

Production Management

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University of Wales Trinity Saint David

**Case Study Report on the Scene of the Battle Against the
Lava Giant in *Moana***

MA Animation

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1 Introduction

Ocean vs. Lava Giant is one of the most visually stunning climactic scenes in *Moana*. This sequence combines ocean fluid simulation, lava effects, dramatic lighting and high-intensity character animation, demonstrating the significant investment of creative and technical resources. Drawing on publicly available data and industry cost standards, this report analyses the production costs and workflow of this sequence, providing guidance on cost management and resource allocation for large-scale animation projects.

2 Clip Overview

In the clip from *Moana*, Moana arrives at the Heart of the Island to return Te Fiti's heart, only to be blocked by the enraged lava giant. Flames engulf the sea, and the lava giant repeatedly attacks Moana, whilst the ocean rises to form a massive wall of water to protect her. As Moana draws closer, she realises that the lava giant is actually a corrupted version of Te Fiti, and so chooses to return the heart rather than attack. Ultimately, the flames die down, and the lava giant transforms back into Te Fiti, the goddess of life. This sequence makes extensive use of ocean fluid simulation, lava effects, character animation, and complex lighting and rendering techniques, serving as a classic example of the integration of emotional storytelling and visual effects in animated film (Lasseter, 2016).

3 Reverse-Engineered Production Scope

3.1 Production Task Breakdown

To better understand the production management requirements of the Ocean vs. Lava Giant sequence in *Moana*, the scene can be reverse-engineered into a structured production scope. Although the exact production schedule used by Disney Animation has not been publicly disclosed, it is possible to estimate the major production stages, departmental responsibilities, workflow structure and approximate durations based on standard industry practices for large-scale CGI

animated film production. The following table outlines the key production tasks, departments, estimated timelines and expected deliverables involved in producing a sequence of this technical and visual complexity.

Production Stage	Task	Department	Estimated Duration	Main Output	Rigging	Character and environment rigging	Rigging Team	1 week	Animation-ready rigs
Pre-production	Storyboarding and concept design	Story Team / Art Department	1 week	Approved storyboard and concept art					
					Animation	Moai and Te Ka performance animation	Animation Team	3 weeks	Final character animation
Pre-visualization	Camera layout and animatics	Layout Team	1 week	Previs sequences					
Asset Production	Te Ka modelling and environment assets	Modelling Team	2 weeks	Production-ready models	FX Simulation	Ocean, lava, smoke and debris simulation	FX Department	4 weeks	Cached simulation data
Asset Development	Texturing and shader creation	Texturing Team	1 week	PBR textures and materials	Lighting	Lava and ocean lighting integration	Lighting Team	1 week	Render-ready lighting setup
Rigging	Character and environment rigging	Rigging Team	1 week	Animation-ready rigs	Rendering	Final frame rendering	Render Farm / TD Team	1 week	DRR image sequences
Compositing	Shot integration and visual balancing	Compositing Team	1 week						Final composited shots
Post-production	Editing and colour correction	Editorial / Colour Team	1 week						Final delivery master

Fig1. Workflow

3.2 Production Workflow

The production process for the segment Ocean vs. the Lava Giant follows the standard CGI animation film production pipeline and involves several interlinked departments (Dunlop, 2014). The entire process begins with storyboarding, concept art and pre-visualisation (previs), which are used to establish the visual style, camera movements and pacing of the scenes. Once the proposal has been approved, the modelling, texturing and rigging teams begin creating digital assets such as characters, environments and simulation systems.

The project then moves into the animation and visual effects phase, where character performances, ocean simulations, lava effects and particle systems undergo multiple rounds of iteration and refinement. Due to the high level of interaction between the animation and simulation systems, close

communication and collaboration between departments is essential throughout the production process (Okun and Zwerman, 2014).

After this, the lighting, rendering and compositing teams integrate all visual elements into the final cinematic shots. The entire process concludes with editing, colour grading and preparation for final delivery. Throughout the production, Production Management is responsible for coordinating the production schedule, maintaining workflow efficiency, and ensuring the project is completed successfully within budget and on time.

3.3 Technical Complexity Analysis

The Ocean vs. the Lava Giant sequence in *Moana* is highly complex due to its combination of ocean simulation, lava effects, particle systems and physically based rendering workflows. Large-scale VFX sequences often require close coordination between animation, FX, lighting and compositing departments because of the interdependent nature of simulation-based production pipelines (Okun and Zwerman, 2014).

One of the main technical challenges in this sequence is the interaction between water and lava, both of which are difficult natural elements to simulate realistically in CGI production. In addition, the scene requires advanced lighting and rendering techniques to manage the contrast between volcanic environments, glowing lava and reflective ocean surfaces. Physically based rendering systems are commonly used to achieve realistic material and lighting behaviour in feature animation production (Pharr, Jakob and Humphreys, 2016).

4 Cost estimation research method and assumption basis

“The production cost of an animated film sequence may be estimated through the analysis of publicly available budgets, labor requirements, rendering expenses, and the technical complexity of similar scenes in previous productions.”

4.1 Clip Importance and Budget Share

From a production perspective, it is reasonable to assume that the Ocean vs. Lava Giant' sequence consumed a significantly higher budget and far greater production resources than a standard shot. The scene combines ocean fluid simulation, lava and fire effects, particle systems, and complex lighting and rendering workflows, whilst the character animation must also interact closely with the dynamic environment. This means that, compared to standard narrative shots, this sequence requires a larger production team, longer rendering times, and a greater investment in computational resources. Consequently, this sequence can be regarded as one of the core scenes in the entire film that has received the highest level of resource investment and incurred the highest production costs.

4.2 Team Size and Production Time

The scene makes extensive use of fluid simulation, volcanic lava effects and dynamic interactions between characters and the environment, thus requiring the ongoing support of specialist FX teams, simulation engineers and technical directors. In accordance with the industry production workflow for large-scale CGI animated films, sequences of this nature typically require collaboration across multiple departments, including animation, visual effects, lighting, cinematography and compositing, often involving hundreds of artists working together through a lengthy process of iterative production. Due to the high complexity of the shots, such scenes generally have a lengthy production cycle, often taking several months to complete. During this period, processes such as shot design, simulation optimisation, animation pre-visualisation and final rendering all require multiple rounds of testing and adjustment to achieve the desired visual realism and artistic effect.

5 Production Process and Cost Structure

5.1 Pre-production

5.1.1 Storyboards and Concept Design

From the perspective of reverse-engineering-based scope assessment, the Storyboards and Concept Design phase is primarily responsible for establishing the visual structure, shot rhythm and overall artistic direction for the Ocean vs. the Lava Giant sequence. As this sequence features a large number of action shots, complex environmental interactions and visual contrasts between the ocean and lava, the pre-production design phase requires more time to be devoted to shot planning and visual testing than is typically required for standard narrative shots.

Based on the complexity of the sequence, this phase is expected to take approximately 2–3 weeks. It is proposed that 2 storyboard artists and 2 concept artists be assigned to jointly complete the key shot design, visual development and adjustments following the director's review. The estimated base labour cost is approximately £18,000.

Furthermore, taking into account director reviews, visual revisions and additional design tests, an adjustment cost of approximately 10% can be added, amounting to roughly £1,800. Consequently, the total budget for the Storyboards and Concept Design phase can be estimated at around £20,000.

This estimate demonstrates that the pre-production design phase not only determines the visual direction of the subsequent production pipeline but also enables the production team to assess shot complexity, VFX workload and overall production scale in advance, thereby reducing the risk of rework and budgetary pressure during post-production.

5.2 Production

The Ocean vs. Lava Giant sequence in *Moana* shows the high level of teamwork required in modern feature animation. As one of the film's climactic

scenes, this sequence combines emotional storytelling with large-scale visual effects, requiring close collaboration between multiple departments, including storyboarding, set design, animation, visual effects, lighting and compositing. The production process typically begins with story development and pre-visualisation to establish the scene's pacing, camera angles and overall emotional tone prior to full production (Kerlow, 2009). Once the proposal has been approved, animators refine Moana's movements and facial expressions to ensure her performance feels authentic, natural and compelling to the audience.

At the same time, visual effects artists need to create simulated effects such as waves, lava, smoke and debris. As water and fire are highly complex CGI elements, they require multiple rounds of testing and adjustment. The lighting and rendering teams are responsible for balancing the visual contrast between the volcano, the lava and the ocean, in order to enhance the scene's realism and dramatic tension. As this sequence forms the climax of the film, it typically requires numerous rounds of review and revision before it is finalised. Overall, this scene demonstrates a high-intensity, complex and technically advanced production process, and reflects the willingness of major animated film studios to invest significant time and specialist talent into climactic sequences (Brinkmann, 2008).

5.2.1 Modeling and Texturing

From the perspective of reverse-engineered scope assessment, the Modelling and Texturing phase is primarily responsible for creating the core digital assets required for the 'Ocean vs. the Lava Giant' sequence, including Lava giant, the ocean environment, volcanic terrain, rock formations and associated textures. As this sequence involves large-scale environmental interactions and complex surface details, the modelling and texturing workload is significantly higher than that of a typical indoor or dialogue scene.

Based on the complexity of the sequence, this phase is estimated to take approximately 2–3 weeks, requiring 4 modelling/texture artists to work for 15 days. Assuming a daily rate of approximately £350 per artist, the base labour cost is approximately:

$$4 \times 15 \times £350 = £21,000$$

Taking into account high-precision model modifications, PBR material testing, and adjustments to the lava glow material and ocean surface shaders, an additional 15% can be added for modification and technical testing costs, amounting to approximately £3,150. Consequently, the total budget for the Modelling and Texturing phase can be estimated at around £24,000.

This estimate demonstrates that this phase not only provides the foundational assets for subsequent rigging, animation and FX simulation, but also directly impacts the material realism and visual quality of the final footage; consequently, sufficient time must be allocated in the early stages for model optimisation and material testing.

5.2.2 Rigging

From the perspective of reverse-engineering-based scope assessment, the rigging phase is primarily responsible for establishing a control system for Lava giant and related characters that can be used for animation and VFX interactions. As this sequence involves significant body movement, deformation of lava fissures, and collision interactions with ocean simulations, the rigging workload is higher than for standard character shots.

Based on a medium-scale estimate, the Rigging phase is expected to take 1 – 2 weeks, requiring 2 rigging artists/TDs to work for 10 days. Assuming a daily rate of approximately £400 per rigging artist/TD, the base labour cost is approximately:

$$2 \times 10 \times £400 = £8,000$$

Taking into account testing, revisions and technical coordination with the animation and FX departments, an additional 15% should be added for

adjustments, amounting to approximately £1,200. Consequently, the total budget for the rigging phase can be estimated at around £9,200.

This estimate demonstrates that although the rigging production cycle is relatively short, it directly impacts the stability of subsequent animation and FX simulation work. Consequently, sufficient time must be allocated to testing in the early stages to minimise the risk of rework later on

5.2.3 Animation

From the perspective of reverse-engineered scope assessment, the animation phase represents a significant portion of the man-hours required for the Ocean vs. the Lava Giant sequence. As this sequence features *Moana*'s character performance, Lava giant's large-scale body movements, and the interaction between the characters' movements and the ocean and lava effects, the animation production is expected to take 3 – 4 weeks, involving approximately 5 – 8 animators.

Using a medium-scale estimate, if six animators are assigned to work for 20 days, with each animator costing approximately £350 per day, the animation labour cost would be approximately:

$$6 \times 20 \times £350 = £42,000$$

Furthermore, taking into account the time required for the animation supervisor, director's review and revisions, an additional 10% – 15% can be added for management and rework costs, amounting to approximately £5,000. Consequently, the total budget for the animation production at this stage can be estimated at around £47,000.

This estimate demonstrates that the Animation phase not only involves the production of character performances but also directly impacts the efficiency of subsequent FX simulation, lighting and rendering. Therefore, clear review milestones must be established within production management to minimise the risk of rework and budget overruns.

Animation Production Stage	Main Tasks	Estimated Crew Size	Estimated Duration	Key Deliverables
Shot Assignment and Planning	Review storyboard, analyse shot complexity, assign animation tasks	1 animation supervisor + 1 producer	2-3 days	Shot allocation and production schedule
Blocking	Create key poses, establish timing and major character movement	5-8 animators	1 week	Blocking pass
Spline Refinement	Refine movement curves, improve body mechanics and transitions	5-8 animators	1 week	Spline animation pass
Secondary Motion and Polish	Add facial animation, secondary motion and performance details	4-6 animators	4-5 days	Polished animation
Secondary Motion and Polish	Add facial animation, secondary motion and performance details	4-6 animators	4-5 days	Polished animation
Director Review and Revisions	Review animation quality, pacing and emotional performance	Animation team + director	3-4 days	Approved animation shots
FX Simulation Preparation	Export animation caches for ocean and lava simulation workflows	1-2 animation TDs	2 days	Simulation-ready animation data
Final Animation Approval	Final quality check and handoff to FX and lighting departments	Animation supervisor + production team	1-2 days	Final approved animation package

Fig2.Production process

5.2.4 Simulation and 3D Visual Effects

From the perspective of reverse-engineered scope assessment, the simulation and 3D visual effects phases represent some of the most technically complex and budget-intensive stages of production in the Ocean vs. the Lava Giant sequence. This phase involves creating ocean fluid simulations, lava movement, smoke, volcanic ash, particle systems, and large-scale interactions between characters and the environment; consequently, the production cycle is typically longer than that of a standard animated shot.

Based on the complexity of this sequence, the Simulation and FX phase is estimated to take approximately 4–5 weeks, to be carried out by a team of 4–6 FX artists and technical directors (TDs). Assuming 5 FX artists working for 25 days, with a daily rate of approximately £450 per person, the basic labour cost would be:

$$5 \times 25 \times £450 = £56,250$$

Furthermore, as this phase also involves simulation caching, render testing, high-performance computing resources and multiple rounds of technical adjustments, an additional 20% is typically required for technical and hardware costs, amounting to approximately £11,000. Consequently, the total budget for the Simulation and 3D Visual Effects phases can be estimated at around £67,000.

This estimate demonstrates that FX simulation is not only a core component of visual effects production but also the stage within the production pipeline most prone to computational strain and production bottlenecks. Consequently, Production Management must control production efficiency and budget risks through phased reviews, simulation testing and render scheduling.



Fig 3. Special effects display



Fig 4. FX Debugging

5.2.5 Lighting and Rendering

From the perspective of reverse-engineered scope assessment, the Lighting and Rendering phase is primarily responsible for integrating characters, the ocean, lava, smoke and particle effects into the final cinematic shot. Due to the strong contrast between light and shadow, the self-luminous lava, ocean reflections and volumetric smoke in this sequence, the technical demands on lighting and rendering are considerable.

Based on the complexity of the sequence, this stage is estimated to take approximately 2–3 weeks, requiring 3 lighting/rendering artists to work for 15 days. Assuming a daily rate of approximately £350 per artist, the base labour cost is approximately:

$$3 \times 15 \times £350 = £15,750$$

Furthermore, taking into account render farm usage, test renders, image revisions and re-renders due to failed renders, an additional 30% can be added for rendering and technical costs, amounting to approximately £4,700. Consequently, the total budget for the Lighting and Rendering phase can be estimated at around £20,500.

This estimate demonstrates that Lighting and Rendering not only affects the visual quality of the final image but also has a direct impact on production time and computational costs; consequently, budget risks must be managed through batch test renders and sensible render scheduling.

5.3 Post-production

5.3.1 Compositing

From the perspective of reverse-engineering-based scope assessment, the compositing stage is primarily responsible for integrating the rendered layers—including characters, environments, fluid simulations, particle effects and volumetric smoke—into the final cinematic shot. As the Ocean vs. the Lava Giant sequence features extensive ocean simulation, lava glow, atmospheric smoke and high-dynamic-range lighting effects, the compositing work involves not only image compositing but also visual balancing and adjustments to ensure shot continuity.

Based on the complexity of the clip, the compositing stage is expected to take approximately 1–2 weeks, requiring 2–3 compositing artists to work for 10 days. Estimating with 3 compositors at a daily rate of approximately £320 each, the base labour cost is approximately:

$$3 \times 10 \times £320 = £9,600$$

Furthermore, taking into account adjustments to render layers, additional glow correction, modifications to atmospheric effects, and rework following the director's review, an additional 15% can be added to the post-production adjustment costs, amounting to approximately £1,400. Consequently, the total budget for the compositing phase can be estimated at around £11,000.

This estimate demonstrates that compositing is not merely a stage for integrating layers in post-production, but also a crucial process for ensuring visual consistency and cinematic quality across shots. Consequently, multiple rounds of review and colour balancing are required to guarantee the stability and continuity of the final image.

5.3.2 Editing and Color correction

From the perspective of reverse-engineering-based scope assessment, the Editing and Colour Correction phase is primarily responsible for adjusting the shot rhythm, visual continuity and final colour style of the Ocean vs. the Lava Giant sequence. As the sequence features numerous rapid cuts, high contrast lighting and complex visual effects, the post-production editing and colour grading will require multiple rounds of review and visual adjustments to ensure the overall cinematic rhythm and visual consistency.

Based on the complexity of the sequence, this phase is estimated to take approximately 1 week, requiring 1 editor and 1 colour artist to work for 5 days. Assuming an average daily rate of approximately £350, the basic labour cost would be:

$$2 \times 5 \times £350 = £3,500$$

Furthermore, taking into account director reviews, colour balancing, adjustments to shot pacing, and additional output testing, an additional 15% can be added to the post-production modification costs, amounting to approximately £500. Consequently, the total budget for the Editing and Colour Correction phase can be estimated at around £4,000.

This estimate demonstrates that although the post-production editing and colour grading phase has a relatively short production cycle, it directly influences the final film's pacing, emotional expression and visual polish; therefore, it remains a crucial final integration stage within the production pipeline.

5.3.3 Final Output and Delivery

From the perspective of reverse-engineering-based scope assessment, the Final Output and Delivery phase is primarily responsible for the final quality check, format preparation and delivery readiness of the Ocean vs. the Lava Giant clip. Although the production cycle for this phase is relatively short, rigorous technical reviews and multiple rounds of checks are still required to ensure that all shots, audio, colour grading and output formats meet the final delivery standards.

Based on the scale of the clip, this phase is expected to take approximately 2–3 days, and one post-production coordinator and one technical assistant can be assigned to complete the final output and delivery tasks. Assuming an average daily rate of approximately £300, the basic labour cost is estimated at:

$$2 \times 3 \times £300 = £1,800$$

Furthermore, taking into account output testing, file backups, format conversion and the final review, an additional 10% in technical and administrative costs can be added, amounting to approximately £200. Consequently, the total budget for the Final Output and Delivery stage can be estimated at around £2,000.

This estimate demonstrates that, although Final Output and Delivery does not involve a significant amount of visual production, it is directly related to the delivery quality and technical stability of the final film; consequently, it remains a crucial final stage in the production pipeline that cannot be overlooked.

6 Conclusion

The production of the Ocean vs. Lava Giant sequence in *Moana* was highly complex, requiring the coordinated efforts of multiple production departments and technical teams. As the narrative climax of the film, this sequence placed greater demands on resource integration and workflow management during production. The importance of production management in this context is primarily reflected in the following aspects:

- ① Establishing systematic technical standards and production workflows to ensure effective coordination between production stages and minimise the risk of duplication of effort and rework.
- ② Optimising production efficiency in key technical areas (such as fluid simulation, character animation and visual effects) through scientific task breakdown and human resource allocation, thereby alleviating resource pressures during high-intensity production phases.
- ③ Implementing dynamic budget and schedule control mechanisms throughout the production process to achieve an optimal balance between cost, time and resources, whilst ensuring visual quality

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Production Management

GRADEMARK REPORT

FINAL GRADE

68 / 100

GENERAL COMMENTS

The submission demonstrates a good understanding of the production complexity involved in the *Moana* Ocean vs. Lava Giant sequence. The work clearly identifies key production stages, including storyboarding, modelling, rigging, animation, simulation/VFX, lighting, rendering, compositing and final delivery.

The strongest aspect is the production and budget breakdown. The use of estimated team sizes, daily rates, durations and additional adjustment costs gives the work a practical production management focus, and the calculations show a clear attempt to connect technical complexity with cost.

The discussion of water, lava, smoke, particles, lighting and character/environment interaction is effective and helps justify why this sequence would require significant time, staffing and resources.

To improve, the work would benefit from a clearer total budget summary and stronger links between the cost estimates and supporting sources. The scheduling and communication elements are also less developed, with limited evidence of client/crew communication or a fully resolved production schedule.

Overall, this is a good Level 7 submission with clear production awareness and a strong budget focus, but it needs more developed scheduling, communication and management documentation to move into a higher mark range.

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