

Technical Design and Production of Special Effects in Musical Theatre Performances

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Abstract

In contrast to the other theatre form, which requires a more predominately dominant combination of acting, singing, music, and choreography, a musical theatre performance is a sophisticated piece of art. Similarly, paying greater attention to the technical special effects design is essential, especially throughout its production process. In order to clarify their requirements and design objectives, this study explores the features of the technical special effects used in the selected case studies. The result shows how well the entire musical theatre production includes customisation requirements and solutions in developing the technical design of special effects production.

Keywords: Scenography, Stage Design, Stage Effects, Technical Theatre

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Nomenclature:

TDPSE	Technical Design and Production of Special Effects
ATM	Aladdin the Musical
PGLM	Puteri Gunung Ledang the Musical
CTM	Cats the Musical

1.0 Introduction

A theatre production is a live performance of a play or musical in a theatre or a similar venue. A theatre production also refers to creating and staging a theatrical performance for an audience. This process involves several stages, including script development, casting, rehearsals, set design, costume design, lighting design, sound design, and stage and production management. It involves collaborating with many creative and technical staff members, including actors, directors, designers, technicians, stage managers and administrators.

In a theatre production design process, there are two areas of interdisciplinary design, including artistic design and technical design or so-called scenography. The technical design and design of creative art consist of two different approaches. Artistic design involves all visual elements of theatrical arts, such as set, lighting, sound sets, costumes and makeup, which involves the initial steps of conceptualisation and production until execution. According to Ramsey (2007), whether the set is complicated or straightforward, familiar or novel, the designer has to create a virtual environment that will remind the audience who the players are and where they are supposed to be. Design can communicate to the audience the spirit and soul of the play. (pg. 212).

Meanwhile, technical designs involve engineering mechanisms such as construction and installation, electrical and electronic, and civil and mechanical engineering. All elements are incorporated into equipment or inventory for any technical solution. For instance, a scene situation that involves the special effects of rain. Regarding the technical solution of a special rain effect, the designers must think of precise ideas and techniques involving mechanical elements of motor, hydraulic or technology. Technical designers determine all proposals and selection techniques in achieving the goal of an idea. They were similarly stated by Holloway (2014) that "scenery is built in parts, or units, that are later assembled in a theatre. The scenery must often be moved during a show, either hand-carried, rolled, or flown out on a rigging system. Moving the scenery around puts extra stress on its structure, which must be considered when the units are engineered" (pg. 112).

The technical design of special effects is a relatively new field in Malaysia that is less well-known than other industrial sectors (such as business, medicine, architecture, and others). Hence, looking at the writing sources also demonstrates that the writing on the technical design of the theatre's special effects has not been applied consistently and widely.

Musical theatre productions require a complex, technologically advanced, and sturdy structure. Malaysia, in contrast, solely uses minimal equipment (simple equipment utilisation). Although the musical theatre genre necessitates a more sophisticated technical

theatre, most theatre shows in Malaysia merely utilise the hall, the auditorium, and other spaces (using newer, sophisticated and technical equipment). Istana Budaya, on the other hand, has stage facilities designed for theatrical performances, including the availability of cutting-edge technology, the physical construction of the buildings, and the main stage in Panggung Sari, which is shaped like a proscenium. According to Najiffaizal Mohd Tawel (Personal interview, October 5, 2015), most plays in Kuala Lumpur, a city known for its theatre, nevertheless lack the ideal base facilities or entire technology infrastructure for a stage.

Most large-scale musical theatre productions require the use of stage technology, such as stage lifts, side waggons, portal bridges, side stage equalisers, rear waggons, flying bars, or cycloramas, as demonstrated by these three case study research materials, 'Aladdin the Musical' (ATM), 'Puteri Gunung Ledang the Musical' (PGLM), and 'Cats the Musical' (CTM). Stage usage is also ideal for the musical genre because musical production requires full-scale space utilisation, including play space, wing room, apron space, backstage space, and loading bay.

Technical theatrical designs receive less attention or competence in Malaysia. The currently used are purely self-taught, like developing skills while producing stuff. The area of technical theatre design is not covered in a formal, extensive study in the educational system. In Malaysia, particularly at Istana Budaya, no professional or discerning expert is more knowledgeable about the technical aspects of theatre design. (Najiffaizal Mohd Tawel, personal interview, October 5, 2015) also claims that "the expertise or technical skills of the Theatre arts are still at an unfamiliar level with foreign countries like Hong Kong or western countries that are far superior to producing specialists in technical stage and theatre art". Some productions under study also use self-taught practices throughout the manufacturing and creation period. Other issues concerning musical theatre productions in Istana Budaya, including a massive budget scale, concept and storytelling allocation, are highly dependent on technical expertise.

The Istana Budaya stage technical system must thus be investigated by the scale of the idea and the notion of a vast scale to gain the efficacy of technical production of special effects. The notion of a musical theatre production typically uses Istana Budaya stage technology. However, the issue began to surface when a small group was chosen to perform a musical theatre production in Panggung Sari, Istana Budaya. Moreover, the Istana Budaya theatre does not exclusively host musical productions in Malaysia. In actuality, certain stages are constructed without the use of cutting-edge technology. The absence of technology infrastructure makes it difficult for designers to produce the sound technical design. Adopting more specialised designs still struggles due to a lack of written guides and knowledge of theatrical technical disciplines. Another significant problem with digital technology is that more damage can be done if technical issues arise. A digital understanding of design and its technology is necessary (Ali et al., 2023).

Therefore, studying the process of developing technical special effects is crucial for ensuring the efficacy of musical performances. In order to analyse technical special effects features and applications, this research focuses on requirement materials and techniques

of special effects execution. According to research by Hashim et al. (2019), any thoughts and innovations in special effects technology need to stand out in terms of their impact, design concepts, utilisation ideas, material selection, size and physical construction, specification, functionality, and ability to add to the stage's awe.

To accomplish the objectives of the study data collection, we focus on a few works of literature and methodological potentials and then examine the results. Special effects technical design is a relatively recent area of study that can help and offer opportunities or encouragement to the next generation in the technical sector of theatre. Engineering and theatre are two separate disciplines. In order to realise spectacular musical theatre performances, both disciplines depend on one another. A study that requires more investigation, particularly about the technical facets of the mechanism, is Technical Design and Production of Special Effects (TDPSE) in Musical Theatre Performances in three featured musicals that performed at Istana Budaya.

2.0 Literature Review

Generally, the technical designs should be incorporated into several design processes, such as pre-planning, design meetings, rehearsals, technical drafting, model creation, production, and execution. Theatre performances should be included in the design process, especially for the technical stage, where engineering and technology are necessary. The design process is a crucial step in creating the efficiency of technical special effects, making the public feel comfortable and the production team alone (Hashim, Zulkepli & Abd Rahman, 2020). According to Hanson (1987), unlike engineers, writers, painters, and filmmakers are not constrained by the physical truths of the world. Engineering design is the most challenging form of creative expression (p. 5). The engineering design and creative art must also take specific safety considerations in its manufacturing brief.

Throughout this design process, the idea of creation must include several experts. The collaborative work of all creative and production teams is needed. According to Krilova (2020), the use of sound, new technical tools, 3D technology, and its interdisciplinary materials like sound, light, colour, word, and plastic is the responsibility of composers and designers and engineers when creating musical and theatrical works. Similarly, Vincent (2021) suggests that the employment of digital scenography in practice and the ensuing effects on the creative organisation, production design processes, and organisational management are identified as having several vital linkages. Creating a comprehensive design requires study, several verification sessions, and a robust and intact end product. Lauer and Pentak (2008) assert that design has a more expansive definition than only the immediately apparent business uses. Designing entails planning and organising (p.4).

Besides, materials and techniques play an essential role in unique effect creation. Materials and techniques could be tools for generating ideas and supporting a musical performance. For instance, stage lighting can promote sustainability and how technical design can stop viewing sustainability as a constraint and start embracing it as an inspiration by using an eco-creative approach. (Pringle, 2021) Despite this, digital

technology and theatre performance must be acknowledged as a cultural product within one of the art paradigms. (Portnova, 2020).

In exploring space in scenography, Česálková & Svatoová (2020) in Svoboda, the *Laterna Magikas'* experimental space, intrigued by the influence of film and television on his stage design, as well as by his experiments with and innovations in lighting and stage kinetics, which produced virtuality and immersion and reformulated the idea of the stage as a screen. Some multi-disciplinary ideas, techniques and approaches are required to produce a good production of technical design. For instance, hybrid practice is promoted by the development and expansion of the media and consequently of the approaches, claim Michael et al. (2020). Several strategies are applied in the hybrid form, which also challenges existing styles or merges with modern technologies to produce an outstanding result. The use of technology is unquestionably present in the fabrication of various musical theatres' technical special effects, as some of these effects use contemporary or technological designs.

Nonetheless, some manual techniques or processes develop special effects' technical designs. It refers to a technical creation whose operation excludes the use of technology. (Hashim et al., 2022).

The production of a technical design requires the implementation of several stages of preparation or initial planning from various angles and forms, such as materiality of ideas, technique, discussions and references. Consequently, specific technical guidelines and design principles are expected to lead to the development of technical designs. These elements will be analysed and discussed further in the next section of this paper.

3.0 Methodology

Data processing for interpretative techniques is gathered through participant observation, interviewing, and document analysis. The qualitative technique is the primary option for gathering significant amounts of data. Yin (2018) suggested that six forms of evidence, including documentation, archival records, interviews, direct observations, participant observations, and physical artefacts, can be utilised in case study research. The case study of three musical theatre performances, including *'Aladdin the Musical'* (2007), *'Puteri Gunung Ledang the Musical'* (2006), and *'Cats the Musical'* (2002) in Panggung Sari, Istana Budaya, Kuala Lumpur, Malaysia, is used to illustrate the qualitative approach. In order to coordinate the process of describing the use of TDPSE in all three performances, the reading and data research findings were compiled using Participant-Observation, Interviews and Document Reviews.

3.1 Participant-Observation

Participant-Observation of the stage location is carried out to obtain details on stage features, stage facilities, motor and mechanical systems at the bottom and on stage, concept stage technology, stage operating system and structure, production design

procedures and processes. In contrast, Participant-Observation methods in production were carried out to see the collection of technical sets that contain special effects.

3.2 Interviews

The theatre production team and individuals with high potential in contributing study data were interviewed, including directors, scriptwriters, designers, artistic directors and technical directors.

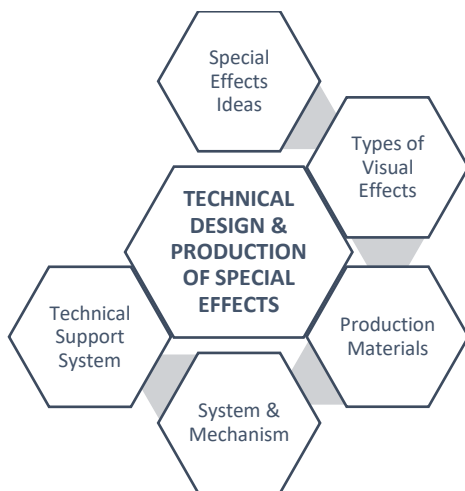
3.3 Document Reviews

Related documents collected and reviewed for data contribution include technical drawings, Pangung Sari plans, tools manual, illustration drawings, box models (replicas of small stage designs), sketches, drawings set construction expenses and props, prompt book and program books.

4.0 Results

Pre-production (preparation), production (during the performance), and post-production (after the performance) are the three primary stages of the theatre production process. No exception is made for the TDPSE during any of the pre-production stages. As shown in Figure 1, a unique approach to developing technical design approaches involves a crucial pre-processing step that involves a technical ideological perspective on the organisation of the mechanisms and the construction techniques of production.

Figure 1: Technical Design and Production Process of Special Effects



(Source: Authors, 2023)

Table 1: Technical Design and Production for 'Aladdin the Musical'

Special Effects Ideas	Types of Visual Effects	Production Materials	System & Mechanism	Technical Support System
Flying Carpet	Flying, Floating, Sliding, Cruising	Plywood Platform, Runway Steel Structure, Caster, Backdrop	Runway/Roller Coaster	LCD Image Display, Lighting, Sound & Music.
Genie and Magic Lamp	2D & 3D Image Displaying	Frame Structure, Surface image display, Steel Cable (Flying Bar Frame)	Holography & Projection	Stage Machinery/Flying Bar, LCD Projector, Lighting Sound & Music.
Wizard's Crescent Moon	Rotation of Object	Bearings, Sprockets, Paddle, Steel Frame Structure, Holders, Handle Stopper and Locks.	Chain-cycle	Stage Machinery/Flying Bar, Lighting Sound & Music.
Magic Gate of Wizard's Cave	Collapsing Structures, Storms, Floods, Earthquakes and Explosions.	Set Structure of the Set, Hinges, Steel Cables, Weights, Holders, Handle, Stopper and Locks and Mounting Keys.	Structure and Hanging Locks	Backdrop LCD Projector, Lighting Sound & Music and Pyro-type "Engine Smoke" Explosion

(Source: Authors, 2023)

Table 2: Technical Design and Production for 'Puteri Gunung Ledang the Musical

Special Effects Ideas	Types of Visual Effects	Production Materials	System & Mechanism	Technical Support System
Gunung Ledang	Mobility & Suggestive Set Transformation, Diverse Range Column	Plywood & Steel Structure, Caster	Wheeled / Pushing Structure	Stage Machinery/Flying Bar & Stage Lift, LCD Image Display, Lighting, Sound & Music.
Gunung Ledang Waterfalls	Waterfalls, Beaches, Waves, Floods, Mud	Set Steel Structure, Lightweight and Thin Colour Fabrics, Size-Filled and Over-the-Shelf.	Fabric Overflow using Manpower	Stage Machinery/Flying Bar & Stage Lift, LCD Image Display, Lighting, Sound & Music.
Panisi Ships	Cruising, Moving Cliffs, Whales, Fallen Trees, Rolling Stones.	Plywood & Steel Structure, Caster, Modified Car Body Parts (Punched Floor, Accessories and Engine Removed)	Manpower Technical for Pushing and Pulling	Stage Lighting, Sound & Music.
Java Seas	Waterfalls, Soft and Wavy Beaches, Floods, Mud, Seas	Lightweight and Thin Colour Fabrics, Size-Filled and Over-the-Shelf.	Fabric Spread using Manpower	Stage Flying Bar & Stage Lift, LCD Image Display, Lighting, Sound & Music.

(Source: Authors, 2023)

Each of the ten [10] special effects specifications, including the production of the technical design process, has been carefully coordinated individually. The alignment of data is necessary for comparisons of special effects technology, which is challenging. This technical comparison for a special effect helps to create a special technical effect that can provide awe, originality, identity, surprise, and a technical fix to a fictional concept.

In order to compare the data in a clear and precise manner, the specifics of all ten special effects ideas are compiled in a table by order. The information in the table includes a separation of specifications on technical special effects, concepts, design features, materials and functions, processes, techniques, picture effects, application of element support facilities, and specifications on technical design impact.

Data comparisons can be altered within the data analysis and subsequent interpretations, in addition to providing a concise and orderly summary of the information. For all three productions (Table 1, Table 2 and Table 3), the following is a complete description of the technical design solutions of special effects for each of the three musicals:

Table 3: Technical Design and Production for 'Cats the Musical

Special Effects Ideas	Types of Visual Effects	Production Materials	System & Mechanism	Technical Support System
Floating Tires	Flying, Lifting, Falling	Hydraulic Cylinder, Steel Trapped Door Structure, Tires	Hydraulic System, Electrics, Stage Trap	Haze Machine, Stage Machinery/Flying Bar & Stage Lift, Lighting, Sound & Music.
Magical Transformation of Mr Mistoffeeles	Flying, Floating, Hanging, Bouncing, Dropping Off	Harness, Safety Cables, Hanger Clips, Ballast, Stopper, Pulley, Monitor Console, Switch Panel and Tracked Harness	Power Source, Harness Machines	Haze Machine, Stage Machinery/Flying Bar & Stage Lift, Lighting, Sound & Music.

(Source: Authors, 2023)

The analysis of the study also prompted a study of the importance of musicality in the technical planning of the production of special effects. A technical analysis of each particular effect was done to determine how well it fit the musical theatre genre. In order to determine the significance of the technical design of the special effects in a musical theatre production, an analysis of the technical impact of the special effects was also conducted. All technical designs have aided the idea's realisation and enhanced the designers' and directors' creativity. Using all technical designs demonstrates that inventive concepts impractical for theatrical performance can nonetheless be accomplished.

Nevertheless, despite their different technical designs, security systems are a significant guide in all three productions. When the rules and execution strategies for each specific design characteristic are more thoroughly described, this becomes clearer.

Samples of every round with a technical special effect have been flawlessly executed without error or mistake.

Safety precautions are implemented early, particularly before being matched at the acting stage. Also, it is believed that discussion and planning occur before the implementation phase. Before proving safe and valuable for usage, all technical design items were tested by all three designers (Napier, Fairuz Ariffin, and Raja Malek).

The three productions have parallels and contrast in the characteristic technical effects. It has been demonstrated that there are parallels and differences among all technical effects through processes involving data gathering, analysis, and interpretation of case studies. The technical direction, text composition, technicality of the stage, and support technical support in implementing a particular technical effect in production are recognised as the features of similarities and contrasts. All three have similarities regarding the textual elaboration on demand for special effects design. There are passages in each of the three texts that provide background information, scene atmosphere, magical components, or the use of transportation, all of which should be creatively depicted on stage. For instance, the need for flying magical action was evident in the 'Aladdin the Musical production. The production of 'PGLM' also desires a waterfall at Mount Ledang. While 'CTM' screenplay text calls for a mystical component in the scenario. The text authoring for all three items is identical. It lays out the technical criteria for special effects to increase the appeal and appreciation for action and acting and to deliver the message coherently.

Similarly, the technique of directing, which illustrates the equation of the three musical theatre productions, is used. All three directors use musically oriented driving styles in their different productions, with effective acting replaced by a concentration on singing, dancing, and other musical elements. Also, the fantasy theme predominated in the offers, particularly for the 'ATM' and 'CTM' productions. Contrary to the reality arena, where technical design of special effects production is needed as the ultimate solution, the fantasy elements have required that production designers expose the background, mystical, and ambience.

Other technical support components like lighting and audio contributed to the striking visual impact and the distinctive earning effects used in the three productions. In addition to lighting the corridor and adding background noise, the supporting components give the involved objects mood, emotion, message, and character. All three productions have embraced the supporting component in the presentation and developing special effects. For instance, the Wizard's Gate Cave special effects, the Gunung Ledang Waterfall special effects, and the special effects of the floating tires demonstrate original, innovative lighting and focussing approaches to enhance special effects in terms of characterisation, atmosphere, and feeling across the three performances. There are particular distinctions in methods and designs, the use of energy resources, the purposes of the designs, and the presentation of concepts that show different approaches to creating special effects, particularly for musical theatre. Each of the three uses a different approach and has a unique concept for creating extraordinary effects, yet they all share the same design criteria. For instance, the term 'technical design' is used to describe a variety of technical kiddie games, such as roller coasters and bicycle rides, in the 'ATM'. The traditional idea

of using human resources best is highlighted in 'PGLM'. The 'CTM' is where the technical design of the technology, which includes electrical components, motors, and machines in the design, is highlighted. All three productions demonstrate various design approaches to attain the distinctiveness, one-of-a-kindness, and appreciation necessary for the musical theatre subgenre. The 'CTM' performance is a western production with a technologically advanced design. As a cost-saving approach and to ensure the same high standard of special effects creation, the production team coordinates the movement of mechanical items from London for usage in the performance in Malaysia, as opposed to Malaysian manufacturing, which uses an individual inventor approach. Because technical records are not kept for future use, every production in Malaysia always results in a fresh creation. The production of both Malaysian theatres is likewise not exempt from the development of personalised inventory.

The stage also influences aspects of the final technical design. All three productions have benefited from Pangung Sari, which has advanced stage technology, notably in terms of technical design overview. A few special effects also use stage technology resources that are not accessible on other platforms in the Kuala Lumpur area. As an illustration, consider the holographic displays used in the special effects of Genie and the Magic Lamp, the technological fabric discharge strips used in the special effects of Sea of Java, and the stage lift used in the special effects of Magical Floating Tires.

Various ideas and approaches can be used to accomplish the primary goals of creating one's special effects, depending on the similarities and differences affecting all the technical impacts of the effects. Any technical design published in a design must adhere to the design specifications (as shown in the result section).

6.0 Conclusion

In conclusion, the TDPSE developed for musical theatre has a set of objectives and requirements while being constructed in small proportions. Nonetheless, the design elements undoubtedly greatly influence a scene or action. The technical concepts created to give the element of spectacle to the show were included in the three musical theatre performances, 'ATM', 'PGLM', and 'CTM'. The TDPSE unquestionably enhances the dramatic action in musical theatre plays and adds to the story's dynamics. Every design has the specifications and the creation method for every special effect technology. Innovative and creative methods highlight the distinctive qualities of technological and technical design creation. In ensuring special effect design's success, admiration-inspiring impacts are crucial. Furthermore, the study could be valuable in expanding the potential of future research in the creative industry. Expanding a theory or practice in a new art and design context, location, or culture would be helpful from this study.

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Article Contribution to Related Field of Study

This study aims to examine the creation requirements and technical design functions. The technical design parameters used to create the special effects are referred to as the specification. The goal of such special effects is also known as their function. The effectiveness and suitability of the musical theatre production are examined in both sections. Thus, this study indicates the critical elements that must be highlighted as a directive in the theatrical design process and technological resolve in future productions. Furthermore, the actual outcome is helpful as a reference to benefit set designers, performance designers, scenographers, practitioners, and students in creating concepts, conducting research, and cooperating in the theatre, film, entertainment, or other related creative industry fields, even in daily praxis for an individual, the general public, or a community. The study will also enhance the possibility for future theoretical and applied research in the technical design concept, process, and application.

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