

University of Wales Trinity Saint David

**Case Analysis Report on the Heart-Piercing Mantra
Segment in *Nezha 2***

MA Animation

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1 Introduction

The Heart-Piercing Spell sequence in *Na Zha 2* is one of the highlights of the movie, with its striking visual effects and gripping plot. Behind this short 20-second sequence is the meticulous craftsmanship of the production team and a huge investment of resources. This report analyzes the production cost of this clip based on publicly available information and animation industry costing standards, aiming to clearly present the details of its cost composition, and provide a reference example for cost management and resource allocation in animation projects.

2 Clip Overview

In the Heart-Piercing Spell clip, Ne Zha and Ao B are given the Heart-Piercing Spell when they are exposing the plot of the Infinite Immortal Weng, and thousands of thorns penetrate their bodies in an instant. Nezha forces his way through the Heart-Piercing Spell, causing his flesh and hair to be instantly torn into over 600 pieces of flesh. These body parts then come together, and Nezha is reshaped and evolves into an even more powerful version of himself. The whole process is accompanied by the flickering of incantations and the changing of light and shadow effects, which not only requires very high requirements for character modeling and animation design, but also requires complex special effects technology to present realistic damage and energy release effects, which is a typical scene combining technical difficulty and artistic expression in animation production.

3 Cost estimation research method and assumption basis

“The time usage to complete a task may be predicted and given meaning through the use of a frequency distribution of the actual time usage of similar tasks on previous occasions.” (Halkjelsvik, 2018, p. 17) In order to scientifically and reasonably estimate the production cost of the “Heart-Piercing Spell” segment in “Na Zha 2”, this study builds a costing model based on industry practices, relevant animation project data and the characteristics of the film itself, in terms of the three dimensions of the importance of the segment, the size of the team and the allocation of working hours, as well as the industry's cost benchmarks. The setting and basis of each dimension are as follows:

3.1 Clip Importance and Budget Share

According to the official announcement of *Ne Zha 2*, the total production budget is RMB 500 million (iQIYI, 2024). Taking into account the plot weight and technical complexity of the Heart-Piercing Spell segment, it is initially assumed that its cost will account for 6% to 10% of the total budget of the film. According to the cost distribution experience of Chinese 3D animation movies such as *Jiang Ziya* and *White Snake*, the cost of the key special effects segments generally ranges from 5% to 12%. With reference to the industry rules and the technical difficulty and duration of this segment, this study selects the median value as the basis for calculation, and thus deduces that the cost of this segment ranges from about

RMB30 million to RMB50 million.

3.2 Team Size and Production Time

In terms of manpower investment and production cycle, with reference to the production team configuration and cycle arrangement of “*Ne Zha 2*”, this clip is expected to be completed by a 40-person core team and an 80-person outsourcing team. The overall production cycle will take 18 months, divided into 3 months for pre-production, 12 months for official production and 3 months for post-production optimization and delivery. On this basis, in combination with the highly complex modeling, special effects and rendering involved in the production process of Heart-Piercing Spell, the human resources were allocated and optimized accordingly.

3.3 Industry Cost Benchmarking

“By delving into the understanding of odds, thoughtful planning, strategic thinking, effective teamwork, risk management, and self-awareness, individuals and project managers can significantly enhance their chances of project success.”(Riley, 2024, p.180) In terms of single cost measurement, this study sets the following cost standards based on the *Foreseeing 2024: China's Animation Industry Panorama in 2024 (with Market Supply and Demand, Competitive Landscape and Development Prospects, etc.)* summarized by the Prospect Industry Research Institute and the research data of a number of animation production companies: the unit price of

complex special effects production ranges from RMB 8,000 to RMB 15,000 per second, and for extremely high complexity scenes, the unit price can be between RMB 8,000 and RMB 15,000 per second, and the unit price can be between RMB 8,000 and RMB 15,000 per second for complex special effects. For very high complexity scenes, the unit price can be floated by 50% to 100% on this basis; the monthly salary range of intermediate animators is from 25,000 yuan to 40,000 yuan, and the monthly salary of senior positions such as senior special effects artist and technical person in charge is from 60,000 yuan to 100,000 yuan. The above benchmark price provides a reliable numerical basis for the subsequent cost measurement of each segment.

4 Production Process and Cost Structure

4.1 Pre-production

The “Heart-Piercing Spell” segment, as an example of the integration of technology and narrative in the animated film “*Ne Zha 2*”, occupies an important position in the overall structure of the film. The clip not only serves as an important plot twist and carries strong dramatic conflicts and emotional tension, but also poses extremely high technical requirements in terms of visual effects and animation performance.

Therefore, in the script development stage, it was clear that the clip needed to deepen the character transformation and theme expression through the visual and emotional progression of “broken - deconstructed - reorganized - sublimated”. At

the screenplay design stage, a systematic plan was made for the camera language and screen composition, covering the following key elements:

- ① Spell initiation and energy gathering
- ② Thousand thorns burst and piercing moment
- ③ Flesh tearing and debris dispersal
- ④ Rebirth in fire and reorganization of fragments
- ⑤ Framing of the adult Nezha as it is being formed

The above planning laid a solid foundation for the rhythm control and visual unity in the subsequent 3D production.

The project plan was to allocate a team of 10 people (5 concept designers and 5 sub-screenwriters) to work on the project for 3 months, with an average monthly salary of 35,000 RMB. The formula is: $10 \times 3.5 \times 3 = 1.05$ million yuan. Comparing the cost of conceptual design and storyboard of key scenes in the same type of animation movie, the cost of this part of the clip is in a reasonable range.

4.2 Production

In the documentary on the production of *Nezha 2*, the project leader responsible for the Heart-Piercing Spell segment said that this short 20-second shot took two years,

which shows that the production process of the Heart-Piercing Spell segment was extremely complicated and involved the collaborative work of many departments and work types. The role of the project leader in the production process of this clip is crucial.

4.2.1 Modeling

In order to realize the amazing effect of tearing and reassembling Nezha, three sets of character models were constructed: a normal Nezha model, a fragmented model consisting of about 600 pieces of flesh and tissue in the torn state, and a reassembled adult version of Nezha. The fragmented models were modeled with topology and split logic in mind to ensure the independence of fragment movement and the natural transition of the reorganization process. The project plan is to assign 10 character modelers to work for 5 months with a monthly salary of 30,000 RMB. The cost is $10 \times 3 \times 5 = 1.5$ million RMB.

4.2.2 Texturing

The main tasks of the texturing department are: Nezha character materials, scene materials, and special effects materials.

However, the Heart-Piercing Spell segment texturing department needs to frequently cooperate with the special effects department to do some special things, such as the surface material of the meat pieces, the material of the thorns of the

Heart-Piercing Spell, and the material of the skin cracks when Nezha is torn apart, etc. Therefore, the project plan is to arrange three special effects staff to work on the texturing department. Therefore, the project plan is to have 3 special effects texture artists.



Figure 1: The material drawing of Nezha's torn skin

The surface of the splinter uses Subsurface Scattering (SSS) technology to enhance the texture of the flesh and blood, showing the wet and realistic effect after tearing. The cracks in Nezha's skin also needed to be drawn when he was torn apart by the Heart-Piercing Spell. The hundreds of Heart-Piercing Spell thorns on Ne Zha's body also needed to simulate the reflection of light between the thorns. In the documentary, the staff talked about this approach, which was inspired by the broken glass used in burglary prevention. 8-member material team (3 character materialists, 2 scene materialists, and 3 special effects materialists) worked for 4 months, with a monthly salary of 40,000 RMB. The cost is $8 \times 4 \times 40,000 = 1.28$ million yuan.

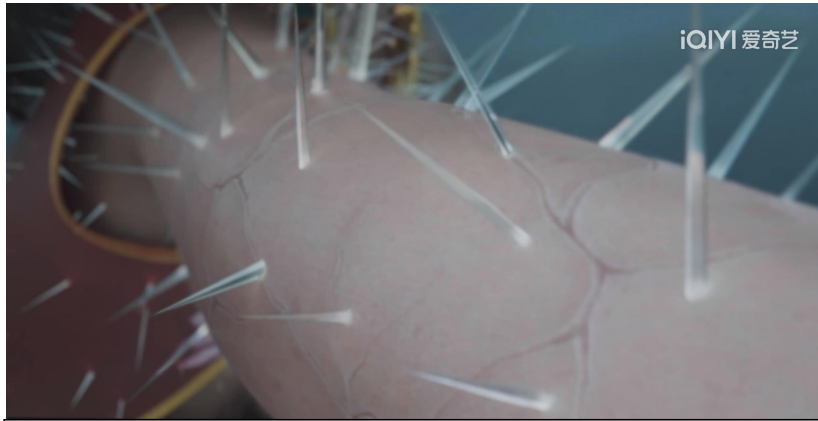


Figure 2: The material manufacturing process of the needles



Figure 3: Refraction treatment between needles

4.2.3 Rigging/Setup

The main work of the Rigging department was to bind characters from different periods in Nezha's history, binding about 600 pieces and presetting various states of motion, such as standing still, flying apart, and reorganizing. The hair and fabric are also bound by a dynamics system that allows for natural response and interaction during the tearing and reorganization process. The project plan is to have 5 skeleton binders working for 5 months with a monthly salary of 30,000 RMB.

The cost is $5 \times 3 \times 5 = 750,000$ RMB.

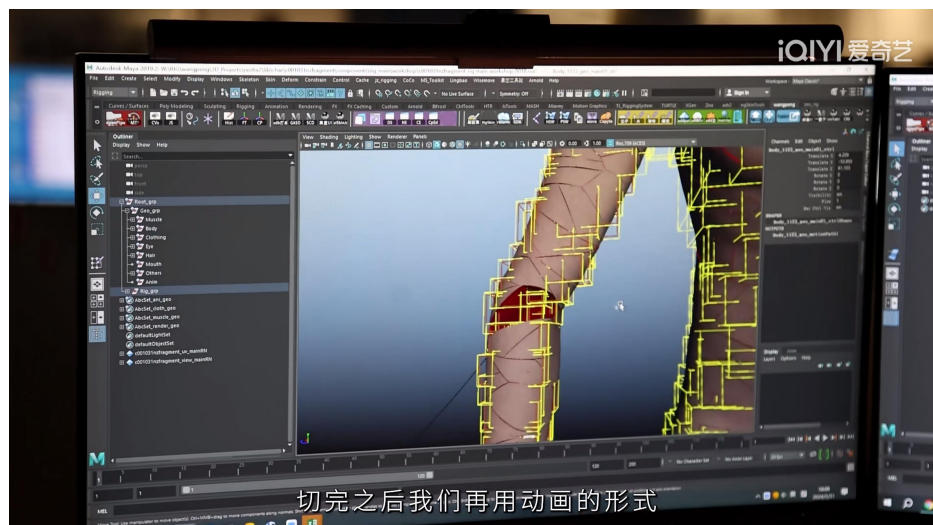


Figure 4: The rigging of over 600 body fragments

4.2.4 Animation

The animation department is responsible for creating keyframe animation for Nezha's movements and related special effects. The animators manually adjusted the dynamics of the thousands of thorns, as well as Nezha's pained expressions and body contortions, frame by frame.

The director of *Ne Zha 2* repeatedly emphasized aesthetics. He wanted the torn pieces of Ne Zha's body to come back together after he broke the Heart-Piercing Spell, but with regularity and beauty. The team therefore abandoned the natural solution of special effects to ensure the ornamental and mechanical rationality of the fragments' flying apart dynamics. The animators manually set K-frames for each of the 600 fragments, and optimized the overall and individual fragments'

motion states at key points.

At the moment of tearing, kinetic simulation was introduced to the fabric, flesh and fragments to significantly enhance the realism and visual impact of the tearing and impact. After the binding department finished this piece of work, the animation began to produce keyframes, only the character movement keyframes are more than 2000, the dynamic keyframes of the stabbing is up to more than 5000.

Therefore, the arrangement of 15 people animator team to work for 6 months, a monthly salary of 40,000 yuan. The cost is $15 \times 4 \times 6 = 3.6$ million yuan.

4.2.5 3D Visual Effects

This is the most important process of the Heart-Piercing Spell segment, which determines whether or not the picture can be effective. There are three main segments, Dynamics Simulation, Fluid and Particle Effects, which can be divided into two different categories.

Dynamics simulation mainly realizes the real physical effects when flesh is torn and stabbed through the body, such as flesh splatter trajectory, fabric tearing pattern, and so on. Need to solve a large number of collision calculations between the broken flesh and the character model, thorns, to prevent the occurrence of wear mold, unnatural movement and other issues. The project plan is for 15 dynamics

engineers to work for 5 months, with a monthly salary of 80,000 RMB. The cost is $10 \times 8 \times 5 = 4$ million RMB.

Particle special effects mainly produce visual effects such as flesh fragments, spell light, energy fluctuations, fluid simulation, air distortion, etc., controlling the process of particle generation, movement, and extinction. The tearing process of Nezha required the use of the Houdini fluid system to simulate the blood splattering and debris trailing from Nezha's body after being torn apart, along with smoke effects to further enhance the impact and aesthetics of the tearing scene.

The flame effects after the rebirth simulate the reorganization of the flame from the outside to the inside, and the combination of the Shader and particle systems effectively shows the delicate changes in the flame's energy flow and light and shadow interactions. It is expected to use a 15-person special effects team (10 particle effects artists, 4 special effects compositors, 1 technical support) to work for 6 months, with a monthly salary of 50,000 RMB. The cost is $15 \times 5 \times 6 = 4.5$ million RMB.



Figure 5: The production process of fluid VFX



Figure 6: Flame VFX

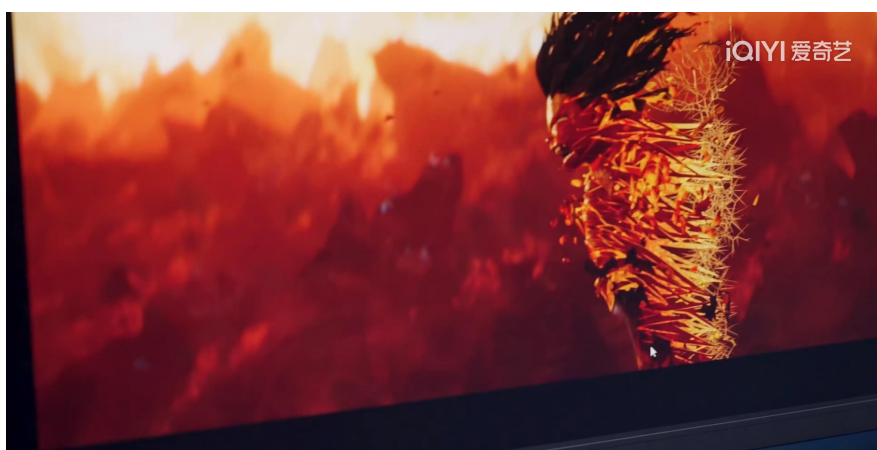


Figure 7: Tailing VFX

4.2.6 Lighting/Rendering

The work of the lighting technician includes the production of special effect lighting, such as the flash and shadow changes when spells are activated, as well as the regular construction of environmental lighting. Through fine three-dimensional lighting arrangement and global lighting adjustment, the spatial hierarchy of thorns, debris and flames is emphasized, while the light and shadow effects enhance the tension and impact of the screen, and the environmental effects create a real battle atmosphere. It is expected to arrange a team of 10 people (6 light and shadow special effects artists, 3 environment special effects artists, 1 special effects director) to work for 5 months, with a monthly salary of 50,000 yuan. Cost: $10 \times 5 \times 5 = 2.5$ million dollars.

Rendering stage, due to the rich details of the screen, special effects complexity, single-frame rendering time up to 30 minutes or more, the need for a large number of servers parallel computing, mainly relying on the output of high-performance rendering farms, the single-frame rendering time and resource consumption is far more than the conventional clips, to ensure that the final picture of the accuracy and texture. The plan is to call 300 servers for rendering, the rendering time is 2 months (60 days), and the daily cost of each server is 800 yuan. The cost is $300 \times 800 \times 60 = 14.4$ million RMB.

4.3 Post-production

This part can be coordinated in one department. Planned components of the 8-person compositing team (5 compositors, 2 colorists, 1 compositing director) work for 2 months, the monthly salary of 40,000 yuan, plus the cost of professional compositing software licenses, such as 500,000 yuan. The cost is: $8 \times 4 \times 2 + 50 = 1.14$ million yuan.

4.3.1 Compositing

The main function is to integrate all kinds of materials (spikes, fragments, fluids, flames and backgrounds) in the compositing stage, and to improve the overall unity and visual depth of the picture through light and shadow adjustments, color correction and depth of field optimization.

4.3.2 2D Visual Effects / Motion Graphics

On the basis of synthesis, add 2D effects such as spell surroundings, flame particles, dust and light spots to further enrich the details and dynamic expression of the picture.

4.3.3 Rotoscoping & Colour Correction

Some of the special shots are keyed and background replacement techniques are used to enhance the visual effect. The color correction stage unifies the tones of the three stages of fragmentation, restructuring and sublimation to achieve the transition of warmth and coolness as well as the progression of emotions.

4.3.4 Final Output

After the compositing is completed, the footage is output in HD format and submitted to the director and production team for final review to ensure that the visual effects meet the expected artistic and technical standards.



Figure 8: 2D visual effect of the scene



Figure 9: 2D visual effect of Ne Zha

4.4 Gantt Chart Production

According to the above process, I organized the Gantt charts.

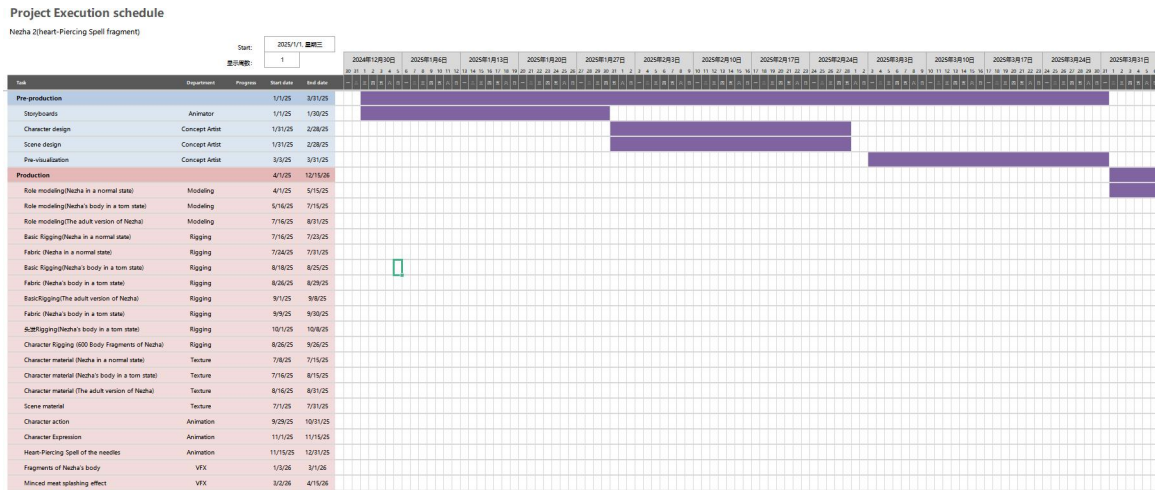


Figure 10: A detailed project division table in Gantt chart form (only part is shown here; the complete Moodles can be seen)

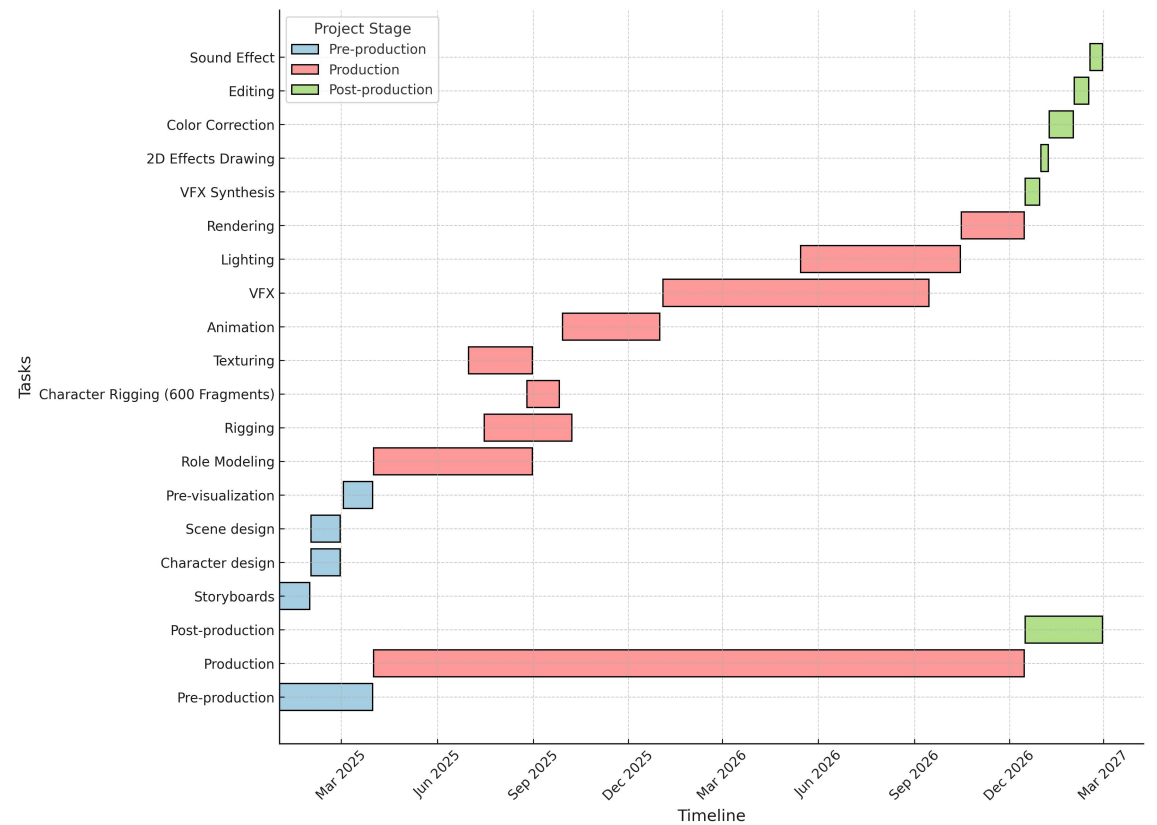


Figure 11: Gantt Chart summary version

In summary, the production process of “Heart-Piercing Spell” fully reflects the high degree of integration of artistic creativity and technical realization in contemporary animation production. From the early conceptualization to the post-production output, each link is interlocked and synergistic. Through high-precision modeling, complex binding, handmade K-frame animation, dynamic special effects simulation, and high-standard rendering and compositing, the team successfully shaped the key clip with both narrative tension and visual aesthetics, demonstrating the continuous breakthrough and improvement of China's 3D animation industry in terms of technological craftsmanship and aesthetics performance.

5 Conclusion

The production process for the Heart-Piercing Spell sequence in *Nezha 2* was extremely complex, involving the collaborative work of multiple departments and labor types. The role of the project leader in the production process of this clip is crucial, and is mainly reflected in the following three aspects:

- ① Define technical standards and milestones to ensure the smooth connection of each link and avoid duplication of labor and rework.
- ② Scientific dismantling of tasks and deployment of manpower, effectively alleviating the manpower bottleneck in manual K-frame and high-intensity special effects production.
- ③ Dynamically control the budget and schedule, and reasonably utilize resources

to ensure the optimal balance of cost and time under the premise of ensuring the quality of the film.

The case of *Nezha 2 Heart-Piercing Spell* demonstrates the comprehensive coordination ability of the project leader in technical animation segments, and is a typical sample of high-complexity animation project management practice with high industry reference value.

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