hand is unfolded, and the skin should look natural in both instances.

TEXTURE MAPPING

Texture-mapping consists of adding colour and texture to characters, environments and props. It is important that the textures of all these elements mesh well together. Complicated environments with a great deal of detail and high definition may

not make sense with a very simplified graphic character, unless that is the look and feel which is trying to be achieved.

Often studios will begin with test animation whilst texture-mapping is being done, which ultimately saves the studio time. A model does not have to be textured before rigging and animating can begin. The textures can later be added to a rigged character.

POSED CHARACTERS AS PROMOTIONAL MATERIAL

Once texture-mapping is complete the character is posed, so the studio can begin advertising/promoting the project. These posed characters can also be used to pitch to potential buyers of the project. Toys and promotional material such as clothing and lunch boxes can be created from these images. According to Winder and Dowlatabadi:

> "Depending on the project, there may be a multitude of requests from ancillary groups such as marketing, licensing, and promotions. The producer may need to budget for a point person to produce materials (such as a style guide) and to coordinate artwork or film as necessary". (sic)(119)

Although the promotion process is not directly linked to the pre-production phase process, it is important to mention as it

demonstrates that multiple processes can continue simultaneously. This includes those facets that do not directly affect production, such as promotional material.

"It is useful to remember that animated films are normally essentially made in their pre-production phase, while live action films are made in post-production" (Wells: 2007, 15). Unlike film, animation does not have the luxury to cut and re-take shots. As such this phase of production needs to be exhausted, ensuring all probable future circumstances are accounted for.

As previously stated there is an industry shift that now places more significance on pre-production as opposed to post-production, as doing so saves time by ensuring that problems are resolved before they occur. Apart from technological improvements which now streamline production this shift of focus, in and of itself, is a production pipeline streamlining tool. Wells contends that "In general, animation is configured in the pre-production stage and monitored and modified during production; this means there is a greater emphasis on the process as it occurs, rather than after it occurs" (2007, 18).

Ultimately studios need to make a profit to be able to afford future projects; hence a focus on pre-production ensures that no

unnecessary time or funds are spent on more labour intensive processes. According to Paul Wells and Johnny Hardstaff, in *Re-imagining animation-The changing face of the moving image*, "It would be naïve to think about animation production in all its guises outside of a commercial context and the demands of the market economy" (Wells and Hardstaff 47). Failing to do so jeopardises both a studios current project and the studios prospects of future projects.

2.2 PRODUCTION

This part of the pipeline includes animation, lighting, and effects. "... the emphasis at this stage is on final timing, composition, staging, and cinematography" (Winder and Dowlatabadi 245). A 3D story reel is also created at this point. This refined 3D story reel, or 3D workbook contains the environment, character and prop placement, poses, character interaction, screen direction, timing, camera position, camera angles, and rough lighting (Winder and Dowlatabadi 245).

ANIMATION

Animators are responsible for creating movement. It can be said that this phase of production is one of the more important

phases because even with the pre-production phase executed well, a badly animated character is bound to look rigid and boring. Similar to 2D animators CGI animators are tasked with ‘breathing life’ into characters by giving them personality and the capacity to move and interact (Winder and Dowlatabadi 246). 3D Animators are also responsible for representing the projects two dimensional design visions in a three dimensional space.

Winder and Dowlatabadi state that “the computer animator should be trained on how to animate a character so that its construction, movement, weight, balance, and proportions are consistent” (246). Therefore CGI animators are expected to follow the same principles of animation mechanics, acting, and timing as traditional animators. Additionally they are expected to use the computer and whichever animating software tool the studio uses.

SOFTWARE

There are various software options available to studios. Most South African studios use 'off the shelf' software such as Autodesk XSI Softimage and Autodesk Maya. International studios tend to be larger and thus tend to have the funds to build their own in-house software, though large studios do not always choose to do so. It depends on the needs of the studio and the project. This can be

seen in the following examples. PDI and Pixar for example utilize large highly specialized teams which utilize in-house software. Blue Sky and DNA have an opposite, but equally profitable approach to production. They use smaller teams and off the shelf software (Bettis 30). All four studios produce quality animations and are profitable. Software options are therefore best chosen according to studios unique needs.

LIGHTING

"How a scene and/or character are lit can greatly affect the viewer's perception and emotional reaction. Lighting creates a mood and, where necessary, adds drama" (Winder and Dowlatabadi 247). An example of this can be seen on Disney movie *Up*, in the montage building up to the hospital scene where Carl and Ellie are told that they cannot have a baby. There is no dialogue but the dramatic lighting contrast between the hospital scene, and the shots before where the couple are painting a nursery, makes it clear that there is sorrow and drama in this scene[19].

[19] Even without formal training on lighting and colour, there are certain colours which most people are able to associate with certain emotions. Film-makers know these and are able to use them to add certain emotions to a scene. This can also be done through lighting where yellow light through a window can indicate a bright sunny day out, whilst dim grey/blue light can signify a rainy day out. Audiences would be able to interpret this, even with a lack of dialogue and sound effects.



Figure 2: Disney Pixar. *Up*. (sher-asliceofheaven.blogspot.com, 4 Sept. 2013; web; 16 Aug. 2014).



Figure 3: Disney Pixar. *Up.* (danigrego.blogspot.com, 12 Apr. 2014; web; 16 Aug. 2014).

Light in CGI animations is expected to behave as real light would. For example an apartment window with open curtains on a sunny day would emit light differently than a neon light in an underground parking garage. Winder and Dowlatabadi propose that experience with traditional painting, drawing, and photography are helpful when it comes to knowledge of how light behaves (247).

Depending on the scene/episode background effects may be necessary to complete the mood. In these cases animators, and for larger projects, effects animators, would create and animate non-character related animation. “Their artwork includes items ranging from furniture to vehicles (also known as props) to natural elements such as shadows, mist, fog, wind, and fire” (Winder and Dowlatabadi 247).

For the film *Antz*, released September 1998, PDI developed a crowd-control simulator. This meant more time could be spent animating important characters, and crowds could be simulated (Bettis 26). “The effects are developed in unison with lighting to ensure proper integration with all elements” (Winder and Dowlatabadi 247).

The production phase of the production pipeline is the most labour intensive and expensive phase, however if pre-production is

properly handled, resources and man-hours can be greatly reduced. Well-planned production also means that studios can learn a great deal from the process. Larger studios like Pixar also aim to "always include new technical features", which can be used in future projects (Tschang and Goldstein 7).

2.3 POST-PRODUCTION

Post-production consists of rendering[20], compositing[21], touch ups and final video output. These renders are the final and not test renders used to check models and animations, or those used in the workbook.

RENDERING

The more detailed the environment, characters, props and texture-mapping of a project the longer it will take to render and the more processing power it will need, "the more layers added, such as texture and lighting, the longer it takes the computer to process all the mathematical data and generate the image" (Winder and Dowlatabadi 248).

[20] Rendering is the retrieval of all information in a scene, including character models, props, the environment, lighting and shaders. Depending on the amount of information in a scene the process may require anything from a few hours to a number of days (Winder and Dowlatabadi 248).

[21] Compositing in animation is the combining of separate sound and visual elements to form a single video output of the best quality.

"When the final scene is ready for output, it is necessary to use the highest form of rendering in order to see how the shot is going to look on the theatrical and/or television screen" (Winder and Dowlatabadi 248). This gives the director the opportunity to see if any last changes need to be done. Changes at this very late point are not recommended however, as they would be very costly. One example of this is on Dream Works Studio's feature-length animation *Shrek*. "Mike Myers, the voice of *Shrek,* decided after an initial viewing that he wanted to change the main character's accent to a Scottish one. This one change forced some of the animation to be discarded, and reportedly cost Dream Works an extra US$4 million" (Tschang and Goldstein 7).

Alice Crawford is the author of "The digital turn: Animation in the age of information technologies" published in *Prime time animation: Television animation and American culture*. She argues that:

> The enormous expense of the machines needed to render CGI led, at first, to an increasing divide between the capabilities of independent animators or small production companies to produce the kind of animation possible in larger companies... However, since the late 1990's, with processing power continuing simultaneously to increase and become cheaper, the same

> procedures the major animation companies have been using have become available to a much broader array of animators. (sic)(Crawford 115)

Thus due to advances in technology, and this technology becoming cheaper and more readily available, smaller animation studios are now able to produce high quality work at attainable costs. Technology has therefore democratized the creation of animated texts, making this medium more affordable.

Some studios, usually those producing feature-length animations, will have a dedicated rendering department. “The advantage of maintaining a department is that quality control becomes more centralized for rendering tasks” (Bettis 53). Not having this department, however, means less people need to be hired, reducing production costs. Therefore if not essential to the outcome of animation quality, this department is not essential (Bettis 53).

COMPOSITING

During compositing “the scene is broken up into separate elements and then layered back together in preparation for final film or video output”. This layering should be “seamless” and the

viewer should not be able to see how everything has been put together (Winder and Dowlatabadi 248). The environment, characters, props, lighting should blend well aesthetically.

Final touch ups are then done. “Since it is too costly to redo a scene at this point, paint programs such as *Photoshop, Matador, Amazon Paint* or *Inferno* are used to touch up the few frames”, which may have been damaged by software, design or production flaws and/or mistakes (Winder and Dowlatabadi 249). Credits are added and a final video output is created, including soundtrack and dialogue, if there is any.

As mentioned most animations are created using the traditional production pipeline format, or slight variations of it. The ability to format, streamline and properly allocate time to each part of production is what makes some productions more efficient than others. It is also what makes some projects more successful than others. Studios need to make a profit from projects in order to be sustainable, but they also have to deliver on time in order to be able to get commissioned, or funded for future projects. The practices which have been discussed above are those which can be said to be “best practice”, phases of production which are integral to the creation of most 3D animations.

CHAPTER THREE: PRODUCTION IMPROVEMENT TOOLS

The twenty-first century has brought with it a clear shift in visual culture which has seen it transition from analogue to digital. Crawford, submits that there has been a technological and cultural transformation which has led to the incorporation of the digital into all aspects of visual communication (110). As a result there has been an increase in the development of digital tools for the production of imagery and its manipulation. The effects of the expansion of visual tools have been far reaching including "everything from the creation of animated texts, to their distribution, reception, and aesthetic characteristics" (Crawford 110).

EARLY ANIMATION

The production of animation is evolving and modes of creation are constantly being improved upon. According to Wells and Hardstaff, "Animation has always re-imagined itself and is merely in a new phase at the heart of new digital orthodoxies" (16). Animation studios which are not open to technological advancement are negatively affected by the development of digital tools.

Illustrative of that fact is the decline of work by early animators such as Emile Cohl[22] and Windsor McCay[23]. They were forced to stop producing animation by 1921 because they were unable to produce animated films in large quantities or failed to keep production costs low. After the demise of animators such as these it became clear that "the next generation of film-makers would be those who controlled costs and regularized mass production" (Langer 5).

As a result early animators such as Walt Disney and the Fleischer brothers sought to keep firm control over production in various ways. At the Disney studio the core of production management was directed by Walt Disney. The script and the storyboard were used as a choke point by which Disney could supervise production. The choke point being the place in production where all aspects of production would be approved before the more labour intensive parts of production (for example animation) commenced. The story department became Disney's main point of management, occupying a place at the pinnacle of the hierarchical

[22] Emile Cohl (1857-1938) was a French graphic artist and animation film pioneer. Initially a cartoonist and writer in the 1880s/90s, he soon graduated to directing comedy films. He then migrated to creating animation films predominantly through the example of American animator Stuart Blackton, creator of *Humorous Phases of Funny Faces* (1906). He worked with line drawings, cut-outs, puppets and other media. His first animated film was *Fantasmagorie* (urbanora).

[23] Windsor McCay (1867-1934), originally a famous cartoonist and lightning sketch artist, created his first animated film *Little Nemo* in 1911 which he used in his vaudeville act. Made in 1912 his second animation is *How a Mosquito Operates*, where a slightly anthropomorphic mosquito protagonist charms eager audiences. His most successful animation however was *Gertie the Dinosaur*, which took two years to complete and features a dinosaur character with human characteristics such as shyness, a temper and the ability to cry when her feelings were hurt. This short was an instant audience favourite (Spring Lake District Library).

pyramid (Langer 7). As previously stated studios need to use context specific methodology to improve production and lower costs. For Walt Disney Studios, at that time, a strict control of narrative was the solution.

At Fleischer Studios they needed a way to coordinate labour and limit costs. The Standard Production Reference[24] was then introduced in order to manage production. The original version of the Standard Production Reference was published as a ring bound file, so additional pages could be added. It had fifty-six pages which consisted of animation guidelines. Other sections included "outlining techniques and procedures for the Inking Department, the Inbetweening Department, Planning, and Special Effects" (Langer 9). This document also defined technical terms and had production information sheets. These production information sheets included exposure sheets, mouth charts, etc. (Langer 9).

[24] The Standard Production Reference, also referred to as 'the bible', was a way to coordinate labour and cut costs at Fleisher Studios. It was compiled by Spaber and Kneitel, animation directors and producers at Fleisher Studios. It had a stipulation on the first page that they are the ones who should be consulted for clarification on all matters. Throughout the book traditional lines of authority are reiterated. "They specify the need to check with them or with the head animators who report directly to them, for approval at key stages of production" (Langer 12). It is noteworthy that the reference does not mention Dave Fleischer, or the story department. The bible was a production manual first and foremost, it however also accentuated administrative hierarchies and consequently controlled power relationships. "As a normative text, the Standard Production Reference not only was designed as a guide to artistic practice, but also to institutional practice" (Langer 12).

CGI, ANIMATION'S 'NEW' AESTHETIC

Since the creation of Pixar's *Toy Story*, created in 1995, CGI animation has become the dominant form of animation especially in feature length projects. Wells and Hardstaff suggest that it has even replaced "Disney's classical 2D styling as the core aesthetic of what Shiloh McLean calls 'new traditionalist' animation" (30). It can be argued that this is true because after the release of *Toy Story*, there has been a large number of aesthetically similar 3D animation features. This however does not mean that 2D animation is dead. There are numerous animated series' and features which are produced in 2D and are successful. Examples include Hayao Miyazaki's feature *The Wind Rises,* released in 2013 and Disney's 2D feature *The Princess and the Frog,* released in 2009[25]. Warner Bros. also still produces 2D animated series such as *Loonatics Unleashed*.

There is also evidence of the popularity of 2D animation which does not conform to the classic Disney or Anime styling. One example is the work of Don Hertzfeldt. He is an independent 2D

[25] *The Princess and the Frog* was released in 2009; five years after Disney closed its 2D studio. In an interview with John Musker and Ron Clemens, Rob Carnevale inquires why. The development of the story was ongoing, on and off, for almost eighteen years. There have been various versions including one by Eric Goldberg, which was a sort of Shrek-like version and a CGI Pixar version which was set in gangland Chicago. After Disney bought Pixar Ron Clements and John Musker, directors on the film, read all the Pixar and Disney versions and came up with their own variation which had an African-American lead; was hand-drawn and was a musical. The decision to set the film in New Orleans was on account of John Lasseter, Head of Disney animation, who thought the proximity of the bayou was natural because of the frogs in the story (Interview).

animator, who shoots his 2D animations using a film camera. He has created multiple short animated films including *Rejected* and *Everything Will Be OK* which were both nominated for the Academy-Award ("Don Hertzfeldt: Biography"). Hertzfeldt contends that digital tools perform certain tasks decidedly well; likewise analogue film cameras do other things particularly well. He substantiates that one cannot be better than the other as they are markedly different (qtd. in Wells and Hardstaff 60).

"Hertzfeldt's approach to animation is traditional (pen, paper, and film), his methods are entirely self-taught and extremely unorthodox" (IMDb). He shoots his animations on the camera which was used to shoot *A Charlie Brown Christmas.* Hertzfeldt has created some of the most popular animated shorts and in 2012 he was ranked 16th in "an animation industry and historian survey of the "Top 100 Most Influential People in Animation" (IMDb). Hertzfeldt's popularity illustrates that 2D is in fact not dead. Furthermore the success of animated shorts such as *Kiwi* by Doni Permedi, which do not follow the popular Pixar and Dream Works style of CGI, prove that the introduction of technological tools does not purport an imposition of aesthetics and that the tools used need not define design.

The rejection of older tools can be counterproductive because as Hertzfeldt submits “we should be expanding the tool box when we add new technologies to it, not subtracting at the same time” (qtd. in Wells and Hardstaff 60). And although digital is cheaper, easier, and in certain ways more practical, this does not make it an innately better format. There are advantages and disadvantages to the use of any medium. The use of non-digital tools affects not only the aesthetic quality of an animation, but also the path of production, cost of production and production time length. The use of non-digital tools means an artist can create an animation which does not have the look and feel of what has come to be known as the animation norm, the 3D look which audiences have become accustomed to.

The problem with digital according to Hertzfeldt is that many artists work in this format; they are then all working with software that is rarely older than a few years. “It means all these artists have little choice but to essentially work from the same palette – and in animation especially, you begin to notice how everyone’s movies sort of start to look and feel the same” (qtd. in Wells and Hardstaff 60).

Despite the fact that Hertzfeldt feels that many of today's animations look and feel the same, "it is important to look at the indices and provocateurs of change in animation" (Wells and Hardstaff 16). Animation has always been diverse. It is a medium which is characterized by a medley of modes of expression; these include everything from the traditional cartoon to experimental film. To grow, and indeed to survive, animation has had to embrace new technologies and the ways in which modern tools can expedite new outcomes (Wells and Hardstaff 16). As mentioned before however animators such as Hertzfeldt are an exception when it comes to the production of 2D animation and not the rule because contemporary 2D makes use of technological tools.

THE COMPUTER AS AN ANIMATING TOOL

"Foremost among the technological developments that have affected animation in the past quarter-century is the merging of computing and image-making technologies" (Crawford 111). This shift has greatly decreased the time it would traditionally take to create images and animate. It has also allowed animators to work in three-dimensions.

> The introduction of the third dimension, or "z" axis, to animation makes possible, among other things, the introduction of highly

> filmic visual techniques that are too labor-intensive in analog...With the flexibility of three-dimensional modelling, some of the basic visual tropes of filmmaking that would be too time-consuming to produce in analog animation now become possible. (sic) (Crawford 113)

Working in three dimensions allows an animator to create visual effects conventionally used in film, such as long zooms, smooth tracking through a scene, and smooth tracking of shots, and scene display from an array of angles (Crawford 113-114). An animator can see action from all angles allowing them to choose the most visually appealing one, without having to re-draw a scene as they would need to in 2D animation.

Apart from the technological tools which are constantly being created and improved upon, the introduction of the computer as a tool has itself drastically improved production time and has allowed animators more freedom and control. “The computer enables artists to make choices more efficiently, and provides many new options in modelling, colouring, lighting, character animation, character control, cinematography and graphic rendition” (Bettis 4).

This freedom and efficiency is what sets CGI animation and its pipelines apart from 2D and stop frame animation, although these

animation types can use the computer in certain areas of production. Czech stop-motion animation director Jiri Barta asserts that “Three-dimensional (3D) CGI has no limits in the computer, but 3D stop-motion is limited by the animators and their access to, and work with, the characters and sets we build” (144). 2D is limited by the time it takes to draw each frame and the immense amount of time wasted if anything needs to be re-animated.

The use of 3D technologies allows for the cyclical nature of the 3D Pipeline. Any changes necessary in a CGI pipeline seldom require a complete reworking of an entire process. “Since the CG pipeline is a digital software system, it is inherently more flexible than systems built upon mechanical hardware. As a result, people are able to adapt new solutions almost as soon as they discover problems” (Bettis 45-46).

The range of imagery which was possible with analogue processes such as painting, drawing and sculpting was limited in scope. The introduction of computing technologies in animation has augmented animation production processes, allowing for qualitatively diverse techniques in the way animation is produced and received (Crawford 112). Barta and Crawford both agree that the computer as a tool makes production quicker and advocates for

the use of technology for the improvement of the animation production process. Furthermore because of the variety of animation software available and the constant development of this software, CGI production is always in flux.

Technology allows studios to create international quality animations as processing power increases and better software is released.

> In the late 1970's Alvy Ray Smith[26] and Ed Catmull[27] calculated that to make a CG animated film at that time would cost one billion dollars, [10:99-100]. However they also foresaw that given enough time to develop, computer animation would actually become more economical than traditional animation. They based their prediction on Moore's Law, a dictum that computers for a given price will double in power about every eighteen months, and, conversely, that prices will drop by half every eighteen months for a given amount of computational power. (sic)(Bettis 13)

This growth in computational power, along with a well experienced workforce and the latest technological tools are an

[26] Alvy Ray Smith is a computer graphics pioneer and co-founded Pixar with Edwin Catmull. He was the first Graphics Fellow at Microsoft has been co-awarded the Computer Graphics Achievement Award by the Association for Computing Machinery (Alvyray).

[27] Co-founder of Pixar Dr. Edwin Catmull has been awarded the Gordon E. Sawyer award from the Academy of Motion Picture Arts and Sciences for his contributions to computer graphics which were used in the motion picture industry. After Disney acquired Pixar in 2006 Catmull was placed in charge of reinvigorating Disney animation studios in Burbank (Pixar Wiki).

invaluable asset to any animation company. “The computer enables artists to make choices more efficiently, and provides many new options in modelling, colouring, lighting, character animation, character control, cinematography and graphic rendition” (Bettis 4).

3.1 PRIMARY TIME SAVING PRACTICES

Animation production tools differ vastly, and there are multiple software options available. Studios can select a complete animation package that is able to complete all of the tasks on an animation pipeline such as XSI Softimage or Maya, where animators can model; rig; animate; light and render.

Kevin Kriedemann, who wrote an article entitled “African animation: Moving from great projects to great companies” in ‘Africa’s leading film industry magazine’ *Callsheet*, states that “Autodesk dominates with several products, the most popular of which is Maya... In South Africa; XSI Softimage is also very popular, especially in the more high-end studios” (19). Alternatively studios may choose to write tools themselves. Advances in technology are allowing animators and studios to do more with less (Kriedemann 19).

Further time saving practices include strict naming conventions, defined file formats, a unified process and a competent general workflow. During his presentation at Kunjanimation[28] on how to improve production pipelines, independent South African game designer and former lead character technical director at Naughty Dog Inc[29]., Judd Simantov emphasizes the importance of the above mentioned time saving production practices. He proposes that the use of these practices increase ease of use, and escalate predictability. This then makes the training of new people in their workflow much easier. Additionally assets can be altered in bulk, further reducing time wastage.

Whatever a studios choice in terms of software and production workflow, there are more common practices which can be used to save time during the production process. These processes do not and cannot however be used by all studios as each project differs and these methods may not be appropriate for all projects.

[28] Kunjanimation is South Africa's Premier animation festival. The festival aims to promote the art and business of animation in South Africa (Kunjanimation).

[29] Naughty Dog Inc. is an American Santa Monica, CA. based game studio. Originally known as Jam Software, it was founded in 1986 and re-named Naughty Dog in 1989. They have created a number of successful games including *The Last of Us, Uncharted 3: Drake's Deception* and *Uncharted 2: Among Thieves* (Naughty Dog).

MODELING

Writer for 3d.about.com, Justin Slick has written over a hundred articles on software reviews, tutorials, interviews and informational pieces which he writes for the beginner to intermediate 3d animation creation audience. In his article entitled "7 common modelling techniques for film and games" Slick discusses various approaches to creating 3D models, one being digital sculpting which allows animators to "intuitively create 3D models in a fashion very similar to sculpting digital clay" (Slick). The artist creates the meshes[30] organically using a Wacom tablet[31]. This process is time efficient and allows artists "to work with high-resolution meshes containing millions of polygons. Sculpted meshes are known for previously unthinkable levels of surface detail, and a natural (even spontaneous) aesthetic" (Slick).

Another method of modelling, which does not require a modelling artist to create a model from primitives is procedural modelling. It allows artists to model by generating algorithms[32]. This form of modelling is usually used for the creation of

[30] A mesh is a 3D surface representation with 3D points and which can be connected.
[31] A Wacom tablet is a type of input device which is used in place of a mouse and keyboard for design purposes. It uses a pen and tablet device which it connected to the computer to directly input graphic or instructional information, much like a mouse would but with a greater level of detail.
[32] According to The Collins Dictionary and Thesaurus an algorithm is "any method or procedure of computation, usually involving a series of steps as in long division" (Collins). In animation it refers it to the mapping of algorithms into images.

environments like cities or forests, which would take too long to model individually and with sufficient variety to look realistic. “In the popular environment modelling packages Vue, Bryce, and Terragen, entire landscapes can be generated by setting and modifying environmental parameters like foliage density and elevation range, or by choosing from landscape presets like desert, alpine, coastal, etc.” (Slick).

Image based modelling is a process where 3D objects are created from 2D images. The images are loaded into the software, which uses algorithms to add the missing information. This form of modelling is frequently used when there are time or budget restraints, which do not allow for the manual creation of 3D assets (Slick).

A different example of the same sort is 3D scanning. This method of modelling entails the scanning and digitizing of real objects into digital models. This method is used when an extreme level of photo-realism is requisite. An actor or object is scanned, and a model is generated from the data. “Scanning is often used when a digital representation of a real-world actor is required, as in *The Curious Case of Benjamin Button* where the lead character (Brad Pitt) aged in reverse throughout the film” (Slick).

RIGGING

There are fundamental procedures which assist in making the rigging process easier. As with modelling, rigging has multiple alternatives. A new rig can be created or a rudimentary one, provided in most animation software, can be used. Autodesk XSI Softimage comes with three skeletal options – biped guide, biped dog guide and quadruped guide. These standard rigs may be best to use if time is limited. If a characters skeletal structure is very specific a rigger can alter the standardized rig to suit the characters needs.

Autodesk Maya has a standard high quality animation rig plug-in[33] named The Setup Machine 2 (TSM2). The plug-in is distributed by Anzovin Studio and the rig is constructed by Raf Anzovin. The team at Anzovin Studio have created a manual available for users and potential users, which explains how the plug-in works. This document has been compiled by Raf Anzovin, Steve Anzovin and Morgan Robinson.

[33]Plug-in applications are programs that are installed into other programs to supplement their functions and/or performance (Rouse).

The plug-in enables efficient 3D character manipulation as well as basic automated skin weighting[34]. The artist need only attach the pre-made widget into their own character then attach the mesh and TSM2 installs the rig and calculates the weights autonomously. This eliminates most of the complex and time-consuming steps imperative for rigging (Anzovin 2).

TSM2 is a beneficial application for two reasons. Firstly it is economical because the plug-in works with Maya, therefore studios do not need to buy a separate rigging package in order to use it. Additionally because it is a Maya plug-in if any weighting issues occur they can be fixed using Maya's weight painting tools. Secondly because it eliminates many of the rigging steps knowledge of joint orientation, pole vectors and expression syntax becomes unnecessary (Anzovin 8).

The plug-in can rig not only humanoid characters but multi-limbed characters such as a giraffe or a squid. The quadruped leg system and the tail system (which can also be used to create tentacles) have unlimited arms; legs and tails/tentacles as a feature. Therefore one can create a character with twenty tentacles

[34] Rigging is the applying of a skeleton to a mesh. Weight painting allows a user to define how much they want the bones in this skeleton to influence the mesh (Caldwell).

if they wanted to. It can also rig fantasy creatures; for example, fauns and centaurs (Anzovin 6).

TSM2 rigs using a widget[35] system.

Each widget, rigging limb, contains all the parts mandatory for that part. This includes the stretchiness functions and various switches. The widgets are inter-attachable in mostly any arrangement. Therefore one can have arms coming out of the head, or legs growing from a tail for example. "Widgets come in the following varieties: head/neck, spine, right arm, left arm, finger, right leg, left leg, and tail/tentacle" (Anzovin 10). They are colour coded for ease of identification and they can be brought in individually or a biped builder with all widgets necessary for a character can be used. The FK and IK controls are also colour coded for ease of use (Anzovin 38).

[35] Widgets are the different parts of the rig, such as arms, legs, spines etc. It appears as an approximate shape of the limb being rigged and has simple controls that allow users to fit the widget into their characters mesh (Anzovin 10).

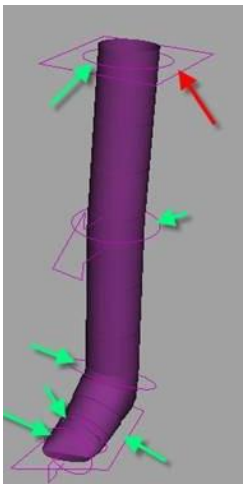


Figure 4: An example of a right leg widget (Anzovin 10).

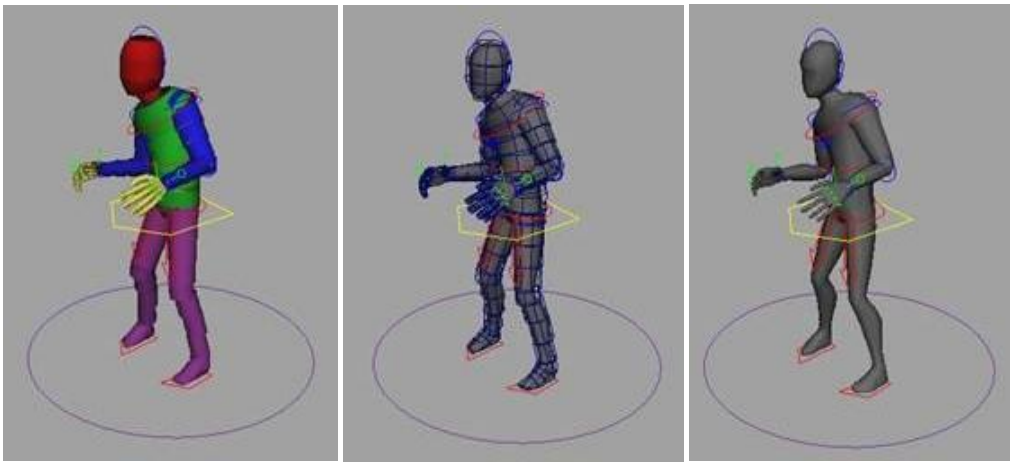


Figure 5: A character rigged with the biped builder (Anzovin 42).

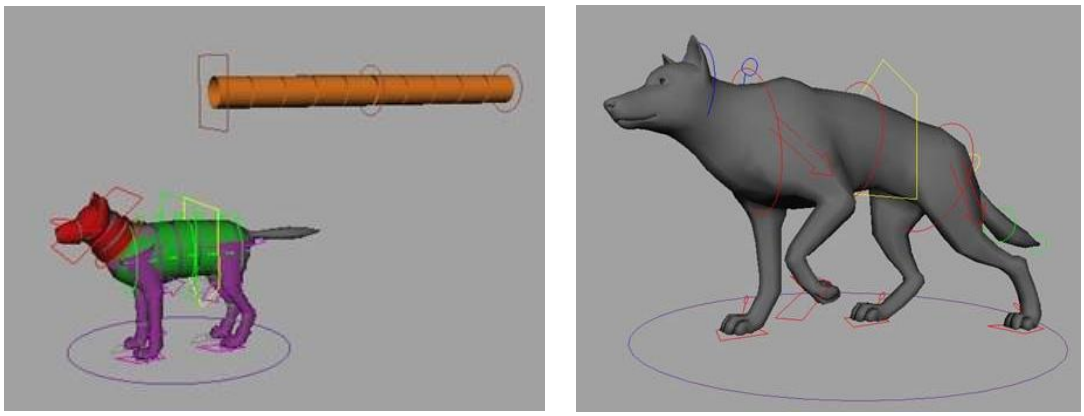


Figure 6: A dog rigged with the quadruped builder (Anzovin 34, 37).

Excortex Technologies, in association with computer graphics artists Chris Covelli and Eric Thivierge, created Excortex Species (Exorcortex). Thivierge is the character technical director at Animal Logic. Covelli is a New York based freelance 3D artist who is a generalist with a focus on 3D character design, organic and hard-surface modelling and character animation.

Jim Thacker, writer for CGChannel explains the Species plug-in in his review of Autodesks new features of XSI Softimage. He states that similar to Anzovin TSM2, Species is a rigging plug-in. This plug-in however is for XSI Softimage and includes character creation in addition to rigging (Thacker, “Autodesk announces new features of XSI Softimage 2014”).

Species has over 12 stock male and female body types which can be customised by importing components sculpted in packages such as ZBrush and Mudbox. Each figure comes with a pre-built rig created by Thivierge and has the fundamental features expected of a pipeline ready rig like IK/FK, stretching, mirrored posing, foot roll, etc. (Thacker, “Autodesk announces new features of XSI Softimage 2014”).

Although created for XSI Softimage the mesh and deformers can be exported to Maya and other packages which support the FBX file format. Additionally the rigs can be used on a character designed by the user, and users can create their own system controls for the rig (Thacker, “Autodesk announces new features of Softimage 2014”).

The Excortex team asserts that a Species user will be able to create higher quality 3D characters quicker and at a lower cost. They further submit that their models help the user to avoid creating generic looking characters, associated with off-the-shelf models, as they supply more than a dozen classic body types. These classic body types include the standard build; out of shape/beer belly; cartoon-style; stocky; obese; pro-athletic muscular; exaggerated muscular and midget (Exorcortex).

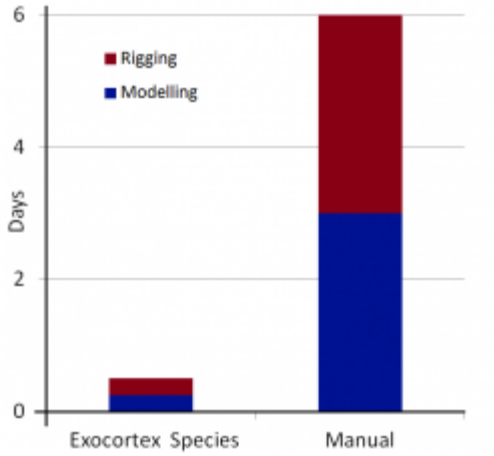


Figure 7: Graph demonstrating the time-saving qualities of Species (Excortex).

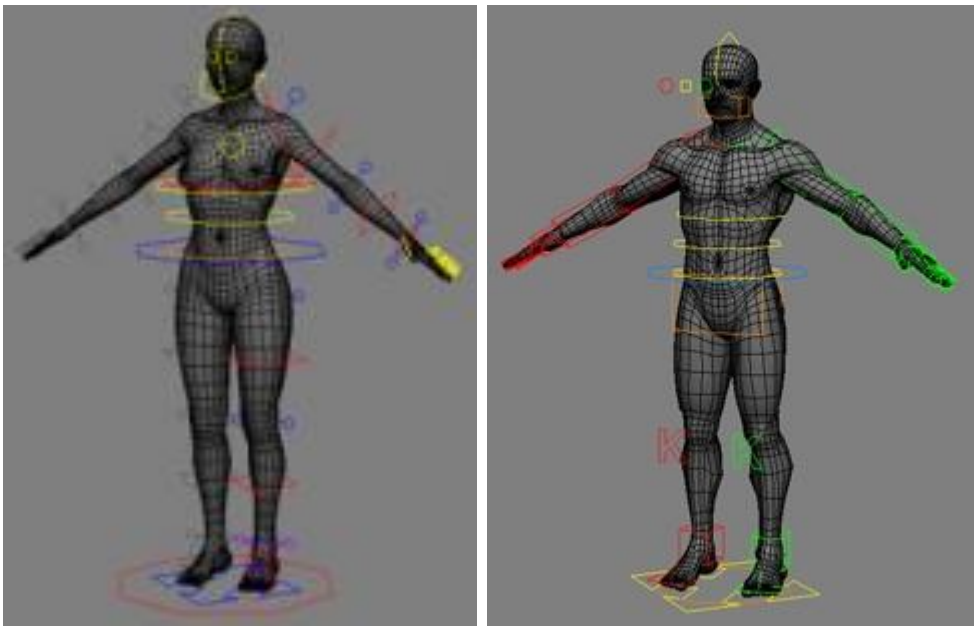


Figure 8: Examples of male and female rigged Species models (Excortex).

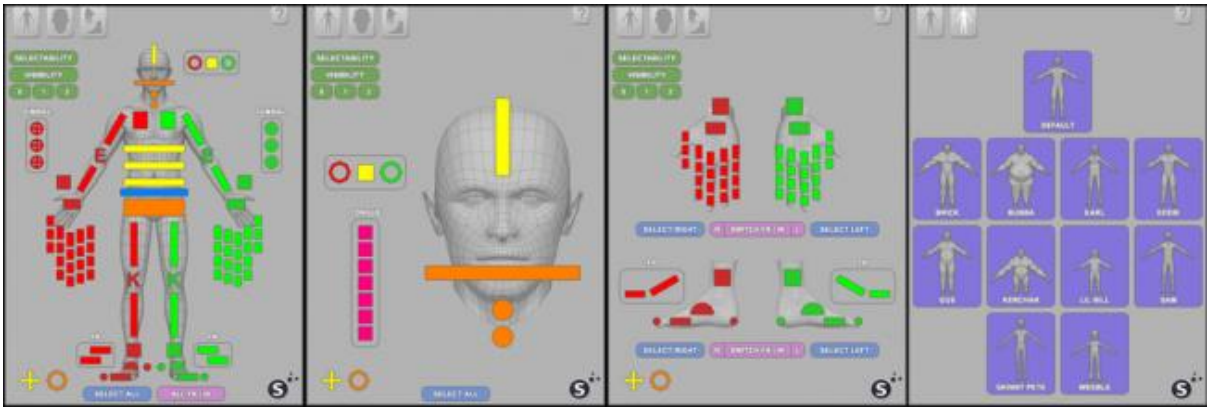


Figure 9: The animation rig synoptic (Excortex).

Animators need to strike a balance. They have to be cautious not to degrade the quality of their animation by taking inessential short cuts. According to Ben Bryan, 3d animation tutorial writer and author of an article entitled “3D character rigging with 3dx Max”, “Ultimately if the rig is not developed enough it will slow down future animation processes” (Bryan). On the other hand it would be ill-advised to spend additional time creating over-developed rigs for background characters (Bryan).

As mentioned standardizing processes saves time and assists studios in building the assets. One example is creating a library of facial expressions during the rigging phase, so each expression does not have to be animated each time, but rather standard expressions such as sorrow can be modified as necessary. (Bryan).

There are countless approaches to creating character rigs, each with their advantages. Bryan contends that the final result of any character rig should be a rig which is uncomplicated to use and one that does not limit the animator (Bryan).

ANIMATING

Animating is one of the more time intensive processes in the pipeline. One device used by animators to reduce animation time is rotoscoping. This process involves recording live action and using the footage to animate from by 'tracing' the live action. The animator can choose to animate using the reference completely, or to use only the main poses. The disadvantage of using the exact reference movement is that human movement, whilst complex, is too stiff for animation. Real action will usually have less bounce, less elasticity and fewer extremes[36] than an animation would.

Disney Studios first used the technique of rotoscoping in their 2D features. According to ufunk.net-an art gadgets and design website-scenes were filmed with real actors, sets and props and then used as reference to aid animators in the visualization of postures and movements (Ufunk). Rotoscoping was used in order to

[36] Extremes in animation are the extreme poses which have inbetweens added between them to make the movement more fluid. It is the extremes however which are most important and which carry the narrative. It is for this reason that in traditional 2D animation the extremes would be created by the animation lead and the inbetweeners would then fill in the gaps.

gain greater realism, however as mentioned human movement is too rigid for animation, so the filmed action was slightly changed during animation. Also not all the characters were rotoscoped, just those whose movement would benefit from the process. Today animators will often shoot reference videos of themselves performing the actions before they animate. This process is not as formal as rotoscoping, but it is based on the same principal. Below is an example of the rotoscoping process at Disney. This particular example is Cinderella.



Figure 10: Disney Studios. *Cinderella.* (visualnews.com, 5 Jan. 2013; web; 21 Feb. 2014).

Another time-saving animation process, which can be viewed as a form of modern rotoscoping is motion capture. It is a quick and accurate way to convert human motion into 3D animation. It is however not necessarily always the best way. Midori Kitagawa and Brian Windsor, authors of *Mocap for Artists: Workflow and Techniques for Motion Capture* submit that "Mocap technology exhibits its remarkable strengths for some projects while other methods, such as key-framing, work much better for some other projects" (Kitagawa and Windsor xiii). Ultimately it is the responsibility of the artist to ensure that the method of animation used is the most effective for the specific project.

The last animation technique to be discussed in this section is machinima. This way of animating saves time because once the characters, environment and game engine of a game has been created then animating in this way is quicker than animating with the use of key frames. Steven Withrow, author of *Secrets of Digital Animation: A Master Class in Innovative Tools and Techniques,* states that the characters and events in machinima are controlled by humans, scripts or artificial intelligence rather than key-frame animation.

According to the Academy of Machinima Arts and Science machinima is the creating of animated film in real-time using 3D video game technology. They point out that this way of animating is a convergence of filmmaking, animation and game development techniques (Withrow 111).

Essentially machinima is 3D animation shot in real-time in a virtual environment. There is no rendering as there is in key-frame 3D animation. Characters are puppeteered or triggered instead of animated. Additionally because the action in the animation has is not individually animated machinimators can produce animations three times as fast at a fifth of the cost of traditional 3D (Withrow 113).

> It's an adage of 'Let the tool do the work for you.' For example, the game engines have physics engines built in, so if a character has to knock a book off a table, we don't have to animate it – the game engine does. And it may drop the book differently each time, so it's like live-action filmmaking in that you can be surprised and frustrated at what you get. (sic)(Withrow 114)

In *Machinima* by Matt Kellan who is a game designer and African politics, cookery and computer game journalist, Dave Morris a Fantasy gaming book author and creator of strategy PC game *Warrior Kings* and Dave Lloyd also a game designer and software

engineer), the authors explain how machinima is powered by the physics engine instead of animating. They propose that the physics engine defines physical properties of objects in the virtual world, and it is this engine that ensures that trees sway, radar dishes rotate and cars roll along busy streets (Kellan, Morris and Lloyd 14).

The traditional 3D animator works in a world that exists only visually, therefore everything that makes the world seem realistic has to be manually included. Although crowd simulation is available for traditional 3D animation, it is not as time effective as having virtual crowds however, which would already be controlled by the game engine. Sounds are also created automatically in machinima, everything that happens in a traditional 3D animation happens because the animator consciously makes it happen (Kellan, Morris and Lloyd 18).

The simplicity of machinima does however come at a cost. Although it is incredibly cheap and comparatively cheaper to produce compared to traditional 3D characters machinima character seem lifeless and inexpressive. “The traditional animator has control over every frame of film, every bone in the skeleton, and every fold of cloth. He can create a picture-perfect animation, where every little gesture and nuance is precisely controlled”

(Kellan, Morris and Lloyd 20). Machinimators are limited to what the game engine can do and their animation library. The style of animation machinima offers may also not be what is required for a project, so no matter how cheap or quick this method of animating is it is not suited to many animation productions.

LIGHTING

Simulation software is available which allows animators and lighting artists to accurately simulate illumination. Raytracing[37], radiosity[38] and photon mapping[39] provide complex interactions between lights and objects creating authentic looking lighting. This method of lighting is however algorithmically intense and as a result it can be difficult to make predictable alterations to the lighting (Bettis 53).

Global Illumination (GI) is rendering software, which simulates the interaction of light in a 3D environment, much like the software discussed above. Jeremy Birn, Pixar's lighting technical director and author of *Digital Lighting and Rendering* surmises GI as "any

[37] Raytracing is the generation of an image by tracing the path of light through the pixels in an image. The effect of an images encounter with virtual objects is simulated.
[38] Radiocity is a rendering method which is based on a detailed analysis of how light reflects off diffuse surfaces. Images resulting from radiosity rendering often have soft gradual shadows.
[39] Photon Mapping is a global illumination algorithm consisting of two passes.

rendering algorithm that simulates the inter-reflection of light between two surfaces" (qtd. In Seymour).

When using GI the manual addition of bounce lights to simulate indirect light is unnecessary. "The software calculates indirect light for you based on the direct illumination hitting surfaces in your scene". GI makes CGI lighting behave like real world lighting. It accounts for the colour bleeding that occurs when non-reflective surfaces produce bounce and diffuse colour (Seymour).



Figure 11: Example of colour bleeding in GI. (Seymour). (Seymour, fxguide.com, 10 Apr. 2012; web; 21 Feb. 2014).

Whatever choice a studio makes in modeling, animating, lighting etc., the above discussed processes, programs and

techniques are methods which are often used to decrease production cost and time.

3.2 TECHNOLOGICAL TOOLS

The creation of animation motion pictures has grown from an artistic hand crafted production to a high-tech digital craft which pushes the envelope in computer generated animation production. During the joint meeting of the Los Angeles ACM Chapter and Engineering management/Education/Professional Communications Society Chapters of the IEEE Los Angeles Council Mike Walsh, secretary of the Los Angeles ACM, states that meeting attendees agreed that studios are compelled to raise the bar technologically in order to make animations more 'eye popping' whilst keeping costs low (Walsh). Having been conceived approximately 160 years ago, animation has utilized digital techniques extensively only from about 1990 in the feature *Rescuers Down Under* (Walsh). Now the use of digital software has become a norm, constantly improving, increasing productivity and lowering costs.

SOFTWARE

Advances in technology are assisting animation companies to do more with less (Kriedemann 19). This includes cheaper and open

source[40] software – allowing smaller studios to create high quality animations at accessible budgets. According to Claudio Pavan, from Cape Town based animation studio Lung, "The preferred technology depends on who you speak to. The same big players are still at the top: Maya/Max/ XSI Softimage for 3D and *Nuke* pretty much owning the VFX compositing" (Kriedemann 19).

Adobe After Effects is the software most used on motion graphics projects. It can also be used for animating however, but it differs from other animation software because it is better suited for compositing. Stuart Forrest, CEO of Triggerfish and producer of *Adventures in Zambezia* and *Khumba*, corroborates Autodesk's dominance in the distribution of 3D software, with Maya remaining the most popular (Kriedemann 19).

Software like Adobe Creative Suite is now available on a month-by-month cloud subscription; 3D animation packages are not available on this month-by-month model yet however. The month-by-month subscription option available on the Adobe Creative Suite is a great advantage for design studios and freelancers alike, because in a growing industry like South Africa's work is not always readily available. Paying for a subscription that is not in constant

[40] Open Source software is software that is freely available for use, redistribution and modification. The improvement of open source software is based on a communal model.

use can become a liability. “I can own R2 million worth of software, but instead of that being an asset, it's actually a R400 000 a year liability because of associated maintenance fees” (Kriedemann 17).

Sea Monster’s[41] Glenn Gillis, who also ran Clockwork Zoo,[42] says he doesn't expect month-by-month cloud subscriptions to be rolled out for animation software for quite some time. He adds, “African data speeds and costs make cloud storage difficult across the continent, especially when you factor in the huge amount of data animation uses. Animation companies also customize their pipelines, which is tricky within a month-by-month model.” (qtd. in Kriedemann 17).

SOFTWARE FEATURES WHICH IMPROVE PRODUCTION

There are assorted 3D software package options available, each offering specialized tools which set them apart from the rest. The following software features can be used as time saving tools.

The 2014 release of XSI has a camera sequencer, which allows users to “create, edit and retime multiple cameras as if they were one continuous shot” (Thacker). The ability to work on multiple

[41] Sea Monster is and South African animation studio based in Cape Town. They specialize in 2D animation, character animation, game development and coding (“SeaMonster About”).

[42] Clock Work Zoo was a Cape Town based, South African animation studio. It was founded in 2006 and closed its doors in 2010. They are the creators of shows such as *Urbo: The Adventures of Pax Africa* and the fifth season of *Caillou* (IMDb).

cameras is a time saving tool which enables the user to cut between multiple cameras and to trim, reorder and retime clips without any damage. The original animation data is left unchanged, meaning that if you are dissatisfied with the changes, you would still have your original content available to edit.

Other new features include updates to *CrowdFX*, the *ICE*-based[43] crowd simulation system. "Crowd Emitter IDs and the new Social Group options enable artists to control sub-groups of characters within simulations; and the Behaviour Tree has been overhauled to provide improvements to actor AI" (automated information). Animators now have control over properties such as velocity, direction, collision avoidance and crowd interaction with objects in the scene (Thacker).

CrowdFX now also has *Animation States*. This feature allows users to "define when characters switch between idles[44] and different movements or actions, and how the source animations are blended during the state transitions" (Thacker). This improved

[43] ICE is a particle based system of working which can be found in 3D animation software such as Maya, Softimage XSI and 3ds Max. This system can be used to simulate things like fluids and dust and even crowds. Particle systems recreate the motion of particles that follow a generally defined motion. "When particles are used to recreate the light of fireworks, for example, they represent a point of light with a variety of attributes such as intensity, flickering, and tail-tracking values (Kerlow 382). Particle systems are often used for dynamics simulation techniques (motion dynamics), which "generate realistic motion of rigid body objects or fluids by simulating their physical properties and the laws of physical motion (Kerlow 374).

[44] In gaming an idle is when a character is not doing any main action or moving. The character would then do an idle action such as blinking or looking around, as for the character to be completely still would look unnatural.

feature ensures that less time is spent trying to make crowds and their interaction with the environment look more natural, the alternative being the manual changing of individual characters in the scene to make it 'look right' (Thacker).

As Kerlow explains, “Crowds are like a large organism and, in that sense, virtual extras are not just moving props but living characters with personalities” (394). They add to the realism and feel of an animation. Software that can simulate their natural behaviour and interaction is therefore invaluable in the creation of a high quality animation project.

Sibling application 3ds Max has a similar crowd simulation tool called Populate. It allows the animator to create crowds of moving, or idle people with ease-“*g*reat for pre-viz, architectural visualization, or just to add realism to a scene” (De la Flor).

In his review of Mudbox 2014 Mike De La Flor, writer for digital creative’s inspirational online magazine Digital Arts, discusses some of the newest features of Mudbox 2014. It has an application called retopology. Retopology consists of producing a

3D model which is based on the topology[45] of a source 3D model (De La Flor).

Retopology is useful for models with dense details such as wrinkles or folds. Models like these need millions of polygons in order to look good, whilst visually appealing these models are difficult to animate and render. Retopology tools permit users to transform dense 3D model features into a model with fewer edge flows and polygons. The model then becomes more practically useful for both animation and rendering.

These new features on XSI Softimage, 3ds Max, Maya and others allow animators to work more quickly and with a greater range of artistic freedom. The ability to simulate "natural" crowd simulation for example not only saves time, but also adds vibrancy to an animated piece improving it stylistically. Therefore if an animator is able to fully utilize the software being used it can reduce production time to a great degree. It is for this reason that studios will invest in fully incorporating specific software into their pipeline, using plug-ins and writing their own scripts where necessary, in order to get the most out of their software.

[45] The term topology refers to a models polygonal mesh (De La Flor).

XSI SOFTIMAGE DISCONTINUED

The above having been said it is unfortunate for the many South African and international studios using XSI Softimage as it has been announced that Autodesk will be discontinuing the software. The announcement came on the 4th of March 2014 (Frazer).

> In announcing the decision, Autodesk Industry Manager Maurice Patel said it is part of a strategy allowing the company to "focus more energy and effort on fewer products" and invest more money in research and development for 3ds Max and Maya. (qtd. in Frazer)

This announcement will undoubtedly affect the production pipelines of many studios. As stated a large amount of time and resources are spent on incorporating specific software into an animation pipeline. Studios which have been using XSI will assuredly have to re-train most of their animators to work with new software; buy new software and re-script certain procedures to work with the new software, all of which will create expenses for studios.

The introduction of the computer has changed the face of animation and the constant advancement of tools is improving

animation production. Animation production pipelines are becoming more streamlined. Producing animations is becoming quicker and cheaper. And there is now, more than ever, a move towards the open sharing of tools.

3.3 STUDIO SPECIFIC CUSTOMIZATIONS

In *Animation Genre and Authorship* (2002), Paul Wells discusses the animation process in his 2nd chapter. Wells proposes that the animation process is dependent upon the technique used, the studio creating the animation, the budget and where it will be broadcasted (15). Regardless of animation type and length/format, context affects production. Each studio therefore has to construct its production pipeline in a manner that best suites its conditions.

AFRICAN AND SOUTH AFRICAN STUDIO DYNAMICS AND CUSTOMS

South African animation studios currently produce mainly adverts and series. They need to customize production in a different manner to larger American and European animation studios, which produce considerably more feature length animations. “Those in the know say that the industry needs a reliable pipeline of projects to continue to grow and thrive”

(Kriedemann 17). Without continuous incoming projects South African studios are faced with a number of problems, one being paying for software subscriptions which are not constantly in use.

Managing director of Sea Monster Entertainment Glen Gillis states that at an individual company level, South African studios can compete with any international studio. South Africa's animation industry growth is however marred by a lack of constant projects, which in turn translates into a lack of funding. Gillis remarks that he at times is not sure if South Africa has an animation industry, he feels that we rather have projects which gear up and run down (Kriedemann 17).

When discussing the African animation industry Shina Ajulo, CEO of Nigerian computer animation studio Sporedust, asserts that he feels that “the industry faces the threat of sustainability if capacity building and market scalability are not set right to meet the upcoming challenges” (Kriedemann 17). Local studios need to find a way to either ensure that there are always projects in place, so there is never a need to scale down on software and people. Or it needs to find mechanisms to ensure that scaling down after a project does not negatively affect a studio too much.

An example of this is Clockwork Zoo. “Once Africa's largest animation company, Clockwork Zoo had a staff of up to 120 animators” (Kriedemann 17). They produced well-known animated series such as *Caillou*-for Cookie Jar, *Florrie's Dragons'*-for Disney Channel UK and Playhouse Disney, *Happy Valley*- for Dinamo in Wales, and *Mr. Bebe* for Xilam France. However in 2010 the studio was forced to close mainly due to the crippling cost of retaining staff, hardware and software between projects (Kriedemann 17).

Many South African studios are run on what Stuart Forrest of Triggerfish calls ‘the project-to-project production model’, which he says is inefficient. He states that the only way it could be sustainable and efficient is if “there is a critical mass of similar production companies which can continue to employ crew and hire equipment” (Kriedemann 17).

The need for a more sustainable model is significant for Triggerfish as their current projects are mainly feature-length animations, with films like *Adventures in Zambezia* (2012) and *Khumba* (2013) under their belt. According to Forrest setting up for a team of a hundred artists is very expensive, and because it takes so long to produce a feature it is normally more cost effective to buy equipment than to hire. Currently at the end of a feature-

length project many artists have to be retrenched as the studio needs to scale down. This then leaves a large pool of freelance artists with no work. This has led to smaller studios mainly using contract artists (Kriedemann 17).

This 'size up, produce, scale down' model is currently the norm in the South African animation climate. This is very different from the U.S, where funding is easier to obtain, or the East which “has a formidable combination of government subsidies, low salaries, huge economies of scale and vastly experienced teams” (Kriedemann 17).

Irrespective of all challenges however there are opportunities for growth in Africa's animation industry, and as the African middle class increases African parents will begin to seek quality content for their children, content which is more closely related to their own culture and which tells their own stories (Kriedemann 20).

Studios, local and international, need to be creative in the customization of their production pipelines. As for local studios, although funding is not currently readily available, the hope is that local broadcasters and investors will begin to see animation as a viable commercial business and investment opportunity. According to Zweli Mokgata, *Financial Mail's* media and advertising writer,

"studios will create new models to suit the market requirements and the amount spent on animation will grow as the demand for better-quality local content increases" (Mokgata).

TRIGGERFISH – PIPELINE DEVELOPMENT

One South African animation studio which has managed to break both the funding barrier and the elusive international market is Triggerfish Animation Studios. Based in Cape Town, Triggerfish opened its doors in 1996, initially as a high end stop frame animation studio ("About Triggerfish").

Initially producing animation for Takalani Sesame, the studio branched out into CGI and producing feature-length animations such as *Khumba* and *Adventures in Zambezia* in just ten years. The studio focused on long-form character animation, and developed its pipeline so that they could deliver high quality material with a short turn-around time. "Triggerfish rapidly produced several short films for international clients and established itself as a world-class animation studio" ("About Triggerfish").

In MBlife - a magazine website by Mercedes Benz South Africa Nadine Theron, features writer and researcher at MBlife, discusses Triggerfish Animation Studios. She states that after the release of

Adventures in Zambezia, Forbes named Triggerfish "Africa's answer to DreamWorks, Disney and Pixar" (Theron). This was not an easy feat however.

Kate Douglas is the author of "How Stuart Forrest built one of Africa's top animation studios" an article in howwemadeitinafrica.com which is a website on African business insight. She submits that Triggerfish owner Stuart Forrest says that initial funding was difficult to obtain. He states:

> Initially I borrowed money from banks, credit card, family and friends – anyone I could convince – and I brought in a business partner who matched the money I could raise. When that ran out, I recruited three more partners who were willing to get behind the business to make it work. Without these partners, the company would not be what it is today. Their strengths complement all my weaknesses. (sic)(qtd. in Douglas)

To get funding for a feature-length animation investors need to be able to trust you with millions of dollars. In order to trust you they will need proof of your abilities. The studio had been producing children's animation for Sesame Street for ten years and had been operating for thirteen years before their first film was funded. Stuart declares: "During this time we perfected our film

technique and pipeline development as well as our confidence" (qtd. in Douglas).

Triggerfish works with a team of forty permanent staff members, and a hundred staff members at the height of production. Every member of the animation team has to complete two seconds of finalized animation daily, contrasted to international heavyweights which have the luxury of animating three seconds per week (Theron). In order to meet production demands, Triggerfish therefore has to run a tight production schedule.

During the production of *Adventures in Zambezia* Triggerfish "developed an innovative stereo[46] pipeline built on IRIDAS SpeedGrade NX[47]" (IRIDAS Magazine). For this project each shot existed separately to others. Animators were able to produce captures of their work, pulling it into edit daily (IRIDAS Magazine). Forrest explains that their workflow organically developed to the new system, where animation captures where converted to Prores/DNxHD[48] and then stored autonomously of running animation files on a system devoted to the edit suites. Additionally the

[46]Stereoscopic 3D is the simulation of realistic image depth. When shooting a 3D film two cameras are used to capture two images of the same object at slightly different angles but a single viewpoint.
[47] IRIDAS SpeedGrade NX is a one stop colour grading, RAW processing and Stereo 3D solution. It delivers fast turnaround times for dailies and a comprehensive toolset for 3D features. It uses the Lumetri Deep Color Engine, which allows the user to perform professional colour grading on video footage (Foster).
[48] Prores/DNxHD is a professional video editing codec.

director wanted to see all final render DPX[49] files as soon as they are in edit, so a few elementary tools were scripted for DPX to Prores/DNxHD conversion (IRIDAS Magazine).

IRIDAS became a key component during editing, and once files had been conformed within SpeedGrade the stereography team confirmed that final frames were completely accurate, to prevent the discomfort caused by watching 3D films which are inaccurate (IRIDAS Magazine).

SpeedGrade has since been bought by Adobe and is available as part of the CS6 Production Premium, Master Collection and Creative Cloud bundles. The program was aimed at high end, professional users. This includes video editors, film producers and filmmakers. It is more advanced than what is necessary for most users, who often require only "a basic three-way color corrector plug-in with a non-linear editing system" (sic) (Foster). It was however a perfect pipeline addition for Triggerfish in order for them to create a high quality stereoscopic local animation at international quality.

[49] DPX (Digital Picture Exchange) is a common file format for digital and visual effects work.

BLACK GINGER – XSI Softimage WORKFLOW

In an interview with *It's Art Mag*, Animation supervisor, *Darrin Hofmeyr, of* Cape Town based animation studio Black Ginger discusses pipeline changes during the production of *Bakers* advert *Precious Biscuit.* He states that many parts of their production pipeline were over hauled including the ways in which their artists work. A more international workflow was adopted and the sending of data from one department to the next was reorganized ("Production Focus: Bakers Precious Biscuit").

Characters were only 75% complete before they were sent to rigging. Hofmeyr explains that XSI Softimage's non-linear approach aided them in delivering on time. He adds that if they had to complete each model pre-rigging that they would not have completed the project on time ("Production Focus: Bakers Precious Biscuit"). Furthermore only rough shapes were initially modelled, to use with the photographic references shot prior to location shooting. This allowed artists to block out the shots prior shooting and modelling. This meant these processes could then run concurrently ("Production Focus: Bakers Precious Biscuit"). This concurrent working on multiple sections of production managed to save the team time and keep their costs within budget. Due to the

cyclical capability of current animation software they were able to render other passes whilst still compositing (“Production Focus: Bakers Precious Biscuit”).

Hofmeyr states that this project taught his team a lot about pipeline management (“Production Focus: Bakers Precious Biscuit”). With the discontinuation of XSI Softimage however the question now is whether Black Ginger will take Autodesk’s offer to migrate to 3ds Max or Maya, or if it will now use a completely different software package such as Houdini in its entire pipeline.

Technological improvements and a general shift in culture because of the digitization of artistic practices have heavily influenced artistic production, specifically animation. The creation, reception and aesthetic characteristics of this field of film have changed vastly and are still constantly changing.

The introduction of the third dimension to animation and the software packages available for the production of 3D animation have positively influenced the creation of animations, leading to the production of high quality work. The industry does need to be cautious however that the tools, aesthetics and practices learned since the conception of animation are not lost. The freedom and

efficiency provided by 3D must be balanced with the principles 2D has taught and perfected.

Though African and South African animation studios are on par in terms of access to 3D software and the ability to use it, currently the biggest problems seem to be a lack of local funding from institutions other than the governmental organizations such as the NFVF[50] and the DTI[51]. Animation has to begin to be viewed as a valid investment in this country, and this can only happen once studios are able to afford to tell our stories in our way and once audiences begin to see the importance of this.

The creation of 3D models using algorithms, automated rigging systems and software which simulates the natural behaviour of light in a 3D space are all improving the way in which animations are being produced. They are enabling artists to save time, time which can be spent refining their artistic craft. Short cuts such as crowd simulation tool Crowd FX are fast becoming necessary tools instead of new innovations. The use of these tools is helping studios with lower budgets to achieve a quality of work similar to international heavy weights.

[50] The NFVF (National Film and Video Foundation) is a government agency, under the Department of Arts and Culture. Its mandate is to ensure the equitable growth of South Africa's film and video industry (FAQs about the NFVF).

[51] The DTI is the Department of Trade and Industry. Their mission is to "promote structural transformation, toward a dynamic industrial and globally competitive economy (About the dti).

As more technological advances are made studios will be able to append to their pipeline those tools which save them time and money. Combined with an increase in the demand for locally produced animations, South African animation is sure to grow.

CHAPTER FOUR: CASE STUDY

The case study section of this research paper will be a review of Luma's production pipeline, on the *Bun and Bunee* project. This review will include interviews and studio documentation. Only those parts of information that interviewees felt comfortable with, will be included in the case study. Also the *Bun and Bunee* production document will not be included or completely discussed due to confidentiality. Due to the nature of the film industry, filmmakers can be secretive especially concerning visual effects, proprietary software and other information that they believe to be intellectual innovations or unique processes. Their secrecy on these practices allows them a competitive advantage and their reluctance to share all their propriety knowledge, including their pipeline information, is valid (Bettis 8).

Animator on *Bun and Bunee* Bronwyn Horne states that she does not feel that there are any large secrets that people in the industry do not know, especially those who constantly research and follow artists, techniques and processes online. She adds that those studios who fail to do this do it to their own detriment. She proposes that in general studios don't mind sharing; however there is no current platform to do this (Horne, Email Interview).

Paul Meyer from Luma partially agrees with this. He explains that what tends to happen is that large studios don't mind sharing information, as they know other large studios will know most of what they know. He adds that studios will not however find a small studio, making bad quality work and say “look, this is how you can take all our clients” (Meyer, Personal Interview). Therefore it can be said that information sharing in the animation industry is based on a mutually beneficial model.

To fully engage with the topic of how production practices can improve the final product and save money a more complete understanding of animation production pipelines and an in depth review of specific pipeline practices is necessary. A generic examination of production norms allows for the generalized study (Stake 442). A case study allows for a deeper exploration of the topic by recognizing that context has an effect on production (Stake 436). For this reason Luma Creative Studios and some of its previous projects will be examined in order to examine the studios general workflow. The specific case of the production of *Bun and Bunee* will then be discussed, observing those practices that the studio attained from their past projects.

4.1 LUMA- THE STUDIO

Launched in 2001, Luma Creative Studios is a character animation agency. Writer for the Gauteng Film Commission South Africa Andrew Worsdale explains in his article entitled “Animation Soars” that having positioned themselves as one of South Africa's leading animation studios, Luma specializes in “character animation, visual effects and game development” (Worsdale).

Herman Manson, column writer for Hermaneutics in marklives.com examines the work of Luma Creative Studios in his article titled “Animation studio grabs international work accolades”. Manson states that the studio is owned by Paul Meyer and Gerhard Painter, who joined the studio a year after its conception. The studio has had its fair share of partnerships; various business units and even a specialized game division. Partners of Luma bought out some of the units however, and the rest have been integrated into the main business (Manson).

In 2006 Luma launched a gaming division called Luma Arcade. Meyer says that, “Building a games developer business in South Africa was an expensive exercise”, he adds that he and Painter prefer to learn through experimenting and making mistakes - and owning the results either way (qtd. in Manson). It is this same

attitude that led the team to create *Bun and Bunee*, funding it in-house, learning from the process and 'owning the results' of this unconventional method of creating an animated series.

In 2010 the financial crisis not only caused Luma Arcade in South Africa to close its doors, but it also forced Luma to retrench 14 people. "At its peak, the commercial business employed close to 40 people before it had a close encounter with bust in 2010" (Manson). Meyer says that initially the company grew so quickly that it would double in size every year in the first five years (qtd. in Manson). The 'size up, produce, scale down' process explained by Forrest has been experienced by most animation studios, Luma included.

Meyer proposes that the recession had some positive results in the animation industry. He explains: "In a recession, agencies are dealing with lower-budgets and so therefore are more creative and animation simply gives them more bang for their buck"(Worsdale). South African agencies and clients are however not always keen to invest in high-value animation productions. Luma has almost 60% of its revenue coming from international clients (Manson).

Luma's clients include Ford, DStv, Yogi Sip, Simba, Mini, and Cremora. The decline of the South African Rand has attracted

international work, so more international clients are choosing South African animation studios when commissioning work. Painter argues that although South Africa is not as cheap as India or China, “the quality of the work we produce in South Africa is on par with international standards” (qtd. in Manson). He substantiates that using South African animation studios and agencies can cut an international production budget by as much as 30% (Manson).

LUMA’S COMMERCIAL WORK

An example of previous animation work produced by Luma is a television commercial (TVC) for Publicis's *Sandoz Pharmaceuticals* advert. In it an African animal jazz band is rehearsing at a bar when the elephant, who is the trumpet player, gets ‘blocked up’ in his chest. The zebra bar lady then offers the trumpet player Sandoz to loosen his chest mucous and clear his throat. The bands performance later that evening is saved because of Sandoz. Rosalix, of between *10and5* the creative showcase, endorses that Luma animated the TVC beautifully (Rosalix). Below are the concept sketches by Luma's character designer Alan Cameron.

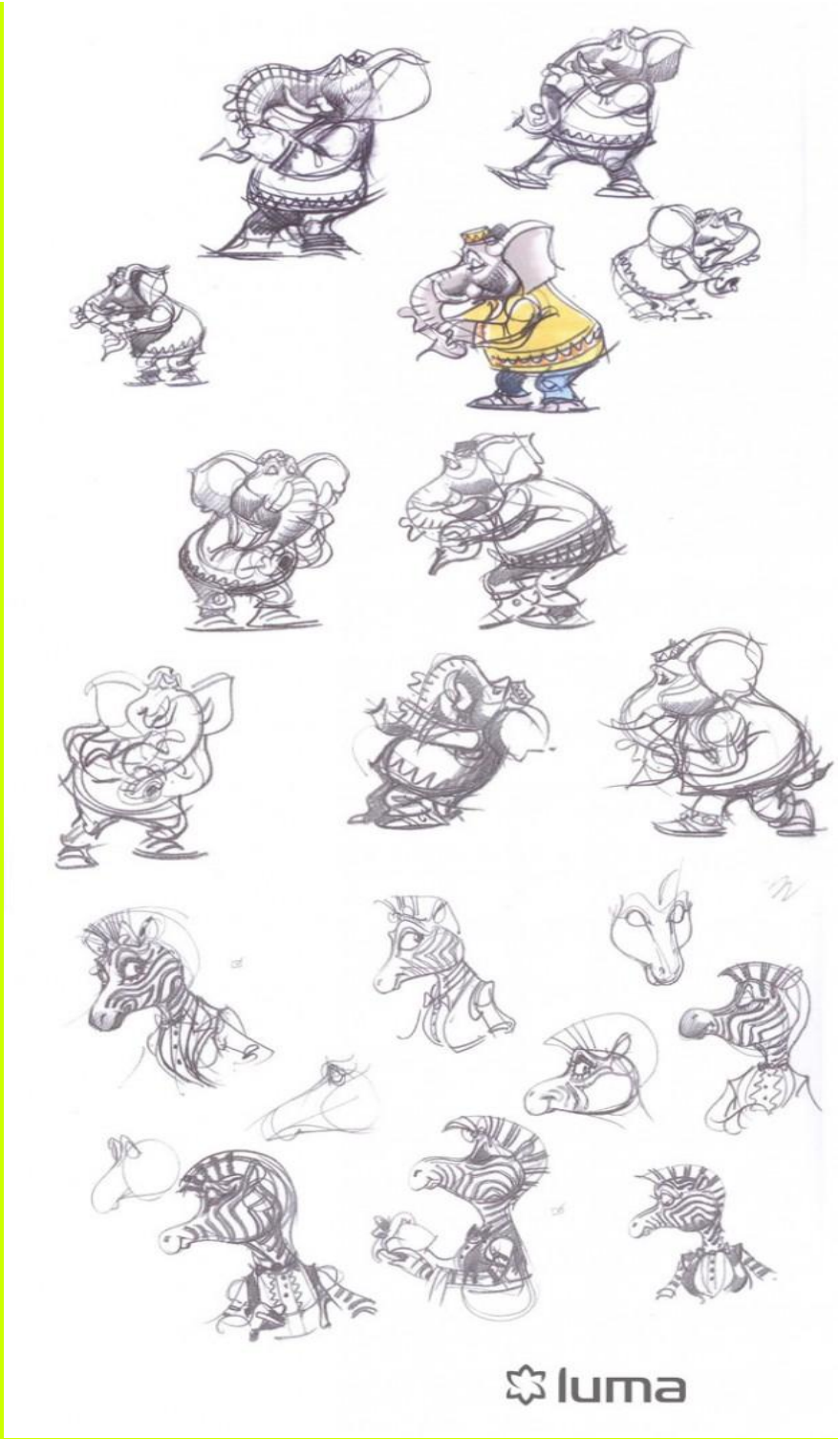


Figure 12: Luma Creative Studios. Sandoz TV Spot. (vimeo.com, 20 Feb. 2012; web; 16 Aug. 2014).

Another example of Luma's work is a Ghanaian TVC for Cowbell. Cowbell is inexpensive fat-filled milk sold in small sachets across Africa. The brand is based around a family of animated characters. Multinational food manufacturer Promasidor wanted to take the animation of the Cowbell characters to the next level and to improve the quality of their design ("Luma Breaths Life into Ghanaian TVC").

Mike Pollecutt Head of Radio and Television for Promasidor states that partnering with Luma was an obvious choice for them as Luma is known for their production of high quality work ("Luma Breaths Life into Ghanaian TVC").

> Drawing on the expertise of a 20 strong team with skills ranging from directors, 3D artists, producers and compositors to keying, rotoscoping and concept artists; Luma created a character animation and fantasy world that appealed to a younger audience. (sic)("Luma Breaths Life into Ghanaian TVC")

The advert is about a young Ghanaian boy who is enjoying Cowbell powder milk while he waits for the school bus. He misses the bus, at which point a billboard near him with the Cowbell character in his favourite racing car comes to life. The character invites him to jump in for a ride to school. The car then appears on

the starting grid of a racetrack, which they race off on. They race past five letters which are placed along the side of the race track. The five letters represent the five vitamins in Cowbell known as Vitarich. The pair win the race and magically arrive at school before the bus. The advert illustrates that "Cowbell with "Vitarich" puts you on the fast track" ("Luma Breaths Life into Ghanaian TVC").

As argued by Meyer, animation as an advertising medium gives advertisers 'more bang for their buck'. Pollecutt argues that the use of animation in their TVC instead of only live action allowed them to communicate the nutritional benefits of Cowbell's Vitarich in a youthful and attractive manner which spoke to their audience (qtd. in "Luma Breaths Life into Ghanaian TVC").



Figure 13: Luma Creative Studios. Cowbell-Vitarich. (vimeo.com, 27 May. 2013; web; 16 Aug. 2014).

Luma has created adverts for international clients such as US agency Periscope, based in Minneapolis. Luma created a 30 second TVC made for them for Kemps, a range of dairy products ("Luma Breaks into American Market"). In this TVC Greek-style mousse, cottage cheese and yogurt is advertised. It begins with four Friesland cows grazing at sunrise in a large opulent meadow. The song Theodokis' Zorba, the Greek begins to play as the cows stand up on their hind legs one after another and starts dancing the Sirtaki[52] ("Luma Breaks into American Market").

[52] The Sirtaki is a popular, traditional Greek folk dance. It is often performed in a line or circle formation ("Luma Breaks into American Market").

The advert took two months to produce, and was aired on cable television in chief hubs like Minneapolis/St. Paul and Milwaukee in September 2013. This opened multiple work opportunities for Luma in the consumer-hungry mass advertising market that is the USA ("Luma Breaks into American Market").

Patti Hoffstad, Executive Producer of Broadcast for Periscope says they "were searching for an animation studio that had experience in creating photorealistic animals, and one that was brave enough to attempt bovines dancing on their hind legs". He states that the project had a very limited budget and strict time constraints and that Luma worked professionally within those limits, proving that South African animation studios can produce international quality work ("Luma Breaks into American Market").

Hoffstad says that the piece of work they received was incredible and that the process of production went exceedingly well. The client was pleased and so were they. According to Meyer producing this commercial was a result of years of work, "building a strong, vibrant, international network, a polished and talented team with good infrastructure and an understanding of what makes client service really deliver, both to a client and agency's needs"(

"Luma Breaks into American Market"). Below are stills from the *Kemps* advert.



Figure 14: Luma Creative Studios. *Kemps Greek Style Dancing Cows.* (vimeo.com, 27 Aug. 2013; web; 16 Aug. 2014).



Figure 15: Luma Creative Studios. *Kemps Greek Style Dancing Cows.* (vimeo.com, 27 Aug. 2013; web; 16 Aug. 2014).

As a studio *Luma* has proven that they deserve their place as one of South Africa's premier animation studios, "Having developed Hollywood-styled tools in-house – a hair and fur system, and a muscle and skin simulation system, the studio is able to produce at an international benchmark" ("Luma Breaks into American Market").

4.2 THE *BUN AND BUNEE* PROJECT

Bun and Bunee is a series of 3D animated shorts in a one minute format. The shorts are based on the antics of big brother Bun and little brother Bunee, whose curious nature lands the pair and their friends in trouble regularly ("Luma's *Bun and Bunee*").

Amanda Goosen who was the executive producer on *Bun and Bunee* states that "it's difficult to say exactly when *Bun and Bunee* was born because in its initial phase, it started as a "down-time" project. Something people would work on when there was little or no paying work in the studio" (Goosen, Email Interview). Meyer says that at the time there was a mobile content revolution, so they decided to create one minute clips which could go onto television, DVD and mobiles. He adds that they then decided that one-minuters are easy to use as fillers and are cheaper to produce - and so the series was born (Meyer, Personal Interview).

> *Bun and Bunee* was originally developed as a brand for mobile content, during the era when mobile phones were suddenly no longer just talking devices. People were "chatting" on apps such as *Mxit* and personalizing their handsets with different visual themes. *Bun and Bunee* was going to break into that market with loads of wallpapers and screensavers and also fully animated one-minute episodes. (sic)(Goosen, Email Interview)

Luma created the series, and completed it without external funding. The project was then sold as a complete product. "*Bun and Bunee* first aired on SABC3[53] in 2009 with fifty two episodes,

[53] The SABC, South African Broadcasting Corporation is the public state owned broadcaster in South Africa. It comprises of 19 radio stations as well as four television broadcasting channels, namely SABC 1; SABC 2; SABC 3 and SABC News.

following which the show secured international distribution and sales to Disney XD Latin America and BBC MyToons" ("Luma's *Bun and Bunee*"). The series also got a slot on SABC3's Expresso and according to Meyer it was more successful on this morning show than it was on its original SABC3 slot (Meyer, Personal Interview).

Meyer remarks that when choosing a distribution company the team came together and decided on which distribution company would be best for them. He then had to make a deal with SABC3 to broadcast the series for free, and state that as the local broadcaster they agreed that the series was good enough to broadcast. He explains that the reason for this is because international broadcasters and networks will not purchase a series unless it has been aired by the local broadcaster. The assumption is that if content is good quality, that the local broadcaster will broadcast it.

Meyer remarks that in retrospect their method of making this series was not a traditional one, adding that "you don't go and make a series and then have to sell it" (Meyer, Personal Interview). A series a made by first creating a pilot and raising funds to produce it using the pilot. This method makes it easier to receive funding. He substantiates however that as a team they wanted to

learn, and that is why they chose this route (Meyer, Personal Interview).

In *Producing Animation* the authors explain the process of selling animated content to potential buyers. They state that buyers can be divided into two groups. The first buyer is one with a distribution arm. This could be a network or a movie studio. According to Winder and Dowlatabadi it is usually best to sell your property directly to one of these outlets, as there are distribution deals in place already (Winder and Dowlatabadi 71).

The second buyers are independent producers or an independent production company. The advantages to this option are twofold. Firstly independents are more accessible. Secondly, they can use their internal resources to develop your project for the pitching process to buyers. Additionally independent production companies are better equipped to turn your property into a franchise than networks are (Dowlatabadi and Winder 71).

Meyer validates the choice to complete the project in-house by explaining that the experience was positive and that he would not have changed it. Since all the funding was internal Luma could do exactly what they wanted to do with the project. They could produce it exactly how they wanted to, without external influence.

Meyer feels that the shorts are the type of quality product that will still be a classic in fifty years (Meyer, Personal Interview).

> When we started *Bun and Bunee*, we said this would be our learning project, this would be our project that taught us anything about the animation business, and it did. And it still is. So it really did achieve what we set out for it to achieve, and more actually. (sic)(Meyer, Personal Interview)

According to Goosen it was only towards the end of 2008 that she was placed to work on *Bun and Bunee* full time, "by then the project had evolved from being a mobile content endeavour. The decision had been made to not only complete an entire series of 52 episodes, to also use the brand for merchandise and clothing as well" (Goosen, Email Interview).

A *Bun and Bunee* java mobile game was created as part of the project. The studio paid close to R300 000 to have the game ported to just 400 handsets. Internationally the game sold over 30 000 units. Meyer declares that although it was successful, it did not make them their money back. It was therefore a learning curve for the team (Personal Interview).



Figure 16: Luma Arcade. *Island Hop.* (pocketgamer.co.uk, 12 Jun. 2009; web; 12 Feb. 2014).

The lack of external funding necessitated the lowering of costs and the streamlining of production. One way of cutting costs was having each member of the team responsible for numerous parts of production simultaneously. For example although Meyer was a producer on this project, he was also responsible for interviewing everyone involved in the project, securing a distributor, buying equipment and software, contracting a musician, reading through contracts, ensuring that content was child friendly[54] etc. Meyer

[54] Bun and Bunee was targeted at the family, meaning the show is acceptable for young children to watch, and their parents can enjoy it also. It is a show the whole family can watch during breakfast before everybody leaves to start their day (Meyer, Personal Interview). Meyer explains that as the creators of a family show, "you are responsible for the tone of that content… so you must pay attention to what children watch… I often had to supervise because people who don't have kids don't know what content is appropriate for kids" (Personal Interview).

even got involved with the writing/editing of some of the stories (Meyer, Personal Interview).

Goosen states that her initial work on the project consisted of creating still images, screen savers and animated gifs. These were created for use on handsets. She also assisted in developing themes for content, creating the website and writing the newsletters. She co-wrote scripts, created storyboards and animated (Goosen, Email Interview).

Animator, Bronwyn Horne's responsibilities were dependant on which episodes were being produced. She was responsible for animating ten of the fifty two episodes but she also worked on various pre-production elements - mostly storyboards and animatics; some production elements; and some post-production (Horne, Email Interview).

INTERNS

Another way that the studio kept production costs low was the use of interns and young animators on the project. The use of interns was mutually beneficial. Interns can be paid less than experienced animators; however "the internships offered these young people an opportunity to learn about the industry and CG

process while working on a real-world project" (Goosen, Email Interview). After the completion of the project, some of the interns stayed on at Luma full-time (Goosen, Email Interview).

The intensive use of interns on the team used for this production is specific to this case study. *Bun and Bunee* was initiated as a training program, using young, recently graduated interns as the production team. The use of cheap labour provided by interns is one possible strategy that studios can use to keep production costs down. The training project aspect of this project will be discussed in more depth at a later stage- exploring the ways in which it was able to keep production costs low. This model is risky as it requires the training of interns, which may consume a lot of project time. Also the inexperience of interns may mean that tasks are completed at a slower rate than usual. Whilst risky, it provides young animators with experience and can cut costs.

The interns' lack of experience pushed the producers to create a production 'bible' to ensure the whole team was in sync at all times, which proved to be a vital part of their fluid production pipeline. There are many conventions used in the *Bun and Bunee* production document. It is structured such that anyone working on the project can find whatever they need at any given time. There is

little room for confusion, waste of time and space, and unnecessary pauses in production.

Meyer places emphasis on the training of animators. He asserts that he is a firm believer in finding an individual animator's niche and developing it. This approach means that he can be free to focus on other things in the project as he knows that he can trust that animator with whichever part of production they are responsible for (Meyer, Personal Interview).

Apart from senior staff members there were "three junior animators, one junior designer and four interns" (Goosen, Email Interview). Goosen says that having young people working on the project was beneficial as they afforded senior staff members insight to what would appeal to the target audience (Email Interview).

When asked what she would change on the project to improve production, Horne contends that she would have a more senior team on board, "the production team was mostly made up of interns, so a lot of the work had to be re-done or was completed at a very slow rate" (Email Interview). The self-funded nature of the project was perhaps an advantage in this regard as interns can be paid less, and there is no strict deadline. A pre-pitched production would have had a specific time limit imposed on it by buyers. The fact that *Bun*

and Bunee was a “learning project”, in some ways, meant that they could afford to explore a greater number of iterations and discover what worked best.

The decision to use interns on this project was an obvious one for Meyer. “We always have interns, we will always have interns. We're always training people... And they always go on to be strong artists. We don't just train people; we pick people who will succeed” (Personal Interview). According to Meyer getting the necessary work from interns was not difficult. “We've trained so many people over the years; we know how to maximize what you can get out of a person” (Personal Interview). He says that a good strategy is to team a junior with potential with an experienced senior. In this way the junior's work is taken to a level where they produce work better than what they are normally capable of (Meyer, Personal Interview). He substantiates, stating that,

> If you find a person’s strength then it means that you can pigeon hole this guy, give him a lot more of that work. This means he doesn’t get to learn so much about the whole process, but he gets to learn a whole lot quicker in this area that you’re pigeon holing him into. And it means you can trust him with more stuff. (sic)(Meyer, Personal Interview)

CHARACTER DESIGN

The *Bun and Bunee* characters, designed by Jason Cullen, are simplistic and cartoony. Meyer jokes that the character design originated from Jason's mind, from doodles he had created due to his lack of drawing skills. He states that Jason was drawing the most basic shapes he could when he created the characters (Personal Interview).

There are numerous advantages to having simplistic characters. As Winder and Dowlatabadi present, each element in an animation must be designed and modelled before it can be animated (Winder and Dowlatabadi 164, 242). Simplistic characters usually mean a corresponding, simplistic background. Thus the simpler the original character design, the quicker the modelling process. The modeling on this project was therefore not as time consuming as projects with more complex character and environment designs.



Figure 17: Luma Creative Studios, *Bun and Bunee*. (animationsa.org, 6 Jun. 2009; web; 21 Feb. 2014).

Another advantage of working with simplistic characters is the artistic challenge it poses to animators, “there’s something wonderful about working on a simple character. It's all about the silhouette and the expression, all about the lines; when you have less to work on you actually have to work harder” (Meyer, Personal Interview). Animators can then focus on performance and not be bogged down by the complexity of a character and its costume, and how to make all these elements work together. Depending on the

project however a complex character may be necessary, but for *Bun and Bunee's* humorous and whimsical narrative and theme, the characters can be said to be just right.

Although the characters are simplistic, to ensure that no time was wasted remodeling any elements, all designs had to be approved before they could be modeled. These designs then had to be saved on the *Bun and Bunee Library*, which contained all template scenes; all prop and character models and their textures; reusable images; designs and reference were all stored here. Once modelling was complete all objects had to be named, their history frozen and the character set to neutral (Goosen 1-2).

DIALOGUE, SOUND AND PERFORMANCE

When asked why *Bun and Bunee* was non-dialogue Meyer uses another animated series as an example: "Like *Shaun the Sheep* it is non-dialogue, it's pantomime. The humour is in the action. It's animation humour, it's not clever dialogue, it's not snarky jokes- it's situation comedy... there's a type of animation that just squawks without dialogue, like *Tom and Jerry*" (Personal Interview).

Meyer states that this was great for the team as it taught them a number of things, one of them being how to tell a story in

pantomime (Personal Interview). Horne adds that they became obligated to create a visual language because where characters thought something they could not use words. They had then to think of how to represent those thoughts in pictures (qtd. in Meyer, Personal Interview).

The advantage of having no dialogue is that the series can be sold anywhere including Minika in Turkey, Irib in Iran, Spectral in Indonesia and Disney Japan, with no translation needed (Meyer, Personal Interview). The need for translation of the entire series would cost extra money. It may also discourage international buyers, because dialogue based humour can have a culture and country bias. *Bun and Bunee* is non-dialogue and because the humour is pantomime, it is more universal. It is therefore appropriate for a wider range of audiences.

The lack of dialogue made the music and ambient sounds more important. “There are both creative and commercial reasons why the inclusion of songs can greatly enhance a project… music can transcend language and cultural barriers” (Winder and Dowlatabadi 204). According to Winder and Dowlatabadi music and songs can be vital in moving the narrative forward (204).

The story in *Bun and Bunee* was therefore progressed through music. Luma bought the formal music rights to all the music on *Bun and Bunee*. This was done because Luma wanted to own all the project content in order to make the maximum amount of revenue from it (Meyer, Personal Interview).

THE PRODUCTION GUIDE

Seasoned artists, who may have worked at a number of studios, may know how most of the production pipeline works and the customs which make the process run more smoothly. A number of interns and juniors were used on this project however, therefore senior members of the team felt it was best to create a production guideline. Much like the Fleischer *'bible'* the *Bun and Bunee Rules and Guidelines* clearly outlines the most important things to the project. In this case the focus is less on studio hierarchy, and more on naming conventions, correct file saving methods and basic instructions on each phase of production.

After the script for an episode was complete, and the storyboard and animatic finalized, a list of all props had to be made so modeling could begin (Goosen 1). Initially props had to be modeled for each episode, but as the collection of assets increased fewer and fewer props had to modeled from scratch. The previously

modeled props were saved in the 'library', for use on any later episodes.

XSI Softimage was used for all 3D aspects of the project, and initially Adobe Illustrator was used for title sequences. Goosen says the choice to use XSI Softimage "was a fairly logical decision as this was the CG software the majority of the studio was using and the animators were already familiar with the program. Also there were already some licenses available although a few extra had to be acquired once the team grew bigger" (Goosen, Email Interview).

An additional benefit to using XSI Softimage was the compositor which is incorporated in the package. No compositing software needed to be bought. Also, because each animator had a compositor it meant each animator could do the compositing for the episode they had just animated themselves. Goosen submits that "Having the animators responsible for all phases of each episode streamlined the process and saved time and money in the long run" (Goosen, Email Interview).

The decision to use Adobe Illustrator for the title sequences was similar to the choice to use XSI Softimage. The studio already had the software. It was also "because the vector art could easily be exported from Illustrator and imported into XSI" (Goosen, Email

Interview). This meant that animators could animate the 2D style title sequence on XSI Softimage, and not have to learn how to use Illustrator (Goosen, Email Interview). Although most animators will know how to use Illustrator the ability to use XSI Softimage exclusively means that the animators can get into a flow of working. The short-cuts and way of working become second nature. Having to switch programs may slow the animators down.

All episodes were rendered on a custom HD format which was 4x3 instead of 16x9. This method of rendering means, "The renders can be cropped for HD resolution and cropped and/or scaled to PAL resolution" (Goosen 5). Meyer says that rendering in HD saved them. He states that "HD can be played any way possible and make for a good picture afterwards, therefore it was only one render as opposed to two" (Meyer).

This way of rendering cut render time in half and saved money. As discussed earlier rendering takes a lot of time and CPU power. The predicament with XSI Softimage is that other processes cannot run concurrently with rendering. Cutting render time as much as possible is therefore essential.

Rendering in HD format works best if animators constantly keep in mind that they are framing for both HD and PAL. Therefore

in the *Bun and Bunee Rules and Guidelines* Goosen reminds animators that when framing their scenes and compositing, they must take HD as well as PAL resolution into account. Animators used HD field guides as reference, to ensure they framed their shots correctly (Goosen 5).

Other production guidelines include the constant cleaning of folders and databases, by deleting any unnecessary or outdated files. 3D files take up an immense amount of space, therefore removing unnecessary files is essential to saving space and therefore money.

A rule that is mentioned a number of times is the naming conventions. Animators are asked to "think before you save! Ask yourself, where would be the most logical place to save this thing? Where would someone else be likely to find it" (Goosen 12)? A number of the original *Bun and Bunee* team are no longer at Luma. Additionally the studio is considering revisiting the project. These strict conventions mean that all the animation assets are still available, where anyone who will work on the project in the future can easily find them.

FINAL THOUGHTS ON PRODUCTION PIPELINES-*BUN AND BUNEE* TEAM

When asked about her thoughts on the animation production process and the setting up of an efficient pipeline Goosen states that;

> Animation production is very challenging. There are so many aspects to take into account and when it comes to producing original content in a country like South Africa, it is even more difficult because there is no strong history in this field and very few experienced gurus to learn from. With *Bun and Bunee* we could draw from Luma's experience in producing commercials, but that didn't give us enough knowledge about creating an animated series. There was no rule book we could follow, we were learning as we were going along. (Email Interview)

In *Producing Animation* Winder and Dowlatabadi state that "Since there are multiple pipeline model choices applicable for all different circumstances, there is really no one established model or approach that fits all; rather, the industry is filled with constantly shifting and improving options" (3). Goosen agrees, confirming that no one universal model will work for every studio and every project, "there are too many variables and influences. She adds that

although there are certain models that can be used to base a pipeline on (best practices) each project has its own needs and nuances. She adds that once your pipeline has been established that it is critical to follow it as closely as possible throughout production. Therefore it is essential to spend sufficient time refining the pipeline before production begins (Goosen, Email Interview).

Technological advances and the customization of production are essential for the improvement of the animation production process. According to Derrek Eberts and Glen Norcliffe in their journal article "New forms of Artisanal Production in Toronto's Computer Animation Industry", although there are clear production norms which are indispensable it is clear that production processes are, "sectorally specific, locally contingent, and culturally inflected, with corresponding achievements in customization and artisanal labor processes appropriate to the context" (sic) (Eberts and Norcliffe 120).

Local studios therefore need to be flexible enough to take into account their own contexts: budget; experience; project size etc. They however also have to be able to incorporate the traditional production steps into their pipeline. These best practices are just

that because they have been proven to work, and a streamlining of these practices can give a studio an advantage over competitors.

Going forward, Luma will be refocusing the *Bun and Bunee* brand into a character fashion brand. Meyer says there will be a clear distinction between the series and the brand/property. "We specifically are separating the two. Retailers were getting stuck on the idea that the merchandising should be tied in somehow to the series" (Personal Interview). Meyer states that the link between series and brand caused retailers to reject the brand if the series was not showing in their territory or was in between screening cycles, "retailers would reject the brand in favor of a top-five[55] brand" (sic) (qtd. in Manson).Meyer adds:

> By positioning *Bun and Bunee* as a perennial character fashion brand to the retailers, they 'get it'. They can easily identify it as a brand 'like' *Hello Kitty*, which relies on its own intrinsic visual appeal and not merely on a co-promotional tie-in to a TV series or film. (Manson)

This model will help retailers see the brand as merchandise worth investing in, regardless of whether the series is showing at

[55] A top-five brand in retail consists of the top five most popular brands. In the context of the market to which Luma was going to sell *Bun and Bunee* merchandise to, the top five competitors were characters such as *Hello Kitty* and *Dora the Explorer* for example.

the time or not. This merchandising programme will include greeting cards, stationery and clothing (Manson).

With the possibility of creating more *Bun and Bunee* episodes, both the series and the brand are set to grow. This is perhaps one of the advantages of completing the project independently. Luma owns all the *Bun and Bunee* content, and with no network or production company rushing them for new content, they have time to consider what is best moving forward for the project and for the studio. And with *Bun and Bunee* having received a *KidScreen* nomination for Best Animated Series: Family Category, the future looks bright indeed ("Luma's *Bun and Bunee*").

As a case study the *Bun and Bunee* project has exhibited the benefits of having a production document to follow. The creation of this document gave the senior team an opportunity to consider their pipeline before production commenced. This document also assisted in ensuring that all members of the team knew what they needed to do, where to store files and the chain of production at all times.

The project was a risk because it was self funded; the rewards have nonetheless been immense. As stated the series has been sold to various international broadcasters. Also because all the content

belongs to Luma, the studio can continue to sell the series and associated merchandise indefinitely. Although this model may not work for all local studios it does show that there are various options available to local animators for the creation and distribution of their work.

CHAPTER FIVE: CONCLUSION

The aim of this paper was to investigate the current implementation of local South African animation production pipelines, and to see if they could be improved upon in any way. Although there are certain procedures which are integral to the production process, after a critical analysis of various production streamlining methods it is clear that production pipeline norms can indeed be improved upon and that the techniques to do this are numerous.

Efficient production practices are the distinction between a studio making a profit or working at a loss. They can also be the difference between creating a long lasting quality product, or one just competent enough to broadcast. It is the discussed production pipeline improving nuances which are imperative to production success.

According to Gillis the increasing connectivity of Africa means that many people are beginning to realize that games and animation are valuable approaches to transcend language and literacy barriers (qtd. in Kriedemann 20). Additionally the demand for animation is set to increase in Africa because of the transition to digital television and the spread of internet connectivity in Africa.

Therefore studios need to position themselves as steady businesses in order to attract funding and be able to keep up with any growth in animation content demand.

5.1 RESEARCH CONCLUSIONS

The research process has revealed a number of significant details. Firstly it has shown that there is a gap in academic literature on animation production. The most conspicuous omission is literature on animation pipelines which are not feature length animations. Ergo more research and formal discussions on animation production pipelines in various formats is necessary.

Secondly although it is undeniable that production differs from studio to studio - it has been shown in this paper that there are certain streamlining practices which are suitable for most production approaches. This therefore reinforces the argument for the existence of 'best practices' when it comes to animation production and pipelines.

As endorsed by Meyer, the building of a custom pipeline is essential on all big projects (Personal Interview). Accordingly studios are required to be proficient in the creation and streamlining of pipelines to ensure the success of their

productions. Essentially what any project needs is solid links in its pipeline (Gocek 3). A pipeline with concrete connections throughout will result in a production which is able to move effortlessly between production steps. This includes revisiting on steps where something may need to be fixed.

Also exhibited was the need for artists to fully utilize available tools. The ability to get all that is possible from any piece of software is of great value. A complete knowledge of available tools means a studio will be able to automate and standardize multiple production steps. It also enables a system in which a number of production processes can be executed concurrently.

The concurrent execution of production processes augments the cyclical nature of CGI, which differs from the production of 2D animation which has a more linear course of production. Due to this it is imperative for studios, and even independent animators, to have a firm grasp on their production pipelines and all processes involved. This will ensure that any possible dilemmas are corrected before they occur. Therefore it is clear that a firm control of the production process is beneficial to anyone undertaking an animated project.

This sentiment is endorsed by Wells, he states:

> Such is the labor-intensive process in making many animated films that the specific advanced preparation of material is crucial in executing the particular intentions of the piece, in the most economically viable and time-sensitive fashion. (sic) (15)

As we have seen, one economically viable and time saving method is the shift of focus from the post-production phase to pre-production. Other processes include the use of certain technological tools. Naming, file saving and hierarchy conventions also aid in conserving time and money.

Lastly the main components of the production process, what each process entails and how the processes can be streamlined have been discussed.

HOW DOES THIS RESEARCH CONTRIBUTE TO CURRENT ANIMATION PRODUCTION SCHOLARSHIP?

As it has been discussed, academic literature on animation production methods is scarce. Literature which is available tends to read as ‘how to books’. There is however a wealth of informal writing on the production process in blogs, CGI chat groups and online opinion pieces. Research such as this adds to formal scholarship on production pipelines and methods.

Leading animation production scholars Winder and Dowlatabadi argue that a ‘best practices’ approach is impossible, however the possibility and success of this approach has been presented in this study. Although there is much to be appended to this best practices production approach, it is an ever expanding domain of knowledge. Additionally as mentioned at the commencement of this research paper, the focus of these production improvement methods is based on a South African animation studio case study. The results may therefore be better suited for South African Studios. The results are also not a ‘one size fits all’ model, hence the need for further study of this topic and the need for studios to mould their pipelines to suit their context.

The hope is that this research facilitates the advancement of literature and increases dialogue on animation production pipeline development in the South African animation community. As already discussed, this research resulted from a personal need to acquire more knowledge on the specifics of the production process, and the ability to form an economical yet valuable, viable pipeline.

It is evident that this subject is still one which needs further study for two reasons. Firstly much like Winder’s treatment of the topic in regard to her having worked at Blue Sky, my handling of the

production process is based on my own context (an animation student with access to the *Bun and Bunee* project production information). It is therefore vital that the topic be revisited under dissimilar conditions. Secondly the technological tools which improve production which are discussed in this paper will have become archaic in a few years, because animation production tools and production processes are constantly evolving. Consequently a constant revisiting of this topic is requisite.

As stated by Kerlow:

> Computer animation projects are team efforts where collaboration is a key ingredient for success. The production of any computer animation requires lots of planning and constant supervision because of the number of individuals involved, the short production cycles, limited budgets, and the unpredictable and changing nature of cutting edge technology. (sic)(65)

The ability to successfully balance and manage all of these conditions is where the success of an animation studio lies. In the context of local animation it is essential that studios ensure that they match international companies in terms of technology and positive animation practices. Our local context is unique and allows

for many opportunities. The growth of the South African animation industry is therefore inevitable.

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APPENDIX A: EMAIL INTERVIEW- AMANDA GOOSEN

NB: What are your general thoughts on animation production, as someone who has worked as a producer in an animated series?

AG: Animation production is very challenging. There are so many aspects to take into account and when it comes to producing original content in a country like South Africa, it is even more difficult because there is no strong history in this field and very few experienced gurus to learn from. With Bun&Bunee we could draw from Luma's experience in producing commercials, but that didn't give us enough knowledge about creating an animated series. There was no rule book we could follow, we were learning as we were going along.

NB: What were your responsibilities on the project?

AG: Bun&Bunee was originally developed as a brand for mobile content, during the era when mobile phones were suddenly no longer just talking devices. People were “chatting” on apps such as Mixit and personalising their handsets with different visual themes.

Bun&Bunee was going to break into that market with loads of

wallpapers and screensavers and also fully animated one-minute episodes.

So when I first started working on Bun&Bunee I created wallpapers in the form of still images, and screensavers in the form of animated gifs. These all had to be done according to certain specifications to be used on different handsets.

I assisted in coming up with themes for the content, creating the website, writing newsletters.

My favourite part was working on the actual episodes though and here I was involved with all aspects. I wrote and co-wrote scripts, drew storyboards and animated.

NB: How long had you been working at Luma before you worked on the Bun and Bunee project?

AG: It's difficult to say exactly when Bun&Bunee was born because in its initial phase, it started as a “down-time” project. Something people would work on when there was little or no paying work in the studio.

I started at Luma in January 2006 and worked on Bun&Bunee from about mid-way through the year I'd say. You will have to check with Paul, Jason or Helena to get a more specific date of when we started on the mobile stuff.

It was only towards the end of 2008 that I was put onto

Bun&Bunee full time. By then the project had evolved from being a mobile content Endeavour. The decision had been made to not only complete an entire series of 52 episodes, to also use the brand for merchandise and clothing as well.

NB: What is your schooling background?
AG: I matriculated from the National School of the Arts where I took History of Art, Drawing and Graphic Design in addition to my academic subjects. After school I attained a Bachelor Degree in Graphic Design, Specializing in Multimedia from Design Center. After working fulltime in advertising for a year, I completed a Postgraduate Diploma in Digital Arts at the University of the Witwatersrand.

NB: When you started working on Bun and Bunee as a producer, which animation production theory did you consult and why?
AG: As I mentioned we were winging it most of the time.

NB: What are the current local animation production trends, and what do you think brought about their conception?
AG: Personally I don't think there is currently enough content being produced in South Africa for there to be clear trends and tendencies. What we can certainly see from local film

production, as in the case of Jock of the Bushveld and Triggerfish's Zambesia and Khumba, is that studios are relying on international investment to get their projects off the ground. They also therefore rely heavily of their investor's expertise, experience and connections.

NB: I heard that the Bun and Bunee team was a young one including Craig who came to work at Luma immediately after high school. Was the decision to do this financial? Or did you guys feel that for the type of project Bun and Bunee was that a young team was better suited?

AG: Certainly it was beneficial to have young people working on the project. They gave us an insight to what would appeal to our target audience. However the main reason for having a young team was a question of cost. We had three junior animators, one junior designer and four interns. The Internships offered these young people an opportunity to learn the industry and CG process while working on a real-world project. It was also an opportunity for them to prove themselves and possibly gain future employment at Luma, and some did go on to work at Luma full-time after their internships.

NB: Which software did you use to create Bun and Bunee and why? Was the decision to use these programmes financial, aesthetic or were there other reasons?

AG: We used Softimage XSI for the 3D aspects of Bun&Bunee. This was a fairly logical decision as this was the CG software the majority of the studio was using and the animators were already familiar with the program. Also there were already some licenses available although a few extra had to be acquired once the team grew bigger. The added benefit of using XSI was that it had a built-in compositor. This saved on cost as we didn't need to use additional software for compositing. It also meant each animator could do their own compositing, once they had animated and rendered an episode. Having the animators responsible for all phases of each episode streamlined the process and saved time and money in the long run.

For the title sequences we used Adobe Illustrator, firstly because it was software we already had available in the studio, but also because the vector art could easily be exported from Illustrator and imported into XSI. This meant that the same animators who were creating the CG elements,

could animate the 2D style title sequences without having to learn an extra program.

NB: In their book producing for animation Winder and Dowlatabadi state that "Since there are multiple pipeline model choices applicable for all different circumstances, there is really no one established model or approach that fits all; rather, the industry is filled with constantly shifting and improving options (Winder and Dowlatabadi 3, 2001). Do you agree with this statement and do you feel that producing according to circumstances is more productive than trying to find a universal model?

AG: I absolutely agree. There can never be one universal model that will work for every studio or even every project. There are too many variables and influences. There are definitely certain models and approaches that one can base your pipeline on successfully, but each project will have its own needs and nuances. In fact, I believe you need to be flexible and willing to mould your pipeline according to the specific needs of a project. I also believe that once you have established your pipeline it is critical for you to stick to it as closely as possible throughout the project and it's therefore a good idea

to spend sufficient time on planning and refining your pipeline upfront.

APPENDIX B: EMAIL INTERVIEW- BRONWYN HORNE

NB: What were your responsibilities on the Bun and Bunee project?

BH: I was primarily an animator but was also responsible for other aspects of the pipeline as well as mobile content management.

NB: How long had you previously been working at Luma before the project commenced?

BH: I started working at Luma only when Bun and Bunee commenced.

NB: What were you doing before the project and what is your animation schooling history?

BH: I was still studying before I started at Luma in February 2009. I completed my Masters at Wits University, Digital Arts in 2008.

NB: Which part of production were you most involved in, pre-production; production or post-production. And out of the three which used the most amount of time and resources?

BH: It was dependant of what episodes were in production at any given time. I animated 10 of the 52 episodes, but also did pre-production (mostly storyboards and animatics); production and Post. Animation and rendering were the most time consuming.

NB: Given the opportunity to work further on the project, what changes do you think would be necessary to improve production?

BH: To get a more senior team on board. The production team was mostly made up of interns, so a lot of the work had to be re-done or was completed at a very slow rate.

NB: Are there any common practices that exist across all local studios that are known production improvement steps?

BH: I'm not sure what you are asking here. There is nothing unique about animation production from my experience. Some studios may choose to emphasize one or two areas, but the

process required to complete an animated piece are still the same.

NB: Are local animation studios comfortable with sharing such information, or are production secrets closely guarded and why?

BH: I don't feel there are any big secrets that aren't known by people in the industry that constantly research and follow artists, techniques and processes online. If they don't, it's to their detriment. I think studios don't mind sharing, but currently there is no platform for this to happen.

NB: What was working at Luma like?

BH: Awesome. I would work there forever if they paid more.

NB: What are your thoughts on local animation studios currently?

BH: That's a very open ended question. Studios are doing what they need to survive and grow the industry. This is not very easy given the current economic climate. We need to build Animation SA so that more can benefit from opportunities that they establish.

NB: What are your thoughts on the future of South African animation studios, considering they have to compete with far cheaper markets like the Philippines and India?

BH: I don't think they are necessarily competing directly with these markets. South Africa needs to grow their own local industry by producing their own content. Funding and resources would be the key to making this happen.

APPENDIX C: LIST OF TERMS

2D ANIMATION: An animated film created by photographing or scanning a series of gradually changing images, giving the illusion of movement.

ALGORITM: The multi tiered procedure of computation which allows the mapping of algorithms into images.

ANIMATIC: A story reel which shows the rough animation and character placement. Additionally characters can be moved around to give animators a feel for how the animation will look.

ANIME: A Japanese stylized 2D animation form. It consists of extreme caricatures and characters with extremely large eyes. Additionally it is animated using limited animation.

ANTIALIASING: The process of eliminating aliasing. Common methods include oversampling and interpolation techniques.

CGI: Computer Graphics Interface. CGI animation is animation created using computer graphics.

COMPOSITING: The assembling of all the elements of an animation after they have been rendered. It also consists of colour balancing, retouching and editing.

DPX: Digital Picture Exchange, a common file format for digital and visual work.

FORWARD KINEMATICS: The movement of the joints of a skeleton attached such that they move a bone chain. An example of this would be the movement of an arm from shoulder-to-elbow-to-wrist. This movement would begin at the root, rotating the shoulder first; the elbow would follow then the wrist, to get the hand into the appropriate position.

GLOBAL ILLUMINATION: Rendering software, which simulates the interaction of light in a 3D environment.

ICE: A particle based system of working which can be found in 3D animation software such as Maya, Softimage XSI and 3ds Max. This system can be used to simulate things like fluids and dust and even crowds.

INVERSE KINEMATICS: Movement which permits an animator to position the hand for example anywhere in the space, the computer then calculates the rotation and position of the upper arm; forearm and elbow, connecting them to the shoulder.

MAQUETTE: A preliminary sketch or model. In 3D it is often used to scan into a 3D virtual space.

MODELING: The creation of characters and props, using geometry, for use in a 3D virtual space.

MOTION DYNAMICS: Techniques which generate realistic motion of rigid objects or fluids by simulating the physical property attributes

and the laws of physics. They take into account characteristics such as weight, mass, inertia, flexibility, density, cohesion, viscosity and even stickiness.

OFF THE SHELF SOFTWARE: Also known as Turnkey software, off the shelf software is commercially available software which can be purchased from various vendors at different amounts, depending on the software's capabilities. It can be used on most computer platforms and can be enhanced by the use of compatible plug-ins.

OPEN SOURCE SOFTWARE: Software that is freely available for use, redistribution and modification. The improvement of open source software is based on a communal model.

PHOTON MAPPING: A global illumination algorithm which consists of two passes.

PLUG-IN: Programs which are installed into other programs to supplement their functions and/or performance.

PRODUCTION NORMS: Animation production practices which are essential to the production process.

PRODUCTION PIPELINE: A production pipeline is the process of producing an animation. This process is based on multiple variants such as budget, creative goals, and schedule. The basic stages of a production pipeline are Pre-production, Production and Post-production.

PROXIES: Place holder geometry used in place of final models to allow the pre-visualization of scenes. They are often used in animatics for example.

RADIOSITY: A rendering method which is based on a detailed analysis of how light reflects off diffuse surfaces. Images resulting from radiosity rendering often have soft gradual shadows.

RAYTRACING: The generation of an image by tracing the path of light through the pixels in an image. The effect of an images encounter with virtual objects is simulated.

RENDERING: The retrieval of all information in a scene, including character models, props, the environment, lighting and shaders.

RIGGING: The process of adding a skeleton to a 3D model. This is done in order to allow animators the ability to manipulate the movement of the model.

SCENE: A series of shots.

SHOT: A length of film taken by a single camera without any pauses.

SPATIAL ALIASING: When the spatial resolution of an image is extremely low, causing a loss in details and jagged edges.

STEREOSCOPIC: The simulation of realistic image depth.

THUMBNAILS: Concise, miniature panels drawn to illustrate action.

TYPOLOGY: A 3D models polygonal mesh.

WIDGETS: In The Set Up Machine, a plug-in rigging system, it refers to the different parts of a rig, such as arms; legs; spines etc., accompanied by simple controls to assist the functionality of the widget.