

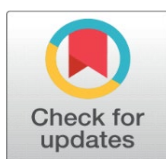
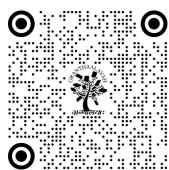


# ASSESSING AUDIENCE RESPONSE TOWARDS COLORIZATION OF ICONIC BLACK-AND-WHITE BOLLYWOOD FILMS

Tanmay Samanta <sup>1</sup>  

<sup>1</sup> Faculty Member, St. Xavier's University, Kolkata, and Research Scholar, Parul University, Vadodara, Gujarat, India



Received 14 July 2023  
Accepted 24 November 2023  
Published 01 December 2023

## Corresponding Author

Tanmay Samanta,  
[bandhutanmey@gmail.com](mailto:bandhutanmey@gmail.com)

DOI  
[10.29121/shodhkosh.v4.i2.2023.608](https://doi.org/10.29121/shodhkosh.v4.i2.2023.608)

**Funding:** This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

**Copyright:** © 2023 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.



## ABSTRACT

In cinema, colors have significance on various levels, including the physical, psychological, and aesthetic. But adding color to black-and-white films so that they appear realistic to the majority of human observers was a significant challenge for the film industry in the 1980s, as it was a very difficult and time-consuming process. However, with the advancement of artificial intelligence and technical developments, the process of colorization has improved, which makes it possible to turn black-and-white films into vivid experiences in a matter of hours. Colorization performs by transferring out the luminance or scalar value, stored in each pixel of a B&W image to a three-dimensional color space.

The objective of this research is to assess the reception of colorized versions of iconic black-and-white Bollywood films by contemporary audiences, particularly the younger generation. By employing a mixed methods approach that combines both qualitative and quantitative techniques, we explore whether the introduction of color through digital technology and recent artificial intelligence motivates the new generation to engage with these venerable classics.

As case studies, five well-known Bollywood movies from various genres—Mughal-e-Azam (1960), Shree 420 (1955), Naya Daur (1957), Kala Pani (1958), and Dil Tera Deewana (1983)—were chosen. Short video montages featuring scenes from both the colorized and original black-and-white versions of these films were presented to undergraduate and postgraduate students at a university. Nonprobability purposive sampling was used to acquire the data, and a mixed-methods strategy was used to analyze it. The results show that colorization has a substantial effect on younger viewers, who have a greater desire to see these movies in color. This study highlights the evolving importance of colorization in preserving classic cinema and reviving its appeal to modern audiences. Although not devoid of controversies, the process of colorization has emerged as a means to bridge the generational gap in the appreciation of cinematic legacy.

**Keywords:** Film Colorization, Recreation of Black and White Films, Modernize Old Movies, Digital Image Processing, Artificial Neural Networks

## 1. INTRODUCTION

Cinema, as an art form, has endured for many years and throughout many cultures. Among its many changes, transforming from black-and-white to color film has left an indelible mark on the cinematic landscape. The implication of color to black and white images may improve their visual appeal, increase their data density, and elicit an emotional reaction. Chroma and brightness fluctuations may also increase the information richness of certain photographs. Colorization has become a catchall phrase for the practice of introducing color to previously black-and-white photographs or motion pictures [Li et al. \(2015\)](#). This transition has special significance in Bollywood, the vibrant and diverse world of Indian cinema.

Black-and-white Bollywood classics are still revered for their timeless storytelling and charismatic leads decades after their first release. However, as technology progresses, a key dilemma arises: should these masterpieces stay in monochrome, or should they embrace the vibrant colors of current cinema? When old Bollywood movies were remade in color, how did younger generations react to them? Does the quality of these colorization procedures meet your expectations and improve your movie-watching experience? In this endeavor, the researcher presents an exhaustive study that attempts to address the fundamental questions.

In the 1980s, colorizing B&W movies was a significant topic of discussion. It's true that color photographs may improve visual impact; however, the significance of colorization as an aesthetic choice is debated [Chen et al. \(2018\)](#). Rich colors not only communicate more information but also improve the visual experience for humans, which plays a crucial part in the human cognitive process as it relates to the external environment [Chen \(2022\)](#). Coloring algorithms for grayscale images convert a black-and-white photo into one with more realistic colors. Maintaining the picture's natural aesthetic appeal when adding color to grayscale pixels is a crucial but difficult issue. Images may be made more appealing to the eye by being "colorized" or given appropriate chroma values. That is, values for the three primary colors (RGB) are allocated to each grayscale pixel. Grayscale pictures, in contrast to RGB color images, are made entirely of intensity values [Titus \(2018\)](#).

In addition to the filmmakers' preference for black-and-white imagery, many early B&W films suffered from a lack of adequate camera technology. Coloring in a black-and-white film may be both a nostalgic and creative experience [Chen et al. \(2018\)](#). Thus, the purpose of this research is to determine how much the new generation is willing to accept the adaptation of color in classic black-and-white movies. There are several layers of meaning attached to colors in film. There's the material aspect first, in that a person's emotional state may be affected by how they see a certain color. Second, color has an effect on how we feel, and third, it has aesthetic value [Costa \(2011\)](#). This article will focus on these three aspects of color while discussing the function of color in motion pictures.

Early colorization research was primarily concerned with creating strategies to increase colorization quality. During the last several years, scientists have expanded their emphasis to include colorization alongside natural language processing (NLP) and industrial applications [Chen \(2022\)](#). But the field of social studies offers two more topics for discussion. The first is the "upgrade" in realism that color provides. Second, color may go beyond what we see, freeing itself from the limitations of traditional color schemes. This freedom allows for a wider variety of approaches to communicating complex ideas and feelings [Costa \(2011\)](#). As we navigate the cinematic odyssey, our primary objective is to assess the audience response towards the colorization of these iconic black-and-white Bollywood films. To accomplish this aim, we conduct an investigation using both qualitative and quantitative approaches. By conducting surveys and analyzing the results, we are able to piece together the complex tapestry of audience tastes and the effect of colorization on cinematic history. Along the way, we'll see how color can have a profound impact on a tale and how different audiences respond in different ways.

For this purpose, five films from five distinct genres have been selected, each of which has been colorized using a different method, resulting in different color quality. List of these films are following:

**Table 1**

Table 1 List of Films, Released Year, Genres, Directors and Casts				
Film Name	Year	Genres	Director	Stars
Mughal-e-Azam	1960	Historical Drama	K. Asif	Dilip Kumar, Madhubala, Prithviraj Kapoor, Nigar Sultana
Shree 420	1955	Comedy-Drama	Raj Kapoor	Raj Kapoor, Nargis Dutt, Nadira
Naya Daur	1957	Social Drama	B. R. Chopra	Dilip Kumar, Vyjayantimala
Kala Pani	1958	Crime Thriller	Raj Khosla	Dev Anand, Madhubala
Dil Tera Deewana	1962	Romantic Comedy	B. Ramakrishnaiah Panthulu	Shammi Kapoor, Mala Sinha, Mehmood

K. Asif, the director of 'Mughal-e-Azam' wished to reshoot all of Mughal-e-Azam in Technicolor when it became widely accessible in India. His investors, however, rejected his proposal. Asif compromised by coloring in a few key sequences, most notably the stunning Sheesh Mahal section. The entirety of Mughal-e-Azam was retroactively "colorized," and the print was restored for a fresh publication in 2004 [Tunzelmann \(2013\)](#). In order to add color to the film Mughal-e-Azam, the Indian Academy of Arts and Animation used specialized software. Deepesh Salgia has elaborated on the colorization process, method, and technique in his article. He claims that the intention of the colorization was to simulate the film's original color shooting to better understand how Mughal-e-Azam would have looked. Therefore, they have taken great care at every stage to preserve the film's visual style. The colorization program filters away unwanted hues. Only colors with the same range of grays as the original photo would be allowed in the program. This contributed much to preserving the authentic appearance. This technique is referred to as "Natural Colorization" [Salgia \(2005\)](#). This procedure required considerable effort and time. It required a lot of manual labor. For the coloring of the film Naya Daur, a semi-automated technique was developed. 'Naya Daur' was digitally colored using advanced colorization technology and processes. There are no credible sources regarding the technology or technique used to colorize the other three films. Assumptions were made about the use of automatic cutting-edge digital colorization technology based on a review of a few online sources and YouTube video discrepancies.

Without an appropriate appreciation for the significance of these films, it is challenging to evaluate the responses to them. Hence, before we get into the color of these films, let's go over a few key facts and the basic plot of these films.

**Mughal-e-Azam:** Mughal-e-Azam, written by K. Asif and based on the play Anarkali by Imtiaz Ali Taj, forever memorializes the sad love story of Salim and Anarkali. The story centers on the relationship between court dancer Anarkali and Salim, the son of Akbar. When Emperor Akbar the Great finds out about the relationship, he imprisons Anarkali. This causes Crown Prince Salim to declare a state of revolt, which leads to an all-out war. Because of its lavish aesthetic, eerie musical score, breathtaking battle scenes, superb acting, painful emotions, legendary romance, and confrontation moments between Akbar and Salim, Mughal-e-Azam will always serve as a standard.

**Shree 420:** In the 1955 film Shree 420, Raj Kapoor both directed and starred as a good-hearted homeless man who hitchhiked from Allahabad to Bombay. He's been tricked and robbed, so he's decided to join the ranks of the homeless and

jobless and spend his evenings there. The problems of succeeding in the contemporary metropolis of Bombay are highlighted in this film, which serves as a cautionary tale on the benefits of dishonesty. Shree 420 is a stirring hymn to national pride that starts in an India that has just attained freedom. The song "Mera Joota Hai Japaani" by Shailendra is still considered an emblem by Indians all over the globe because it highlights the natural love that Indians have for their homeland.

**Naya Daur:** Naya Daur, released in 1957, by BR Chopra, addresses the disconcerting victims of the rapid industrialization that is envisioned as the future. Naya Daur takes place in a utopian hamlet where everyone has a work at the mill or as a tonga driver. The mill owner believes in a horizontal connection between employer and employee. Things alter when he departs on a journey and is replaced by Kundan, his city-bred son. Kundan emphasizes the difference between modern India and rural India by valuing his father's business but not his devoted workers. Shankar, a tonga driver, is against introducing a bus service to the village. Kundan, a prosperous local merchant and the bus's owner, bets that if he can beat the bus in a race using his tonga, the bus will be withdrawn. The story's remaining events center on Shankar's training for the race, his eventual win over the bus, and rivalry for Rajni's affections, which finally results in Shankar's friend Krishna's betrayal.

**Kala Pani:** Kala Pani (1958) is an adaption of *Beyond This Place* by A.J. Cronin, directed by Raj Khosla and starring Madhubala, Dev Anand, and Nalini Jaywant. Karan learns that his father is alive and serving Kaala Pani for the murder of a dancer at a prison in Hyderabad. That surprises him since he was always told that his father had passed away. To meet his father, he makes the trip to Hyderabad, and learns that his father was wrongly convicted of the dancer's murder because of shaky evidence. Then he decided to find the real killer to free his father from the infamy of a fifteen-year-old murder. He enlists a journalist, a former police inspector, and an unwary prostitute who have critical information to free his honest dad from "kaala paani." The film earned a lot of praise for its two main stars and had considerable box-office success upon its first release. At the sixth annual Filmfare Awards, Dev Anand won best actor and Nalini Jaywant won best supporting actress.

**Dil Tera Deewana:** Directed by B.R. Panthulu, the romantic comedy Dil Tera Deewana featured hilarious performances by Shammi Kapoor, Mehmood, Mala Sinha, Shubha Khote, Om Prakash, and Pran. An enraged father, Diwan Badriprasad, sends his unruly, boisterous, and rebellious son Mohan to a retired army captain, Dayaram, to acquire basic respect and discipline. But, Mohan approaches his buddy Anokhe and asks if they may trade places. Anokhe accepts. Mohan visits the home of Meena and her blind father. Anokhe is formally introduced as Mohan to Captain Dayaram and Malti, his daughter. Malti and Anokhe both end up in a romantic relationship. When Captain Dayaram learns that Anokhe is not only married to another lady but also operates a rickshaw, the situation quickly becomes more complicated. Three different Mohans are taken into custody after police are alerted and urged to make an arrest. Later, Mohan's parents come and identify the real Mohan.

## 2. REVIEW OF LITERATURE

Digital image processing is an interdisciplinary field that includes subfields such as computer graphics, image processing, and human interaction, and hence has been the subject of much study. Among the various applications of colorization, restoration of color to previously B&W films is the most important subject for discussion [Chen \(2022\)](#). The first perspective contends that the addition of sound

and color to a picture gives it a more realistic feel while yet maintaining its atmosphere of authenticity. As such, color might be seen as only one more factor that helps bring a film closer to resembling reality. Yet, the complexity of producing a film with several color scales meant that it could not replace monochrome film. In comparison to modern films, those from the silent era used hues that were not realistic. However, the inclusion of color was a mystery to the filmmakers and may potentially increase production time [Costa \(2011\)](#).

In the late 1950s and early 1960s, the colorization procedure included tracing the original B&W frames onto fresh animation cells, which were then colored. With technological advances, studios could colorize B&W films by digitally coloring individual items in each frame until the whole picture was colorized [Koleini et al. \(2010\)](#). Back in the early 1980s, it was Wilson Markel who first began adding color to previously B&W films. Since then, several other techniques for adding color to B&W film and still images have been developed. Most of these techniques involve segmenting a black-and-white picture into smaller pieces, after which either a color image is superimposed over it or the user manually selects a color for each segment before the color is applied globally [Lavvafi et al. \(2010\)](#).

Markle's first iteration of colorization was launched in 1987, and it requires a color mask to be painted by hand for at least a frame of reference for every shot. After motion has been detected and followed, static areas of images may be automatically given color. Optical flow is used to assign colors to areas near moving edges; nevertheless, this process typically requires human adjustment by the operator [Koleini et al. \(2010\)](#).

Movies that were colorized using older methods often have lesser contrast, are paler and flatter, and display washed-out colors. During the 1980s, however, colorization technology advanced to the point that certain black-and-white TV programs and movies have been provided a color treatment that is, in the opinion of some viewers, entirely realistic [Koleini et al. \(2010\)](#). Most colorization techniques work by assigning colors to specific areas of a frame and then tracking those areas in successive frames. For instance, in 2003, the commercial image-colorization program Black Magic was released; it makes use of neural technology. Users are given access to a wide variety of color palettes and patterns inside the program, and picture segmentation is a user-driven process as well [Lavvafi et al. \(2010\)](#).

Several automated film colorization approaches have been suggested in the recent years. In 2018, Yu Chen, Youdong Ding, Yeyun Luo, and Bing Yu, three Chinese researchers, published an automated colorization neural network (CNN) that employs multi-scale compression kernels and integrates low and intermediate data extracted from VGG-16. The results of these experiments show that their algorithm can successfully colorize pictures from black-and-white videos with little to no input from the viewer [Chen et al. \(2018\)](#).

A new local distance definition is introduced by Yao Li, Ma Lizhuang, and Wu Di, which helps distinguish between two areas' colors more clearly. The smallest distance between each pixel and the scribbles is calculated using two-dimensional programming, and then the chrominance of the three closest pixels is averaged to get the final result. The time needed to complete the coloring is reduced significantly. Recolorization and film colorization are two other applications where their approach may be used. The findings of this study demonstrate the superiority of their algorithm over numerous state-of-the-art algorithms when starting with a minimal quantity of user input. Furthermore, a 320x240-pixel picture may be implemented in less than a single second [Li et al. \(2015\)](#).



In 2002, Welsh demonstrated a method for automatically adding color to monochrome photographs. Using a black-and-white picture as a target, Welsh's method transfers colors from a color source image by finding the pixels that have the most comparable brightness and then transferring that color to the target image. This technique performed well on photos with areas of contrasting hue and brightness. Some photos required the user to manually locate the matching pixels in both the source and destination images. Good results were achieved with this approach, although once again, user input was crucial. As an added step, the user must locate an appropriate source picture with colored sections and then link the portions of the picture that require coloring to the colored regions of the source image [Lavvafi et al. \(2010\)](#).

In recent years, artificial neural networks have become more popular computational methods for tackling difficult real-world issues. ANNs are appealing because of their outstanding information processing qualities, including nonlinearity, fault & noise tolerance, high parallelism, and the capacity for learning adaptation [Basheer and Hajmeer \(2000\)](#). Automatic and more effective than state-of-the-art procedures, convolutional neural network (CNN) based colorization does not rely on human intervention to get desirable results. After CNN has been taught, it can quickly and automatically provide high-quality results. As compared to other approaches, this procedure yields favorable outcomes in a shorter amount of time [Titus \(2018\)](#).

### 3. OBJECTIVES

There are many aspects linked to this research; it is not just discussed in terms of reproducing black-and-white films in color, but also tried-

- To evaluate the acceptance of colorized classic Bollywood films among the younger generation.
- To understand the audience perception and satisfaction of colorization on iconic black-and-white films.
- To explore the possibilities and potential of colorization in grayscale movies.
- The following research questions were developed in order to serve as a framework for the study:
- How do younger generations perceive colorized classic Bollywood films?
- Are these colorization processes satisfactory?
- What are the possibilities of colorization in grayscale movies?

### 4. METHODOLOGY

Color is a language in and of itself, and its impact is amplified when linked to moving images. However, with the advent of contemporary technology, traditional film colorization methods may be less familiar to today's viewers. In accordance with the goals of the study, a mixed-methods approach including both qualitative and quantitative techniques was used to investigate audiences' reactions to colorization in classic movies.

In this study, color serves as the independent variable. The color analysis of a film requires a comprehension of cinematic language as well. In order to gather data, it is important to choose a person who is familiar with the film language and often

---

watches movies. Hence, non-probability purposive sampling has been used to acquire primary data. Data has been collected in the control environment.

## 5. RESEARCH METHOD

### 5.1. SAMPLING TECHNIQUE

Google Forms were used to create the 6-page questionnaire used in this study. Each page was comprised of five questions. On the first page, respondents provided basic demographic information about themselves, including their names, ages, genders, and programs. The following five pages analyze the color significance of five films. Each film was given the same set of five questions to answer. Three of the five questions were open-ended, whereas the first two were closed-ended (if they had seen the movie before and, if so, in what form). After seeing the video, their thoughts on the color were solicited.

### 5.2. SAMPLING METHOD

**Subjects:** Forty-five Indian undergraduate and postgraduate students of St. Xavier's University, Kolkata, participated in this survey. Most of the students were from the journalism and mass communication departments, and their age group was 18–23. To ensure the appropriateness of the sample, it's important to note that these students had received formal education in film studies and documentary filmmaking as part of their coursework. They possessed a foundational understanding of film language, analysis, and production techniques, making them well-equipped to engage with the subject matter. Additionally, many of them had practical experience, having completed final film projects as part of their academic curriculum. These participants were carefully selected based on their academic background, keen interest in films, and frequent viewership of films across various platforms. The objective of the experiment was kept secret from all participants. Ishihara's test verified that each participant's color vision was normal. The test did not reject anyone; however, participants who knew they had color impairments may not have applied for the research.

**Material:** Five video montages were meticulously made utilizing colorized and black-and-white material from five films. In order to give a representative sample of the film's key elements, each video montage was between 6 and 7 minutes in length. These montages were built methodically. Two minutes from the first 15 minutes of each film, two from the second hour, and two from the last 15 minutes were taken. Important sequences that captured each film's spirit were selected. Most importantly, our method represented colorized and black-and-white portions equally. The source material for these films, available in both color and black-and-white versions, was obtained from reputable sources on YouTube and archived in 720p quality. To preserve the authenticity of the colorized and black-and-white portions, no color correction or modification was made during editing. Popular video editing program Adobe Premiere Pro was used to make the montages. Minimalist cuts and transitions were used throughout the editing. Without visual changes or subjective editing, the goal was to display the colorized and black-and-white versions side by side and next to each other within the frame. This research focuses on audience perception and reaction, although video montages' quality and presentation shape viewer expectations. These montages were meticulously created to accurately portray both film versions and retain the plot and subject matter.

**Procedure:** Videos were displayed to students using a standard classroom projector while the researcher was present. At the time of screening, all lights and windows were turned off. There were never more than 10 participants in a classroom at the same time. A maximum of two students sat silently on a bench together. At the time of screening, a Google form was given to applicants in order to gather their feedback. After watching one video, there was a 10-minute break for the participants to express their thoughts.

## 6. DATA ANALYSIS AND INTERPRETATION

Collected data shows the audience's response to the colorization of iconic black-and-white Bollywood films. But before discussing our data, it is important to discuss the basic demography of our population.

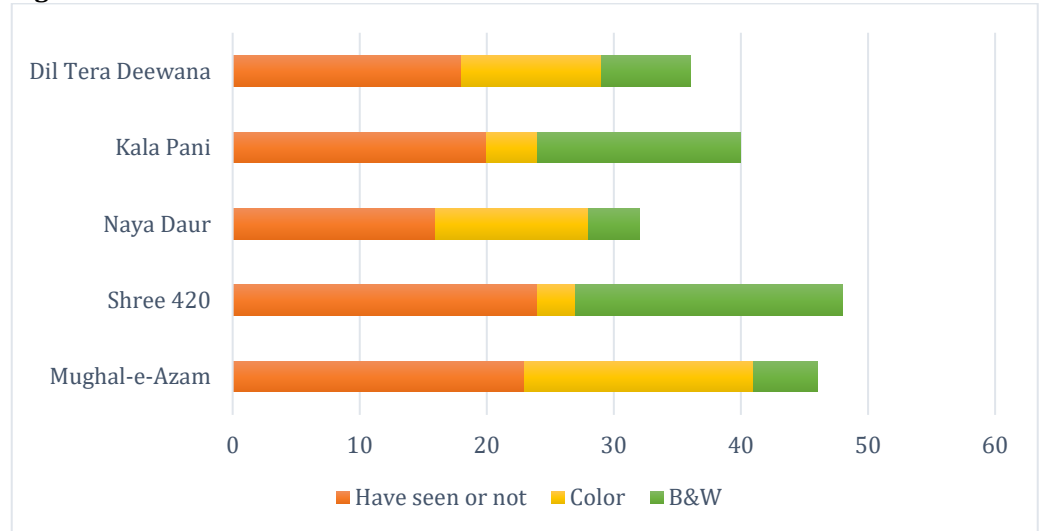
**Table 2**

Table 2 Gender and Program wise Distribution of Respondents		
Participants	Male	Female
Under Graduate	15	15
Post Graduate	10	5
<b>Total</b>	<b>25</b>	<b>20</b>

The above table presents that among the total respondents, 55.55% (N=25) students are male and 44.44% (N=20) students are female. On the other hand, among the total respondents, 33.33% (N=15) students are postgraduates, and 66.66% (N=30) students are undergraduates.

Next, for each movie, they were given two closed-ended questions, such as: Have you seen the movie before? And, if yes, in which version?

**Figure 1**



**Figure 1** How Many Respondents Have Seen the Films and Which Color Format?

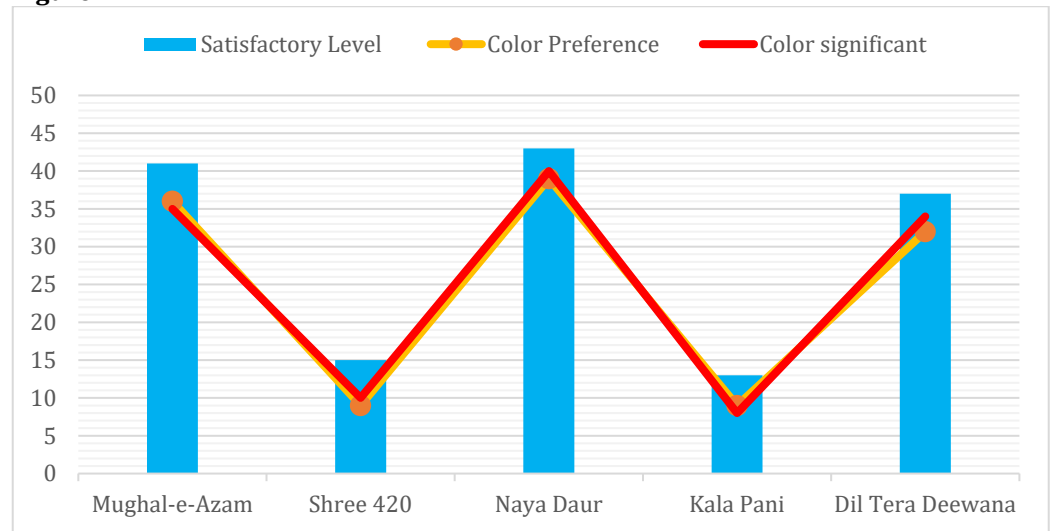
The above clustered column chart [Figure 1](#) shows that, for the film Mughal-e-Azam, among the total respondents, 51.11% (N=23) students are informing that they have seen this film earlier, and among them, 78.26% (N=18) respondents have seen this film in color. For the film Shree 420, 53.33% (N=24) of total respondents



say they have seen it before, with 12.5% (N=3) saying they have seen it in color. With regard to the movie *Naya Daur*, out of the total respondents, 35.55% (N=16) reported having seen it previously, and of those, 75% (N=12) had seen the color version. For the movie *Kala Pani*, 44.44% (N=20) of the students who answered say that they have seen it before, and among those, 20% (N=4) say that they have seen it in color. For the film *Dil Tera Deewana*, 40% (N=18) of students have seen it before, and 61.11% (N=11) have seen it in color.

Next, they were asked three open-ended questions, do you think that the colorization of this film is appropriate and satisfactory? Which version of this film, black and white or color, would you prefer to watch and why? Do you believe converting this black-and-white film to color would make it more significant to young generations or make it more likely to watch again?

**Figure 2**



**Figure 2** Color Preference and Satisfactory Level of the Respondents

The above custom column-line chart [Figure 2](#) shows that, the colorization of the film **Mughal-e-Azam** is deemed appropriate and satisfactory by 91.11% (N=41) of the total respondents, although there are a few instances in which it could be improved upon. The remaining participants (N=4) believe that the color scheme of this movie is completely inappropriate. 80% (N=36) of the total respondents indicated that they would prefer to watch this film in color. Among the total respondents, 77.77% (N=35) believe that the color version of this film is more significant.

For the film **Shree 420**, only 33.33% (N=15) of total respondents believe the colorization is acceptable and decent. The majority of participants (N=30) believe this film's color scheme is inappropriate. 20% (N=9) of the overall respondents favor the color version of the film. 22.22% (N=10) of respondents think this film's color version is more significant.

For the film **Naya Daur**, 95.55% (N=43) of total respondents believe the colorization is adequate and excellent. Of all respondents, 86.66% (N=39) of students indicated a preference for seeing this film in color. According to 88.88% (N=40) of respondents, the color version of this film is more relevant.

For the film **Kala Pani**, only 28.88% (N=13) of all respondents believe that the colorization is appropriate and satisfactory. The majority of participants (N=32) believe this film's color scheme is inappropriate. Only 20% (N=9) of the total

respondents favor the color version, and 17.77% of all respondents (N=8) believe that the color version of this film is significant.

For the film **Dil Tera Deewana**, among the total respondents, 82.22% (N=37) students say that the colorization of this film is appropriate and satisfactory, and in a few cases, it could be better. The rest of the participants (N=8) are thinking that the color of this film is not appropriate at all. Among the total respondents, 71.11% (N=32) students said they would prefer to watch this film in color. According to 75.55% (N=34) of respondents, the color version of this film is more significant.

We may get important insights and reach insightful results by carefully evaluating the data gathered from the respondents' viewpoints and opinions. This research examines study participants' comments to identify motifs and preferences for film colorization. We want to get a deeper familiarity with the respondents' perspectives and evaluations by using this method. We can now go into a thorough review of the colorization quality across the five chosen films by expanding on the objectives and methodology employed in this research work. On the basis of the opinions of respondents, the researcher has developed five fundamental evaluations for gauging the level of satisfaction with the colorization of each film.

**Table 3**

Table 3 Opinion of Responders Concerning Adequate Levels of Colorization	
Film	Satisfactory Level
<b>Mughal-e-Azam</b>	<ol style="list-style-type: none"> <li>1. Colors have appropriately brought out the essence of the film</li> <li>2. Appropriate with the advent of technology, and satisfactory as it looks livelier</li> <li>3. Colors enhance the visual appeal.</li> <li>4. Appropriate overall, although some areas appear brighter.</li> <li>5. The color version is visually appealing but slightly over-saturated and bright.</li> </ol>
<b>Shree 420</b>	<ol style="list-style-type: none"> <li>1. The black-and-white scheme complements the film's somber setting and narrative.</li> <li>2. Colorization lacks visual appeal and feels somewhat off.</li> <li>3. The colored version doesn't significantly enhance the storytelling.</li> <li>4. Inconsistencies in color and unnatural skin tones (too red).</li> <li>5. Colors appear artificial and unsuitable for the mood of the scenes.</li> </ol>
<b>Naya Daur</b>	<ol style="list-style-type: none"> <li>1. Well-executed colorization with accurate scene-based colors.</li> <li>2. Captures softer color tones, enhancing the viewing experience.</li> <li>3. Colorization surpasses the previous films in quality.</li> <li>4. Well-balanced tones and shades, contributing to the film's beauty.</li> <li>5. Colors appear fairly appropriate and natural.</li> </ol>
<b>Kala Pani</b>	<ol style="list-style-type: none"> <li>1. Uneven color distribution and distortion hamper visual appeal.</li> <li>2. Predominantly greenish colors with fluctuations.</li> <li>3. Some oversaturation, resulting in excessive brightness.</li> <li>4. Inconsistent color patches and high contrast levels.</li> <li>5. A cool tone gives a monotonous bluish tint to scenes.</li> </ol>
<b>Dil Tera Deewana</b>	<ol style="list-style-type: none"> <li>1. Technically sound colorization but lacks strong visual appeal.</li> <li>2. Satisfactory overall, except for skin tone issues.</li> <li>3. Acceptable colorization, but occasional harsh color tones.</li> <li>4. Somewhat satisfactory, though brightness on faces could be toned down.</li> <li>5. Adequate but with occasional color discrepancies in certain scenes.</li> </ol>

Another important aspect of the film **Mughal-e-Azam** is that, according to five participants, there are several color continuity errors in the dresses. They have noted that there are a few romantic scenes in both when Anarkali is about to meet

Salim in his "Rajmahal." Despite being in the same scene, their dresses are changing colors [Figure 3](#).

**Figure 3**



**Figure 3** Color Continuity Error. Film: Mugal-e-Azam

Source YouTube

A second fact about the movie Shree 420 is that, in the famous song 'Mera joota hai japani,' Raj Kapoor's "laal topi" was not red, indicating that the colors had not been added properly. Not only that, but the colors are inconsistent and shift from scene to scene.

**Figure 4**



**Figure 4** "Laal topi" is not red. Film: Shree 420

Source YouTube

In the qualitative analysis of the open-ended questionnaire responses, participants provided detailed insights into their perceptions of the colorization of classic Bollywood films. Their feedback encompassed a wide range of reasons for both positive and negative viewpoints, shedding light on the factors that influence their preferences. From these responses, common themes and codes emerged, allowing for a deeper understanding of the participants' sentiments.

For respondents who expressed positive views about colorization, nine key points or codes were identified, each contributing to their appreciation of the colorized versions of these films:

**Better Understanding:** Respondents felt that colorization improved their comprehension and engagement with the films, possibly by making scenes and elements clearer.

**Visually Appealing:** The colorization was described as visually captivating, indicating that the addition of color enhanced the overall aesthetics of the films.

**Enhancing Emotions:** Many respondents believed that colorization heightened emotional connections, making the storytelling more impactful.

**Realistic & Meaningful:** The perception of realism and meaning was associated with colorization, suggesting that it added depth and authenticity to the films.

**Liveness:** Colorization was seen as a means to breathe life into classic scenes, making them feel more contemporary and relatable.

**Eye Catching:** Respondents found that colorization made certain elements or scenes stand out, drawing their attention effectively.

**Vivid Perspective:** Colorization provided a vivid and immersive perspective, enhancing the overall viewing experience.

**More Aesthetic:** The colorized versions were appreciated for their aesthetic qualities, contributing to the films' visual appeal.

**Dynamic & Attractive:** Colorization was perceived as dynamic and attractive, potentially making the films more appealing to a modern audience.

Table 4 shows how many respondents have mentioned these codes for what films.

**Table 4**

Table 4 Reasons for the Preference of Colorization									
Film Name	Better Understanding	Visually Appealing	Enhancing The Emotions	Realistic & Meaningful	Liveness	Eye Catching	Vivid Perspective	More Aesthetic	Interesting & Attractive
Mughal-e-Azam	6	5	3	4	3	2	4	2	5
Shree 420	2	1	-	-	-	1	-	-	2
Naya Daur	5	6	4	8	6	4	3	3	6
Kala Pani	1	1	-	-	1	1	-	-	2
Dil Tera Deewana	4	3	2	3	2	3	3	1	3

On the other hand, for respondents who expressed negative views about colorization, nine distinct codes or key points were identified:

**Nostalgic Vibe:** Some participants preferred the nostalgic charm of black and white films, valuing the historical aspect and sentimental connection.

**Originality:** Respondents who emphasized "originality" believed that the black and white versions represented the films in their unaltered, authentic form.

**Emotions:** The emotional impact of the black and white versions was appreciated by some, suggesting that the absence of color didn't detract from the films' emotional resonance.

**More Authentic:** Similar to "originality," the black and white versions were seen as more authentic, preserving the films' historical and artistic integrity.

**More Aesthetic:** Interestingly, some participants found the monochrome quality of the films more aesthetically pleasing, valuing the unique visual style.

**Satisfactory Factor:** Those who preferred the black and white versions found them satisfactory and didn't perceive the need for colorization.

**Classic:** The classic appeal of black and white films, with their timeless quality, was favored by certain respondents.

**Color Quality:** Some participants may have found issues with the quality or execution of colorization, leading them to prefer the original black and white versions.

**Color Shifting:** Concerns about inconsistencies or inaccuracies in color shifting within the colorized films contributed to the negative perspective.

Table 5 shows how many respondents have mentioned these codes for what films.

**Table 5**

Table 5 Reasons for the Preference of Black and White									
Film Name	Nostalgic vibe	Originality	Emotions	More authentic	More aesthetic	Satisfactory factor	Classic	Poor Color quality	Color shifting
Mughal-e-Azam	2	-	1	-	2	2	-	-	-
Shree 420	5	4	2	4	2	4	4	9	8
Naya Daur	1	-	-	-	-	1	2	-	-
Kala Pani	4	3	2	4	2	5	5	8	7
Dil Tera Deewana	3	1	1	1	-	2	3	1	1

## 7. CONCLUSION

This research has effectively addressed its essential objectives and research questions, giving valuable insights into how the addition of color affects the reception of classic black-and-white Bollywood films.

### Objective 1: Evaluating Acceptance Among Younger Generations

The research finds that young people have a strong preference for colorized adaptations of old Bollywood movies. This approval depends on how well and accurately the colors are developed. This study indicates that the correct use of color may greatly improve aesthetics. According to the findings, audiences prefer to see these films in color if they have a favorable impression of the color quality and the way it has been used in the film. However, they decide to watch the black and white version when they notice the color quality is inadequate.

### Objective 2: Understanding Audience Perception and Satisfaction

Audience perception and satisfaction with colorization have emerged as significant aspects of this study. The results show that people respond positively to colorization when it satisfies their standards for visual appeal and realism. Conversely, subpar colorization quality can lead to viewer dissatisfaction, highlighting the imperative of considering viewer preferences during the colorization process. Researchers must not overlook the significance of context,



time, originality, authenticity, sentiment, and significance. However, these factors are only discussed when the image's color quality is poor. 80% and 86.66% of survey participants, for the movies *Mughal-e-Azam* and *Naya Daur*, respectively, said they would like to see them in color. Many viewers are turned off by the color version due to issues including poor color quality, changing colors, high contrast, incorrect color utilization, too bright, artificial look, and wrong use of color.

### **Objective 3: Exploring Colorization Potential in Grayscale Movies**

This study explores both the possibilities and the promise of colorization in black-and-white films. This highlights the transforming role that colorization has in giving classic films a new breath of life, making them more relevant to modern viewers, and increasing their attractiveness to those people. Nevertheless, it emphasizes how important it is to keep the film's original essence and creative purpose intact throughout the colorization process.

## **8. RECOMMENDATIONS**

**Quality-Centric Approach:** Filmmakers and restoration teams should adopt a quality-centric approach to colorization. Investment in advanced technology and expertise can elevate the colorization process, ensuring it aligns with viewer expectations.

**Artistic Preservation:** While embracing colorization, it is vital to preserve the artistic and emotional value of classic films. Thoughtful color choices and a deep understanding of the film's mood and context can enhance audience satisfaction.

**Educational Initiatives:** Efforts to educate audiences about the cultural and historical significance of classic films in both black and white and colorized forms can foster a greater appreciation among younger generations.

This study concludes that colorization has had a significant effect on the way younger audiences see and appreciate traditional Bollywood films. Grayscale films might be given new life by being colorized, making them more accessible to modern viewers if done with care for aesthetics and authenticity. The results emphasize how important it is to strike a balance between updating and preserving classic films.

**Limitations and Scope for Further Research:** This research has some useful conclusions to make on how colorization affects a certain group of people, but it also recognizes its own limits. In order to better understand how audiences react to colorized versions of classic films, further study is needed to broaden the reach, diversify the sample, and explore other factors. Because of their regular viewing habits, the respondents in this research were selected using a purposive sample strategy, which might bias their opinions. The effects of colorization might be tested in future studies on a broader, randomly chosen population, perhaps including those who aren't avid moviegoers. This method may provide a more accurate picture of colorization's impact on the general public. Future studies could aim for larger and more diverse samples representing various age groups and backgrounds, to enhance the generalizability of findings. A more comprehensive quantitative and qualitative study of colorization's effects might improve audience reaction knowledge.

## **CONFLICT OF INTERESTS**

None.

## ACKNOWLEDGMENTS

None.

## REFERENCES

- AHa. (2015). Mughal-E-Azam.
- Adarsh, T. (2018). Mughal-E-Azam Movie Review.
- Basheer, I., and Hajmeer, M. (2000). Artificial Neural Networks: Fundamentals, Computing, Design, and Application. *Journal of Microbiological Methods*, 3–31. [https://doi.org/10.1016/S0167-7012\(00\)00201-3](https://doi.org/10.1016/S0167-7012(00)00201-3)
- Chen, S.-Y. (2022). A Review of Image and Video Colorization: From Analogies to Deep Learning. *Visual Informatics*. <https://doi.org/10.1016/j.visinf.2022.05.003>
- Chen, Y., Luo, Y., Ding, Y., & Yu, B. (2018). Automatic Colorization of Images from Chinese Black and White Films Based on CNN. *ICALIP*. <https://doi.org/10.1109/ICALIP.2018.8455654>
- Costa, M. H. (2011). Color in Films: a Critical Overview. *Crítica Cultural*, 333-346. <https://doi.org/10.19177/rcc.v6e12011333-346>
- E-Times. (1996). Kala Pani.
- IMDB. (2009). Shree 420 (1955).
- Jmathur. (2010). A Classic Which is the Predecessor to Lagaan.
- Koleini, M., Monadjemi, S. A., & Moallem, P. (2010). Automatic Black and White Film Colorization Using Texture Features and Artificial Neural Networks. *Journal of the Chinese Institute of Engineers*, 33(7). <https://doi.org/10.1080/02533839.2010.9671693>
- Lavvafi, M. R., Monadjemi, A., & Moallem, P. (2010). Film Colorization, Using Artificial Neural Networks and Laws Filters. *Journal of Computers*, 1094-1099. <https://doi.org/10.4304/jcp.5.7.1094-1099>
- Levin, A., Lischinski, D., & Weiss, Y. (2004). Colorization using Optimization. *ACM Transactions on Graphics*. <https://doi.org/10.1145/1015706.1015780>
- Li, Y., Lizhuang, M., & Di, W. (2015). *Fast Colorization Using Edge and Gradient Constrains*. UNION Agency – Science Press.
- Liu, S. (2022). Two Decades of Colorization and Decolorization for Images and Videos. <https://doi.org/10.48550/arXiv.2204.13322>
- Memsaabstory. (2007). Dil Tera Deewana (1962).
- Pegatraju, S. (2020). Shree 420: Why this Masterpiece from Raj Kapoor Needs a Revisit.
- Salgia, D. (2005). Mughal-e-Azam : Restoration-cum-Colorization for 35mm Release. *The Moving Image*, 5(Spring), 128-135. <https://doi.org/10.1353/mov.2005.0018>
- Sharma, S. (2021). Bollywood Rewind | Shree 420: Raj Kapoor's take on Conmen Who Pose as Saviours.
- Sharma, S. (2021). Bollywood Rewind | Naya Daur: Of the New Era That will Always be Intimidating.
- Srivastava, N. (2013). Shree 420 Review : Bollywood Classic of 1955. <https://filmykeeday.com/shree-420-review/>
- Tangleofwires. (2010). Film Review: Shree 420.
- Titus, S. (2018). Fast Colorization of Grayscale Images by Convolutional Neural Network. *IEEE*. <https://doi.org/10.1109/ICCSDET.2018.8821180>
- Tunzelmann, A. V. (2013). Mughal-e-Azam: Royally Glossing over History's True Colours.

Zore, S. (2020). *Mughal-e-Azam Review: Grand Tale of Doomed Love that Stands the Test of Time.*

Wikipedia. (n.d.). Wikipedia.

Wikipedia. (2023). en.wikipedia.org.

## ANNEXURE

The image displays two side-by-side screenshots of a Google Forms survey. Both forms have a header image with the text 'FILM COLOR' and a background of a vintage car in a desert. The left form is titled 'Recreating B&W Bollywood films in color' and is for the film 'Mughal-e-Azam (1960)'. It contains five questions: 1. 'Have you watched the film earlier?' with 'Yes' and 'No' radio buttons. 2. 'If so, which version of it have you seen?' with '(A) Black and White' and '(B) Color' radio buttons. 3. 'Which version of this film, black and white or color, would you prefer to watch and why?' with a text input field. 4. 'Do you think that the colorization of this film is appropriate and satisfactory?' with a text input field. 5. 'Do you believe converting this black-and-white film to color would make it more significant to you or make you more likely to watch it again?' with a text input field. The right form is also titled 'Recreating B&W Bollywood films in color' but includes a disclaimer: 'This is strictly for educational study and to understand the theory of film color. Answer all questions honestly.' It contains demographic questions: 'Name', 'Gender' (Male, Female, Other), 'Age group' (18-20, 21-23, 24-26), 'Email', and 'Program' (Under Graduate, Post Graduate). Both forms have 'Back', 'Next', and 'Clear form' buttons at the bottom.