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Animation & visual effects technologies influence on global production trends & digitalization of cinema from 1990 to 2020

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Abstract

The acceleration of globalization has increased considerably in the last thirty years. Among many reasons for this condition, technological advancements and the use of web have an important place. This situation has changed the dynamics of capitalist finance, social life, educational processes, artistic production methods and production design trends which are positioned at the center of the article. In a period when the interaction is increasing and capitalist control mechanisms may not ignore this interaction, the expectations of people both economically and artistically changed, also simultaneous changes have occurred in the production methods. Now, the media production method has moved out of the processes where the cinema industry is marketing through digitalized mediums and contents in many different media platforms. The audience is now more directly involved in cinema, television, literature and other media as a consumer. The main goal of the research is to analyze this trend of digitalization in cinema through technologies connected to animation and visual effects. In the article firstly, history of animation and technological developments will be summarized and then digitalization of cinema will be described in different aspects. Both technological, artistic and political variations will be analyzed and after that the trends will be shown by graphics from statistical data. This data is taken from "Box Office Mojo" website and the trend include mainly, changes in animation and visual effects technologies. This article will basically try to reveal the changes in the technological and cinematic understandings of production companies that have been most integrated into this orientation in the thirty-year period. In summary, the process will be analyzed through statistics that will reveal the course of globalization, both in terms of orientation towards animation, visual effects and films produced through digital cinema.

Keywords: Production, Animation, Global, Media, Cinema.

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1. INTRODUCTION

It can be thought that the world is in a technological and sociological shift. This change is increasing and effecting humanity almost every day. It can be assumed that one of the most important effects of this change is computer technologies and the media. The perceptional speed of time has differentiated through last thirty years. Now, a new kind of consumer has emerged who wants to consume more content in number and also in expressiveness. They mostly express their demands through digitalized media technologies. This consumer not only examines the story universe in depth, but also shares his insights about new works with other participants he meets in the digital world. In these processes, both technology and media understanding have changed with this understanding. It may be assumed that this all began with the new advancements in computer technology and change in perception of media. With the arrival of home entertainment system and the internet, viewers were not limited to television broadcasting and movie theaters anymore. And conventional filmmaking has also changed the viewers idea of a movie. Digital animations and new visual effects technologies helped the people to expect more from cinema in content wise. Science fiction and fantasy genres had the chance to make more expressive story structures and strong visual content. And because of the developments in home entertainment systems, more and more productions have been developed in these genres.

When it comes to cinema, animation has made technological developments both in cartoons and motion pictures. While the transition from classical animation to digital animation in cartoons, visual effects technologies in movies have transformed into higher-level visual effects from middle range after conventional visual effects. At the same time, media has transformed from the production design of a single motion picture into a process where animated films, motion pictures, computer games, novels, comics, television series and animated series are linked together to create a multi-platform narrative structure. Each work has evolved and connected the concepts of media and technology simultaneously. All these technological and cinematic changes have led to cultural renewals. The article will try to obtain clear data to reveal this process with a series of statistical graphs. Finally, through the graphics formed from statistical data will be shown to reveal the production trends of nearly twenty production/distribution companies observed.

1.1. Method

Statistical data analysis method will be applied as a method in the research. Since it would be difficult to analyze the trends of the media in the global sense without resorting to statistical data analysis, it was used as a method in this research. The graphics that these data will reveal in total, will show the course of the media on a global scale and the data can be used in future research.

1.2. Population and Sample

The universe of the research consists of lists of the box office results from the website " Box Office Mojo by ImdbPro". In order to expand this universe, not only the box office revenues but also the statistics obtained indirectly from this information associated with different classifications will be used. This classification is going to be mentioned on the next chapter. Although the information is going to cover worldwide box office results to develop a broader perspective. Also, the technological developments in animation and visual effects over the decades are taken into account to strengthen the structure of the research. In this way, the scope of the research is going to be limited in digitalization of cinema to make clearer perception of the present day. Five different animation and visual effects technology levels, which are assumed to be more important, will be analyzed and visualized in this way.

1.3. Data Collection Method

The main tool used in the research is the box office revenue chart of the movies in the "Box Office Mojo by ImdbPro" site, which shows highest grossing movies from the past thirty years. (https://www.boxofficemojo.com) The data in this table were brought together in the first instance and then classified and from this classification, statistical values were reached. After the information provided by this table is divided into

categories and calculated, it is divided into two main topics. Two main topics were determined, first in terms of animation and then visual effects technologies. Animation and visual effects technologies' classifications are classical animation, digital animation, conventional visual effects, middle range visual effects and higher-level visual effects. These categories have divided into five sub-branches with the expectation to show developments in technological and visual perspectives. The aim here was to show the cinematic changes and to reveal the media understanding within the digitalization of cinema.

1.4. Literature Summary

In this chapter, to understand digitalization of cinema, the literature will be shown through digital media. Also, animation and visual effects technologies will be explained. The media of the new millennium is now oriented towards gaining human attention from many different aspects. Each platform has started to contribute to the story universe by doing what it does best. Use of cinema has changed drastically in the last two decades. The changes in this area may be linked to developments in animation and visual effects technologies. To understand the journey of animation and visual effects, the chapter will start to show history of classical animation and then digital animation visual effects technologies will be explained. Animation as a technology had been developed in the end of 19th century to beginning of 20th century.

"Émile Reynaud's Pauvre Pierrot (1892) was created by using a longer image roll for the praxinoscope, allowing for a longer viewing time. Pauvre Pierrot is often credited as the first animated film because Reynaud's picture roll was hand-painted with 500 individual images. However, film historians argue that Émile Cohl's Fantasmagorie (1908), is the first instance of a film produced with traditional animation techniques, making it the first true animated movie." (masterclass.com)

In most of the sources the short cartoon made in 1908 is considered the first one but in this era because, cinema and animation technologies are developed rapidly there is a grey area anyway. Even though Fantasmagorie is considered the first produced animation, British-American producer J. Stuart Blackton's Humorous *Phases of Funny Faces* (1906) is also an animation captured on a real film. Even though the animation is made on a black board, after that it is captured by the camera and turned into an animation. After that series of short animations and TV series made and in end of 1930s Walt Disney Studios' *Snow White and the Seven Dwarfs* (1937) has made as the first feature animation film.

"This film used the traditional animation process of cel animation, which involved rendering two-dimensional visuals on a transparent sheet of celluloid. The cel animation process allowed transferring illustrations between frames, rather than having to redraw from scratch each time, speeding up the process, saving time and labor." (masterclass.com)

Until that time all the animation made in classical ways. Cartoon animation had mostly made in celluloid papers. Celluloid papers were translucent materials which put on light box desks and animators were drawing all the pictures frame by frame. And after that all the frames were shot by a camera 24 frames per second. There were also films that included stop motion technique to their productions. Stop motion is a technique that puppets and clay is used to make movements and recording that by camera like cel animation. After the classical animation era people started to make researches about making animation digitally.

"Composer, animator, and inventor John Whitney Sr. built a custom computer device from a converted Kerrison Predictor (a World War II-era anti-aircraft fire-control system). Using mathematics to control the device in more specific ways, they had the ability to produce precise lines and shapes. Whitney Sr., with the assistance of legendary graphic designer Saul Bass, animated the opening title sequence for Alfred Hitchcock's 1958 film Vertigo. The classic film is considered to be one of the first live-action films to use computer animation." (masterclass.com)

Technological developments changed the way people perceive art in general, but animation was one of the most powerful art forms when this development have changed the perception of art. After all these changes, the concept called

CGI (Computer Generated Imagery) started to be used. And through CGI, new techniques to make animation and visual effects has emerged.

Animations created on 2 dimensional platforms are either made by drawing or by giving the keyframes and calculating the remaining frames by the program using limited animation techniques. In 3 dimensional platforms, this process is created in a different way. To create an animation the artist must perform a series of arrangements on the software. Primarily, a character is produced with a virtual model by manipulating the surfaces inside the three or four points created in a program that can calculate the X, Y and Z coordinates. By calculating the parameters of this character in the 3D environment, color, material and texture information is assigned to the model based on model's topology, using the surface coating method. Then, a virtual rig is made to the model that the texture is already assigned and it gains the ability to move. The model is moved by giving keyframes according to the translate, scale and rotation information in three-dimensional coordinates. Finally, it is converted into image frames and recorded by means of light and camera simulations in the established virtual scene. And videos are obtained by converting these images into image sequences in compositing programs. In cartoons, digital animations are used in general, whether they are obtained in 2D or 3D environment. These images obtained via computer increase both production processes and visual quality in cartoons. Although animations obtained with images recorded by cameras such as cell or stop motion still continue to be produced, many of the techniques used in both cinema and advertising are obtained in digital media.

In the research classical animation indicates the movies made in cel animation, stop motion and other conventional animation techniques. Digital animation is used for animations made in 2 or 3-dimensional animation softwares. Visual effects also emerged from the tools had been designed for and from digital animation technologies. Visual effects technologies also have changed through the time, especially after 1990s because of the improvement in computer science. But mainly Conventional visual effects include, special effects and color correction. Middle range visual effects include rotoscope, matte painting, green/blue box and compositing. Finally, higher level visual effects include dynamic simulations, motion capture, match moving and computer-generated imagery in general. Special effects are made by reel material, captured by a camera and integrated to reel image in computers. Sets, props, stop motion animation and small-scale explosions are examples to this technique. Color correction is digitally manipulating the camera's image data and making final result different than the shot. Rotoscope is the technique which an object or a character is extracted from the video by frame by frame drawing and making either alpha channels for the background or using. The extracted part on another image surface. Matte painting is digitally manipulating and making modifications and/or alterations to real video frame by frame. Green/blue box is the method that using a color matte on the background of the shot and deleting it on computer to create alpha channel videos afterwards. Compositing is using all these elements mentioned before to make a composited video from different materials. Dynamic simulations are making particle animations through 3 dimensional simulation algorithms and make either liquid, explosion or other simulations. Motion capture is taking movement data from a real shot of a character via body suits and special cameras created for this technique and applying this data to a virtual model. Match moving is taking environment data from a shot and creating a virtual camera to correlate a virtual scene to a reel shot through compositing continuum. Computer generated imagery has already explained to conclude digital animation processes and it is also widely used in visual effects to create virtual element like character models, environments and dynamic simulations.

The collective term Computer Generated Imagery (CGI) denotes digital two- or three- dimensional effects that are used in movie and video game production. (Schulz, Eder, Tiberius, et. 2021: 400) These effects had a relatively strong effect of the digitalization of cinema. Because efficiency and speed of production became rel-

atively high and it made many production difficulties easier to solve. Also, these technological improvements made more dynamic and strong visual structures possible Technological advancements, such as CGI, can create more dramatic effects and therefore draw more viewers. (Schulz, Eder, Tiberius, et. 2021: 407) This trend for digital filmmaking and using more and more visual effects has begun approximately in 1990s.

"With the rise of DVDs (digital versatile discs) in the late 1990s replacing VHS (video home system) or Betamax tape, which both held analogue data, and then the rise of cameras which stored all the data on a chip rather than tape, the field moved further away from celluloid. The mass-market breakthrough of domestic DVD recorders and digital video recorders in the late 2000s meant that the means of production was within the grasp of many rather than being the preserve of professionals." (Sparke, 2015: 59)

DVD and digital camera technologies and it's connection to production and consumer preferences effected the filmmakers to be more digitalized. Because ways of production have changed in two ways. Both contents have digitalized through the effect of computer-generated imagery and the medium has evolved into something digital through DVD and digital camera technologies. With these advancements even the movie theaters changed their preferences when it comes to screening films.

"Since 24 October 2012 all television broadcasts in the United Kingdom have been in a digital format, but not all the content will have been recorded digitally. In cinemas celluloid film has long been used for recording the moving image, then replicated for distribution to multiple cinemas, and then shown by projecting from the celluloid. However, from a slow start in 2005/6 (accelerated by expected demand from audiences for digital 3D films such as Avatar, as well as the significant push from distributors), cinemas have been rapidly converting to digital display, requiring the scanning (conversion) of all non-digital movies." (Sparke, 2015: 58)

When a filmmaker makes the movie mostly on computer, putting all these data back into celluloid started to make no sense. That's why production techniques also changed the ways viewer to experience films. *Star Wars: Attack of the Clones* (Lucas 2002) was outputted to the DVD as code not from an image. That is to say it existed in its primary form not as a film but as computer code. (Ganz, Khatib, 2006: 25) With all these improvements in digital cinema viewers expectations has also increased simultaneously. Viewer has started to expect more experiences in more platforms. Both the medium and the content got more interactive and expressive. Animation and visual effects technologies had an important part in these advancements and still plays a valuable part in the film industry.

With the development of digital animation technologies, both game and movie graphics in this structure have increased gradually, and the participant has started to be more interested in digital film franchises with the visual quality provided by the highest technology on every platform. Strengthening this interest in both on the level of visual technologies and the story structures have imposed a system that is going make the participant more interactive. Also this perspective strengthens production companies' investments and to rise within the market.

"Media convergence makes the flow of content across multiple media platforms inevitable. In the era of digital effects and high-resolution game graphics, the game world can now look almost exactly like the film world—because they are reusing many of the same digital assets. Everything about the structure of the modern entertainment industry was designed with this single idea in mind—the construction and enhancement of entertainment franchises." (Jenkins, 2006: 104)

It means, digitalization of cinema works in both media convergence to create participant communities and also making technological advancements to manipulate viewers as a consumer. As a consequence, participant communities which integrated into movie productions with the habit of digital media in terms of technology and cinema are inevitably faced to being directed towards mainstream discourse. This is where the power of Hollywood comes into play. A consumer cannot be thought apart from the ideology and discourse, directed at an unconscious level. Although the participatory culture may impose the

production companies to produce works that is going to fit participating communities' mindset, the manipulation of the big production companies may still be considered relatively high.

"I would counter that Hollywood is largely a business. When there is dissatisfaction in society with a political regime, Hollywood is quick to exploit it with films transcoding the disaffection or anger with the ruling group, whatever its politics. However, it probably should be admitted that many in the Hollywood film community are liberals, so there will be liberal and socially critical films no matter who is in power and even during a conservative regime." (Kellner, 2010: 34)

Even though there is an ideological motive to make cinema more liberal, digital cinema and media in general can be considered to be oriented to make films more expressive through visual effect technologies. Beyond all these ideological orientations, the demand in the globalizing world is the connection of the products on many different platforms. Animation technologies and digital media trends integrated the world through Hollywood. These digital media products can be thought that they were expected with a similar enthusiasm in every corner of the world.

"The process of globalization has accelerated the tempo of production, management, and distribution of goods and services throughout the planet, measuring productivity and competition by shrinking time to the lowest possible level. Global financial markets have invented time-trading derivatives that spiraled out of control and threaten to destroy the economy they were supposed to fuel." (Castells, 2010: 1)

The connection of this analysis when it comes to digitalization of cinema is that animation and visual effects technologies made the production time span and location difficulties far more resolvable. Now, the expectation of the participatory culture has reached to a point where all the participants meet in different networks and try to determine the direction of the franchise with both fan-made productions and discussions in the forums. While animation technologies increase the interest in games and movies, the perception of the consumers has also increased on the level of expecting more movies made through computer-generated imagery.

"…a new communication system, increasingly speaking a universal, digital language, is both integrating globally the production and distribution of words, sounds and images of our culture, and customizing them to the tastes of the identities and moods of individuals. Interactive computer networks are growing exponentially, creating new forms and channels of communication, shaping life and being shaped by life at the same time." (Castells, 2010: 2)

Beyond the expectation of more digitalized cinema, people have entered to an era which the advancement of the cinematic technologies in media are getting higher. Most of the viewers of cinema seem to be satisfied with the habit of using digital platforms to consume cinematic works which created heavily on computer-generated imagery. In order to observe the trends within the production companies that set up and run this system, the next section will reveal the statistical data based on developments in animation and visual effects technologies among the top ten blockbuster movies of the last thirty years.

2. ANALYSIS OF DATA

In order to show the influence of animation, visual effects and digitalization of cinema on the worldwide box office revenues of the last thirty years, statistical data has been collected and classified over the box office revenues on the internet. Considering the top ten highest-grossing films of the last thirty years, which this classification will analyze, three hundred movies have been converted into statistics according to the classification mentioned in the previous sections. The data obtained from these statistics has turned into graphs to reveal the production/distribution companies' trends in filmmaking. Considering that it would be more effective to go back thirty years in order to determine the variability of the data, the revenue rates were discussed in a range from 1990 to 2020. In addition, the sociological dimension of the subject with the literature review; expanded to perceive the link between globalization and digitalization of cinema through animation and visual effects.

For example, the data taken from the mentioned website in 1990 is as follows.

Rank	Release Group	Worldwide	Domestic	%	Animation/VFX Levels	Production Company
1	Home Alone	$285,761,244	$285,761,243	100%	Conventional VFX	20th Century
2	Ghost	$217,631,306	$217,631,306	100%	Conventional VFX	Paramount
3	Dances with Wolves	$184,208,848	$184,208,848	100%	Conventional VFX	Orion
4	Pretty Woman	$178,406,268	$178,406,268	100%	Conventional VFX	Buena Vista
5	Teenage Mutant Ninja Turtles	$135,265,915	$135,265,915	100%	Middle Range VFX	New Line
6	The Hunt for Red October	$122,012,643	$122,012,643	100%	Conventional VFX	Paramount
7	Total Recall	$119,394,840	$119,394,840	100%	Middle Range VFX	Sony/Carolco
8	Die Hard 2	$117,540,947	$117,540,947	100%	Conventional VFX	20th Century
9	Dick Tracy	$103,738,726	$103,738,726	100%	Conventional VFX	Touchstone
10	Kindergarten Cop	$91,457,688	$91,457,688	100%	Conventional VFX	Universal

Figure 1. "Box Office Mojo" website's highest-grossing films in 1990.

In the year of 1990, it is observed that eight of the ten films with the highest box office revenues were made through conventional visual effects. Based on these observations, it can be assumed that the digitalization process of cinema was still at very low levels. The data has undergone the following changes until the year 2000.

Rank	Release Group	Worldwide	Domestic	%	Foreign	%	Animation/VFX Levels	Production Company
1	Mission: Impossible II	$546,388,108	$215,409,889	39.4%	$330,978,219	60.6%	Middle Range VFX	Paramount
2	Gladiator	$460,583,960	$187,705,427	40.8%	$272,878,533	59.2%	Middle Range VFX	Universal
3	Cast Away	$429,632,142	$233,632,142	54.4%	$196,000,000	45.6%	Conventional VFX	20th Century Fox
4	What Women Want	$374,111,707	$182,811,707	48.9%	$191,300,000	51.1%	Conventional VFX	Paramount
5	Dinosaur	$349,822,765	$137,748,063	39.4%	$212,074,702	60.6%	Digital Animation	Walt Disney
6	How the Grinch Stole Christmas	$345,141,403	$260,044,825	75.3%	$85,096,578	24.7%	Conventional VFX	Universal
7	Meet the Parents	$330,444,045	$166,244,045	50.3%	$164,200,000	49.7%	Conventional VFX	Universal
8	The Perfect Storm	$328,718,434	$182,618,434	55.6%	$146,100,000	44.4%	Conventional VFX	Warner Bros.
9	X-Men	$296,339,528	$157,299,718	53.1%	$139,039,810	46.9%	Higher Level VFX	20th Century Fox
10	What Lies Beneath	$291,420,351	$155,464,351	53.3%	$135,956,000	46.7%	Conventional VFX	20th Century Fox

Figure 2. "Box Office Mojo" website's highest-grossing films in 2000.

Now, after a decade, the films which produced with digital animation and higher-level visual effects have also begun to be observed. Bu movies made with conventional visual effects are still dominate the highest grossing movies with %60 percent. Other %20 percent contains middle range visual effects and only one movie contains digital animation also one other contains higher-level visual effects. Even though there is no foreign box office data for the year 1990, in 2000 there are visible changes on that subject. In 2000, %48,95 of all worldwide box office revenues were made through foreign box office results. It means that with the arrival of new technologies Hollywood cinema industry, started to make more revenues from overseas screenings. Consequently, digitalization of cinema started to make new consumer communities all over the world.

Rank	Release Group	Worldwide	Domestic	%	Foreign	%	Animation/VFX Levels	Production Company
1	Toy Story 3	$1,066,969,703	$415,004,880	38.9%	$651,964,823	61.1%	Digital Animation	Walt Disney
2	Alice in Wonderland	$1,025,467,110	$334,191,110	32.6%	$691,276,000	67.4%	Higher Level VFX	Walt Disney
3	Harry Potter and the Deathly Hallows: Part 1	$976,536,918	$295,983,305	30.3%	$680,553,613	69.7%	Higher Level VFX	Warner Bros.
4	Inception	$826,137,188	$292,576,195	35.4%	$533,560,993	64.6%	Higher Level VFX	Warner Bros.
5	Shrek Forever After	$752,600,867	$238,736,787	31.7%	$513,864,080	68.3%	Digital Animation	Paramount
6	The Twilight Saga: Eclipse	$698,491,347	$300,531,751	43%	$397,959,596	57%	Higher Level VFX	Lionsgate
7	Iron Man 2	$623,933,331	$312,433,331	50.1%	$311,500,000	49.9%	Higher Level VFX	Paramount
8	Tangled	$592,461,732	$200,821,936	33.9%	$391,639,796	66.1%	Digital Animation	Walt Disney
9	Despicable Me	$543,113,985	$251,513,985	46.3%	$291,600,000	53.7%	Digital Animation	Universal
10	How to Train Your Dragon	$494,878,759	$217,581,231	44%	$277,297,528	56%	Digital Animation	Paramount

Figure 3. "Box Office Mojo " website's highest-grossing films in 2010.

In 2010, there are not a single movie made with neither conventional nor middle range visual effects. Back then, there were only movies made with either digital animation or higher-level visual effects technologies. %50 percent of all the movies on top ten highest grossing movies in 2010 were made as digital animation movies and the other half was made with higher-level visual effects. In 2010, %61,38 of all worldwide box office revenues were made through foreign box office results. It means that more than %10 percent off worldwide box office revenues were made after a decade. This trend clearly shows that both the digitalization of cinema and globalization had been influenced by the domination of digital animation and higher-level visual effects among highest grossing movies.

Rank	Release Group	Worldwide	Domestic	%	Foreign	%	Animation/VFX Levels	Production Company
1	Avengers: Endgame	$2,797,501,328	$858,373,000	30.7%	$1,939,128,328	69.3%	Higher Level VFX	Walt Disney
2	The Lion King	$1,656,943,394	$543,638,043	32.8%	$1,113,305,351	67.2%	Digital Animation	Walt Disney
3	Frozen II	$1,450,026,933	$477,373,578	32.9%	$972,653,355	67.1%	Digital Animation	Walt Disney
4	Spider-Man: Far from Home	$1,131,927,996	$390,532,085	34.5%	$741,395,911	65.5%	Higher Level VFX	Sony
5	Captain Marvel	$1,128,274,794	$426,829,839	37.8%	$701,444,955	62.2%	Higher Level VFX	Walt Disney
6	Joker	$1,074,251,311	$335,451,311	31.2%	$738,800,000	68.8%	Conventional VFX	Warner Bros.
7	Star Wars: Episode IX - The Rise of Skywalker	$1,074,144,248	$515,202,542	48%	$558,941,706	52%	Higher Level VFX	Walt Disney
8	Toy Story 4	$1,073,394,593	$434,038,008	40.4%	$639,356,585	59.6%	Digital Animation	Walt Disney
9	Aladdin	$1,050,693,953	$355,559,216	33.8%	$695,134,737	66.2%	Higher Level VFX	Walt Disney
10	Jumanji: The Next Level	$801,693,929	$320,314,960	40%	$481,378,969	60%	Higher Level VFX	Sony

Figure 4. "Box Office Mojo " website's highest-grossing films in 2019.

In the year 2019, there was only one movie among the highest grossing movies with conventional visual effects and all the other movies were ei-

ther made digital animation or higher-level visual effects. The figure shows that nothing much has changed in the last decade when it comes to digitalization of cinema. And also, foreign box office revenues remained on the similar levels with %63,79. Even though there is a slight decrease on the level of foreign box office revenues, the connection between digitalization of cinema and globalization may be considered relatable.

3. FINDINGS

In this section, the distribution of 300 films in total of 10-year periods and 100 films for each ten years among the companies is distributed among the 17 largest companies. Since co-productions were handled as a movie for each company, the number reached over 100 in some decades. For each decade, the number of films categorized according to the 5 animation and visual effects levels mentioned in the "Data Collection Method" section and whether they are produced or not, will be shown on a company basis.

Production companies made more than $37 Billion at the box office between 1990 and 1999. Between 2000 and 2009, this rate reached more than $60 Billion. Between 2010 and 2019, the box office revenues increased to approximately $97 Billion. In other words, Hollywood has almost tripled its box office revenue levels in end of this 30-year period. In the meantime, a total of 300 films were produced by the companies and these companies categorized in terms of the use of animation and visual effects technologies. The main to make this categorization is to understand the influence of global production trends through digitalization of cinema. These companies will be examined in the charts below, respectively.

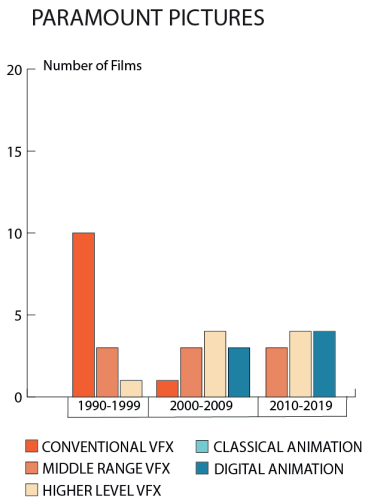

Figure 5. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Paramount Pictures Company.

The first company, Paramount Pictures did not produce films in the field of animation between 1990-1999, but mainly produced films containing conventional visual effects. Paramount Pictures completed the first ten years by producing 14 films in total. 10 of these films were made with conventional visual effects. 3 other movies were made with middle range visual effects and only one movie was made with higher-level visual effects. While the production of films containing conventional visual effects decreased considerably between 2000 and 2009, the proportion of films containing middle range visual effects increased among all the films made by Paramount Pictures. During this period, they produced 11 films in total. Only one movie was made with conventional visual effects. 3 movies with middle range visual effects. 4 movies were made with higher -level visual effects and lastly 3 movies were made with digital animation technologies. It clearly shows that on the second decade, preferences of the production company oriented to more digitalized cinema productions. Between 2010-2019, the company also produced 11 films in total. In the last decade production company had chosen to make no movies with conventional visual effects. They made 3 movies with middle range visual effects, 4 movies with higher-level visual effects and 4 other movies were made with digital animation technologies. Paramount made no movies with classical ani-

mation, but they changed their preferences in the last two decades to make more movies with digital animation and higher-level visual effects. It mainly shows that the company integrated into global production trends in a very effective way. They made relatively a lot of productions and very successful box office revenue in all over the world.

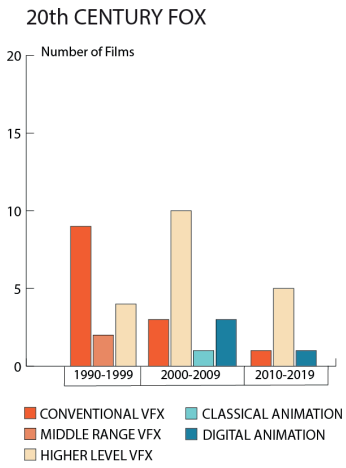

Figure 6. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for 20th Century Fox Pictures Company.

The next production company after Paramount Pictures is 20th Century Fox. Between 1990 and 1999, the company mainly produced films with conventional visual effects. They also produced 2 films with middle range visual effects and 4 movies with higher-level visual effects. While the number movies with conventional visual effects decreased between 2000 and 2009, the number of movies containing higher level visual effects increased considerably. The company made 3 movies with conventional visual effects, 10 movies with higher-level visual effects, 3 movies with digital animation and only one movie with classical animation techniques. In the last decade between 2010-2019 they produced 7 movies in total and 1 of these movies was made with conventional visual effects, 5 of these films were made with higher-level visual effects and 1 other movie was made with digital animation technologies. In the last decade '0th Century Fox's production number were decrease more than half. But their production trend remained in digital cinema. It shows that even though their production strategies were not quite successful, they found no other alternative in filmmaking techniques.

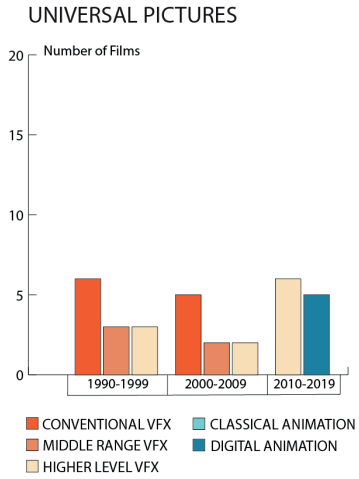

Figure 7. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Universal Pictures Company.

The third company is Universal Pictures. The company which produced 6 movies with conventional and 3 movies with middle range visual effects between 1990-1999, they also produced 3 more movies with higher level visual effects. Between 2000-2009, the company produced 5 films with conventional visual effects, 2 movies with middle range and 2 other movies with higher level visual effects. In the last decade they made 6 films with higher level visual effects and 5 movies with digital animation technologies. In the graph it can be seen that, the company continued to make mostly films with conventional visual effects in the first two decade, but also, they remained to choose higher-level visual effects technologies to make movies. In the last ten years they also chose to make movies with digital animation and stopped to choose conventional visual effects as a production technique. It clearly shows that even though their production numbers among the highest grossing films are relatively high, their preferences when making movies oriented to digitalization like other successful companies.

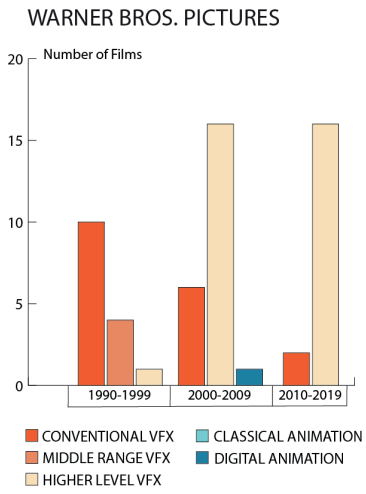

Figure 8. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Warner Bros. Pictures Company.

The fourth company is Warner Bros. Production. The company has the second highest number in productions among the highest grossing movies after Walt Disney Production Company with 66 productions in 30 years. Between 1990 and1999, the company produced 10 movies with conventional visual effects, 4 movies with a middle range visual effects and 1 other movie with a higher-level visual effects technology. From 2000 to 2009, they made 6 movies with conventional visual effects, 16 movies with higher-level visual effects and one more movie with a digital animation technique. Between 2010 and 2019, the company made only 2 movies with conventional visual effects and 16 other movies with higher-level visual effects. The trend shows that after the first decade level of productions with conventional visual effect technologies are gradually decreases. But even though the level of films with higher level visual effects in the first decade is as low as 1, in the last two decades it is getting higher to the number of 16 production for each decade and they dominate the industry with high level technological production methods. As an analysis, the success of Warner Bros. Production may be linked to their preference to make movies with higher-level visual effects technologies.

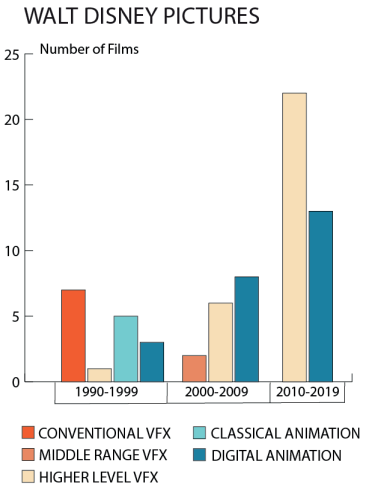

Figure 9. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Walt Disney Pictures Company.

The fifth one, Walt Disney Production Company is perhaps the fastest growing company when it comes to rise in production numbers. At the same time, its integration with new technologies and platforms may be considered much higher than other companies. Between 1990-1999, the company produced 7 movies with conventional visual effects and 1 other movie with a higher-level visual effects technology. They produced 5 movies with classical animation technique and 3 movies with digital animation Between the years 2000-2009, the company produced all kinds of films except conventional visual effects and classical animation. In the second decade, the company produced 2 films with middle range visual effects. They also made 6 movies with higher-level visual effects and 8 films with digital animation technique. It may be observed that the company produced only higher-level visual effects and digital animation films between the years 2010 and 2019, it may also be seen that the number of productions increased considerably in both techniques. In the last ten years, the company has produced 22 films with higher level visual effects and 13 films with digital animation technologies. The company that produced a total of 35 films in the last decade had doubled the production numbers of other companies.

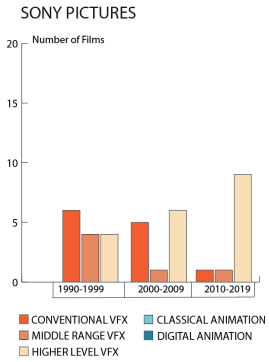

Figure 10. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Sony Pictures Company.

Sony Pictures is the sixth company. They have not produced any animated films in 30 years. Between 1990-1999, they produced 6 films with conventional visual effects, 4 films with middle range visual effects and 4 other films with higher-level visual effects. Between 2000 and 2009, the company produced 5 films with conventional visual effects, 1 other film with middle range visual effects and 4 more films with higher-level visual effects. In the last ten years, the company made 1 film with conventional visual effects, 1 other film with middle range visual effects and 9 more movies with higher-level visual effects. They are among one of the 5 or 6 most successful companies. And the graph shows that they had their success through their orientation into digitalization of their production techniques. And it can be seen that their preference to make movies with higher level visual effects may have an important effect on this matter.

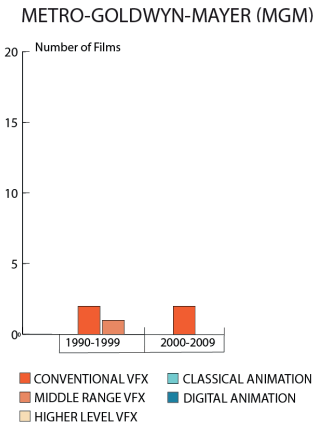

Figure 11. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for MGM Pictures Company.

The seventh company is Metro-Goldwyn Mayer (MGM). The company could only produce films in the top ten highest grossing movies from 1990 to 2009. All of the films produced by the company were movies with conventional and middle range visual effects technologies. Between 1990-1999, the company made 2 films with conventional visual effects and 1 other movie with middle range visual effects. Between 2000 and 2009, they only made 2 films with conventional visual effects and they couldn't produce films that reached to the level of top ten in the box office revenues between 2010 and 2019. These preferences clearly show that choosing conventional visual effects as a production technology may result in failure to stay on top, among the highest grossing movies.

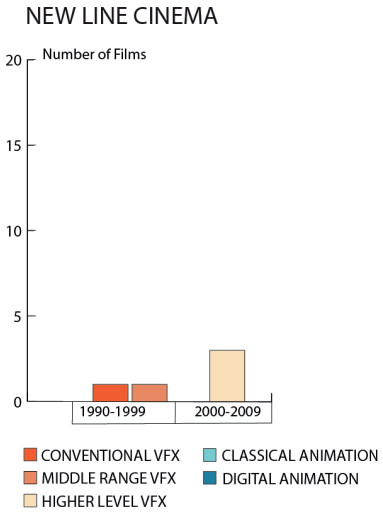

Figure 12. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for New Line Cinema Company.

The eighth company, New Line Cinema, was also unable to remain in the top ten box office revenues with their new films after the first two decades, like MGM. From 1990 to 1999, the company made 2 movies, one made with conventional and the other made with middle range visual effects technologies. Between 2000 and 2009 they could only make 1 other movie with higher level visual effects but obviously it was not enough to remain in the top ten highest grossing movies in the last decade as well as MGM.

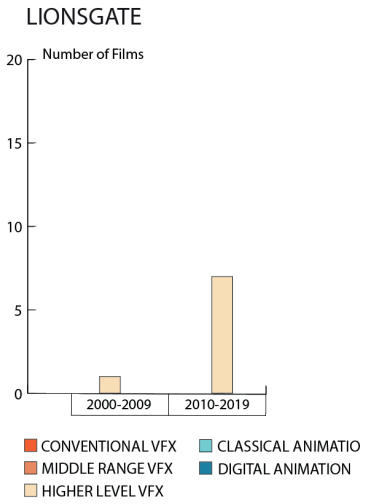

Figure 13. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Lionsgate Pictures Company.

The ninth company is Lionsgate Pictures. All the productions of the company were made between 2000 and 2019, All of the 8 films made with higher level visual effects and the seven of them made between 2010 and 2019. The company started to make successful effects in contrary to MGM and New Line Cinema and it may be connected to the fact that their preferences changed to use higher-level visual effects technologies.

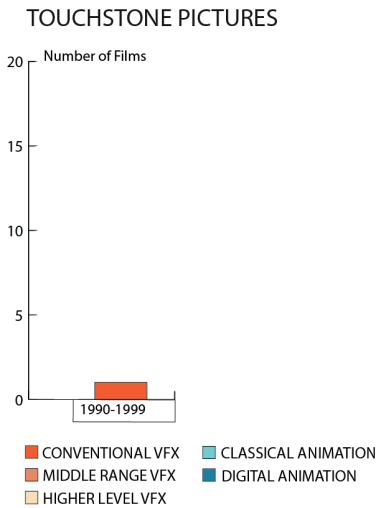

Figure 14. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Touchstone Films Company.

The tenth company is Touchstone Pictures and they only made movies between 1990-1999. They managed to enter top ten box office revenues with 1 film with conventional visual effects.

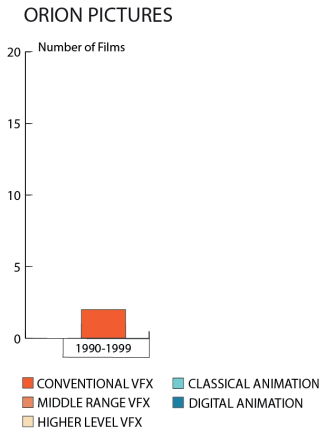

Figure 15. Highest Grossing Movies' numbers for each decade in the category of Animation & visual effects levels for Orion Pictures Company.

The eleventh company is Orion Pictures and they managed to enter the box office with only 2 films made with conventional visual effects between 1990-1999.

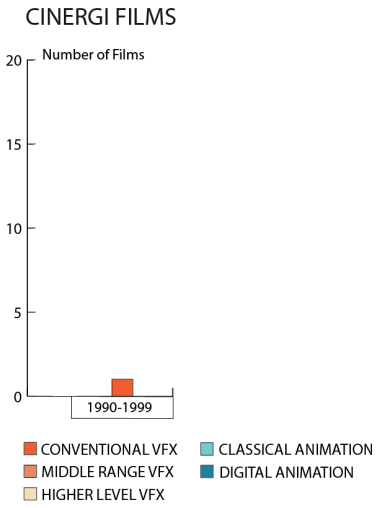

Figure 16. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Cinergi Pictures Company.

The twelfth company is Cinergi Films and just like Touchstone Pictures, they managed to enter the box office with 1 film with conventional visual effects between 1990-1999.

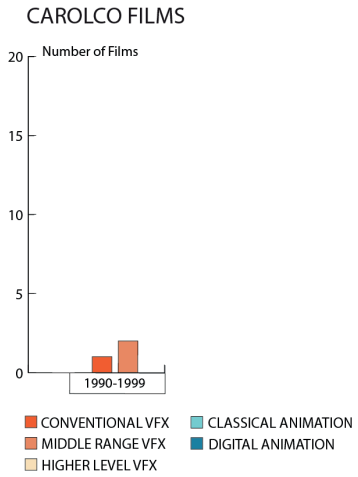

Figure 17. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for CarolCo Pictures Company.

The thirteenth company is CarolCo Pictures they only managed to remain on the top ten box office revenues between 1990 to 1999. They made 3 films with conventional visual effects in the first decade. Their preferences in the cinematic technologies may result this trend to end after a decade.

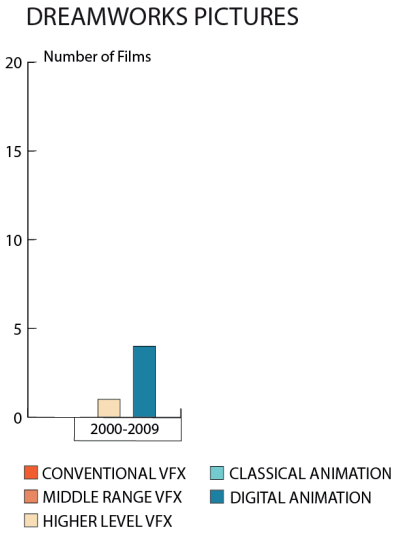

Figure 18. Highest Grossing Movies' numbers for each decade in the category of Animation & visual effects levels for DreamWorks Pictures Company.

The fourteenth company is DreamWorks. In this company, they could take a place in the top ten box office revenues only between 2000 and 2009. They produced movies with only digital animation and higher-level visual effects technologies. The company produced 1 film with higher level visual effects and also, they produced 4 films with digital animation technique. They had relatively high amount of success until NBCUniversal had acquired the company in 2016.

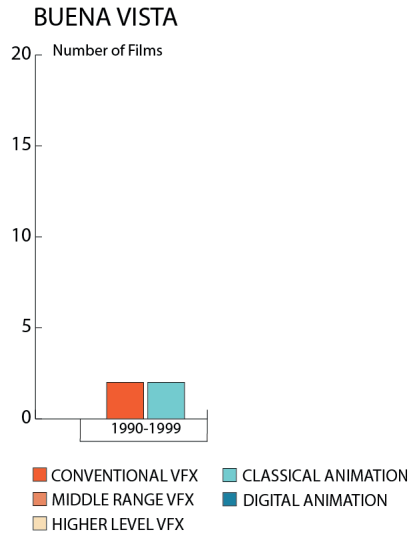

Figure 19. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Buena Vista Pictures Company.

The fifteenth company is Buena Vista Pictures. They only could remain in the top ten box office revenues from 1990 to 1999 like Cinergi and CarolCo. Between these years they made 2 movies with conventional visual effects and 2 more with classical animation technique. Their orientation to remain with conventional cinema may result not to keep going in further years.

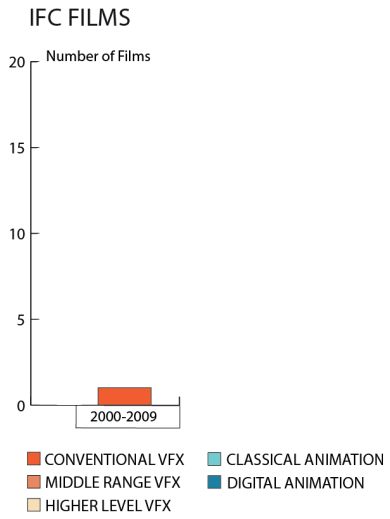

Figure 20. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for IFC Films Company.

IFC Films Company is the sixteenth company among others. They made 1 film with conventional visual effects only between 2000-2009.

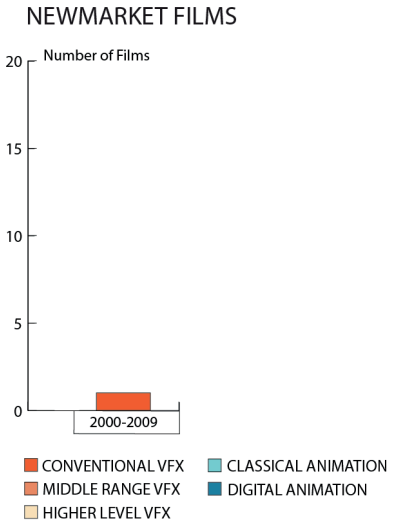

Figure 21. Highest Grossing Movies' numbers for each decade in the category of Animation & Visual Effects levels for Newmarket Pictures Company.

New Market Films, the seventeenth and the last company in the analysis of data chapter made only 1 film with conventional visual effects between 2000-2009 like IFC Films. These last two companies' preferences to make movies with more traditional ways may result their box office revenues relatively low. And consequently, it is quite possible to assume that there is a visible connection between the technological preferences in productions with their highest grossing film revenues. When their orientation is turned to more digital technologies in both animation and visual effects, films have made more revenues and it is a clear data for movie audiences' percentages.

3. CONCLUSION

As a result, the global production trends of the companies were revealed as a result of the figures shared in the study, which brought together from the top ten films for each year in the box office revenues of the last thirty years. Among the 6 companies that dominated the industry for 30 years and managed to remain in the box office records in all 3 decades, Paramount Pictures produced a total of 36 films. 20th Century Fox produced 15 films between 1990 and 1999, 17 films between 2000 and 2009, and 7 films between 2010 and 2019 and made 39 films in total over 30 years. Universal Pictures produced 12 films between 1990 and 1999, 9 films between 2000 and 2009, and 11 films between 2010 and 2019 and made total of 32 films over 30 years. Sony Pictures company produced 14 films between 1990 and 1999, 12 films between 2000 and 2009 and 11 films between 2010 and 2019. The company made total of 37 films over 30 years. Warner Bros. Pictures company produced 15 films between 1990 and 1999, 23 films between 2000 and 2009 and 18 films between 2010 and 2019. They produced a total of 56 films over 30 years. They managed to double the box office success of their competitors. Disney, which stands out the most prominent among these companies, produced 16 films between 1990 and 1999, 16 films between 2000 and 2009, and 35 films between 2010 and 2019. They produced 67 films in total for 30 years and became the leading production company of the last thirty years.

It may be clearly seen that as animation and visual effects technologies improve, the audience's preference of movies is also affected by that development. Globally, advances in both production and screening technologies of cinema have changed the way of films is produced and experienced with a paradigm shift. Over time, the

rate of screening digital films in foreign countries has increased, as well as the production rates of companies have given these preferences in the direction of digitalization. In the research, which set out to question the effect of the digital cinema technologies on the production of films, both the preferences of the society in this area and the transformation of film production companies were tried to be revealed. The digitalization of cinema has caused many technical, aesthetic and sociological changes. Although the conjuncture that emerged as a result of the current cinema-related decisions was considered, the main purpose of this research was to reach the data that would objectively show in which direction a trend was developing. It can be thought that the aim of the research has been achieved in both statistical data and graphics. While the perception of time changes, the preferences of both the audience and the film producer change simultaneously. Under the influence of all these changes, cinema has a tendency to be more digital and more technological. If this process of filmmaking remains to be more digital as it has progressed in the past thirty years, one day a complete break from traditional cinema may be occurred and this may change the aesthetics of cinema once and for all.

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