The Potential of Pop-Up Artworks for Visual Communication in Digital Media

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ABSTRACT

The pop-up mechanism or paper engineering is often referred to a physical card or book, which can show 3D objects when it is opened. When in fact, pop-up artworks can also be found in digital media such as movie, animation, video game, video advertisement, and music video. There are many interesting differences between physical pop-up and digital pop-up that can be analyzed to maximize its potential and create great visual effects, especially in digital media. This research uses a qualitative descriptive method by collecting data through observation of digital pop-up artworks and also literature studies. Various examples will be analyzed to find out the strengths, weaknesses, and potential of pop-up artworks for visual communication in digital media.

Keywords: digital pop-up, pop-up book, paper engineering, visual communication, digital media

INTRODUCTION

Pop-up or paper engineering is a very interesting paper art, because it can create movement and 3D shape from 2D page, by using only paper as its basic material. Storybooks and greeting cards are the examples of pop-up artworks which are most easily found around us. Since the invention of the printing press, pop-up production has increased and spread rapidly. Pop-up has many unique appeals, one of which is the surprise factor, which Robert Sabuda calls as the "Wow Factor" when a book is opened and something moves (Hiebert, 2014, 9). So it is not surprising that children and adults can be fascinated by seeing a book that was flat closed, then when it is opened it can bring up 3D objects. Besides being fun and entertaining, pop-up also makes people understand 3D shapes or the movement of the objects described in the book. Therefore, pop-up is often used for many purposes like entertainment, education, and advertising. Even in the post Covid-19 pandemic, pop-up book media are also referred to as interesting and suitable learning media for students (Setiyanigrum, 2019, 219).

Along with the development of technology, pop-up is starting to be found in many digital media such as movies, games, TV commercials, animations, and music videos. The beauty of this pop-up 3D effect has attracted many moviemakers, art directors, video creators to make their digital visuals through pop-up techniques. As stated by Bernadette Puleo in her thesis that the pop-up/movable paper phenomena has had a major influence on movies, TV commercials and music videos in recent years. The general consensus among industry professionals is that there is a basic love for pop-up by the people who direct and produce this other form of movable media (Puleo, 2011, 30). Pop-up in digital media can be from physical pop-up that are videoed or pop-up created with animation or other digital technologies. Not only for entertainment media, digital pop-up book media are also said to have the potential to facilitate students in this digital age in learning mathematics lessons (Amelia & Karlimah, 2018, 170).

Besides having a beautiful and attractive appearance, a pop-up book or pop-up card can also be used as a medium for delivering messages.. This is what makes pop-up one of the media types favored by visual communication designers. Each visual communication media certainly has its own characteristics. Likewise, physical media and digital media have differences, strengths, and weaknesses in carrying out their functions as communication media. Artistic visuals may also be made to arouse the interest of the target audience. Visual communication design must be able to appear attractive, communicative, effective, persuasive, and contextual (Tinarbuko, 2015, 81). Of course, this also needs to be considered, when a creator wants to create digital pop-up artworks. Physical pop-up has a long history, and many have mastered the technique of making them. However, digital pop-up is still emerging along with the development of digital technology, and there has not been much research. Because the characteristics of the media are different, there needs to be adjustments and further studies if some designer wants to create a pop-up in digital media. Therefore this study will discuss some examples of digital pop-up artwork, to find out the characteristics, strengths, weaknesses, and potential for its development.

METHODS

This research uses a qualitative descriptive method by observing various examples of digital pop-up and also literature study. There are 15 digital pop-ups being observed from 5 types of digital media: animation, video advertisement, video game, music video, and movie. Most of them were launched in the past 10 years (2013-2022). After observing, it will be explained the differences between digital pop-up and physical pop-up from 3 aspects of visual artwork (Soewardikoen, 2021, 41), which are: the image aspect, the production aspect, and the audience aspect. Therefore the characteristics of digital pop-up can be obtained, to get the strengths, weaknesses, and analyze it to develop every potential for creating better digital pop-up artworks.

FINDINGS AND DISCUSSION

In general, there are more examples of physical pop-up artworks than digital pop-up artworks. However, in recent years, digital pop-up artworks are also increasing. In 2011, Bernadette Puleo's thesis has briefly discussed about pop-up in digital media such as pop-up in the Enchanted movie, Lexus TV commercials, The Happy Duckling animation, Fergie's Clumsy music video, and others (Puleo, 2011, 30). Therefore this research will discuss more recent examples of digital pop-up. The following are some examples of digital pop-up observed in this research, and most of them aired in the past 10 years (2013-2022).

Table 1. Pop-up Artworks in Digital media
Source: Personal Documentation

	Image	Description
1		Title: Rio 2 Media: Animation Year: 2014 Pop-up Utility: Storybook Image Source: Movie - Rio 2 https://www.hotstar.com /id/movies/rio-2/
2		Title: Trolls Media: Animation Year: 2016 Pop-up Utility: Party Invitation, Scrapbook Image Source: Movie - Troll https://www.netflix.com/en-en/ title/80108182
3		Title: Sing 2 Media: Animation Year: 2022 Pop-up Utility: Presentation Props Image Source: Movie - Sing 2 https://www.singmovie.com/
4		Title: Kellogg's "Storybook" Television Advert - UK Media: Video Advertisement Year: 2014 Pop-up Utility: Storybooks / Props Image Source: Youtube Kellogg's UK & Ireland https://youtu.be/wFK9y48BlPM

5		Title: The Story of The Crushing Sea Begins, Tokyo Bay Tokyu Hotel Media: Video Advertisement Year: 2018 Pop-up Utility: Storybooks / Props Image Source: Youtube - Tokyu Hotels https://youtu.be/PITGdjwha9w
6		Title: Qatar Airways 'Women's World Cup' Media: Video Advertisement Year: 2019 Pop-up Utility: Pop-up Book, Props Image Source: Youtube - Adelphoi Music https://youtu.be/ifcqUAOUESs
7		Title: Carnival with WeTV Ambassadors Media: Video Advertisement Year: 2021 Pop-up Utility: Christmas Card Image Source: Instagram - WeTV Indonesia https://www.instagram.com/tv/CXsIAbAlKs6/
8		Title: Letto - Kasih Tak Memilih [Official] Media: Music Video Year: 2016 Pop-up Utility: Storybooks / Props Image Source: Youtube - Letto Band https://youtu.be/2nadL05QYVo
9		Title: Cavetown - Home [Official Music Video] Media: Music Video Year: 2020 Pop-up Utility: Storybooks / Props Image Source: Youtube - Cavetown https://youtu.be/2APLh8_ExU0
10		Title: Tengami Media: Game Year: 2013 Pop-up Utility: Background Scene (Setting of The Place) Image Source: Youtube - Nyamyam Ltd. https://youtu.be/NThIOPxtYbw
11		Title: Peronio Media: Game / Interactive Pop-up Book Year: 2015 Pop-up Utility: Background Scene (Setting of The Place) Image Source: Youtube - Peronio Pop-up Book https://youtu.be /e2t1wRiiP3c
12		Title: Enchanted Media: Movie Year: 2007 Pop-up Utility: Pop-up Book in Prologue Scene Image Source: Movie - Enchanted https://www.hotstar.com/en/movies/enchanted/

13		Title: Bedtime Stories Media: Movie Year: 2008 Pop-up Utility: Pop-up Book in Epilogue Scene Image Source: Movie - Bedtime Stories https://www.hotstar.com/en/movies/bedtime-stories/
14		Titles: Paddington 2 Media: Movie Year: 2017 Pop-up Utility: Pop-up Book as The Main Object of The Movie Image Source: Movie - Paddington 2 https://www.youtube.com/watch?v=sw7RElt-SvE
15		Title: Mary Poppins Returns Media: Movie Year: 2018 Pop-up Utility: Pop-up Book as Backdrop / Stage Set Image Source: Movie - Mary Poppins Returns https://www.hotstar.com/en/movies/mary-poppins-returns/

Pop-up for Visual Communication in Digital Media

From the table above, in general, pop-up artwork in digital media has 3 possible ways of making. First, physical pop-up that are recorded directly for the video, for example: Letto and Cavetown music videos. Second, full-animated pop-up, such as pop-up in the animations of Rio 2 movie, Peronio game, and WeTV ads. Third, the combination of physical pop-up recordings and some animations, such as pop-up in Mary Poppins Return movie and Kellogg's ads.

Like physical pop-up, pop-up on digital media also maximize the potential of its visual appearance to communicate a message or a story. This could be an interesting way of storytelling for the audience. For example, in the 2018 Tokyu Hotel ads, Narumi Kaminari designed a beautiful pop-up for various scenes in the TV commercial. This unique way of storytelling grabs people's attention, and makes them watch the commercial to the end. As we know, commercials and movies must attract people's attention from the beginning. So it's no wonder that pop-up artworks are often used as an opening video, such as in Qatar Airways commercials, WeTV commercials, and Enchanted movie. There are also pop-up that are used as the closing of the movie, to give a beautiful and memorable epilogue in the memory of the audience, such as the Bedtime Stories movie. Or there are many videos that use pop-up for storytelling from beginning to end, such as Letto music videos, Kellogg's commercials, Tengami, and many more.

Observing the examples of digital pop-ups in the table above, there are some stages of the visual communication process. At first when a pop-up appears in the video, it will make people surprised. Then they become interested in watching more and not skipping the video. Besides the pop-up makes people keep watching and enjoy the videos, it also makes them understand the message or the story. Until the end of the video, when the pop-up closed, it will amaze the people and leave a good memory, or even the satisfied audience can share the video and talk about it with their friends.

Digital pop-up is often used for various purposes on many occasions. Pop-up books have often been used in movies as useful props or narrative devices (McCarthy, 2019). For example in the Trolls movie, pop-up is used as part of the scrapbook as well as party invitation. In Rio 2 and Paddington 2, pop-ups are used as storybooks. Then most recently, in the Sing 2 movie, the pop-up was used as props for the presentation of the show's concept. In the Mary Poppins Return, the pop-up became a decoration property for the stage set. In Tengami and Peronio games, this pop-up is more interactive and used as background scenes / setting of the place, where the game characters can walk on it. Meanwhile, in Letto and Cavetown music videos, pop-up is used as a storybook to tell and visualize the whole song lyric.

Physical Pop-up VS Digital Pop-up
After observing the 15 digital pop-ups above, it turns out that there are many differences between physical pop-up and digital pop-up. To observe visual artworks, according to Rose, G. (in Soewardikoen, 2021, 41-44) there are 3 aspects that need to be considered: the image aspect, the production aspect, and the audience aspect. The image aspect is the visual artwork itself, which in this discussion is the pop-up artwork. The production aspect in pop-up artworks include: paper engineer/pop-up artist, illustrator, animator, printing and assembly company, other related parties, and also the making process itself. The audience aspect is the people who watch, read, observe, and also the process of how they use the artwork. In the description of the table below, it will be discussed the differences between physical and digital pop-up from these three aspects. These differences need to be understood, to maximize the potential of making each type of pop-up. In this research, what is meant by physical pop-up, is pop-up that can be held directly or touched physically. While digital pop-up are pop-up that are enjoyed through a digital screen. Table 2 will explain the differences between physical pop-up and digital pop-up based on several categories.

Table 2. Differences Between Physical Pop-up and Digital Pop-up
Source: Personal Observation

Aspect	Category	Physical pop-up	Digital pop-up
Image	Visual and Dimension	Physical objects that can be seen in real 3D and touched by hand	In the form of a video that can only be viewed in 2D screen, but has a 3D impression
	Visual Effect	Real motion and visual effect	Digital visual effect (video editing/ animation)
	Audio	No audio (need to add special tools/machines)	Has audio (automatically included in the video)
	Text	Pop-up is often accompanied by text as additional/main information	Generally there is no text in digital pop-up, it only shows visual effects, because the story can be told from the audio
	Durability	Less durable, can be torn/folded/ wrinkled, can be damaged by water, and can be damaged more quickly if used frequently	More durable, files can be stored digitally, can be copied easily, and it will not be damaged even if it is used many times
Production	Makers	Paper engineer/pop-up artist, illustrator, layouter, printing & assembly company, etc	Paper engineer/pop-up artist, illustrator, animator/video editor, etc
	Paper engineering	Creators need to use appropriate paper mechanisms to make the objects stand, create 3D shapes, and movement	Creator can make the mechanism like a real physical pop-up or not, because the pop-up can be moved through the animation program
	How to make	Made with paper, cut out, folded, glued, and pasted	Made using an application/software on a computer
	Cost	Apart from designer, the cost will be quite expensive for printing, assembly, and delivery	Cost focused on paper engineer and animator/video editor
Audience	How to use	Open a book or pop-up card, and readers can observe the pop-up from all sides	Play the video, requiring a digital screen media, the pop-up can only be seen from the angle being videoed/animated
	Duration	Can be adjusted according to the desire of the readers/users	Same as the duration of the video, although it can be played back or paused. Except for the pop-up in video games, which is more flexible
	Uses	Storybooks, textbooks, comics, brochures, invitations, greeting cards, flyers, board games, ads, toys, etc	Movies, animations, advertisements, games, music videos, props, decorations, background scenes, etc

From the table above, it can be concluded that the strengths, weaknesses, and potentials of digital pop-up are:

The Strength of Digital Pop-up
- The pop-up mechanisms can be made like a real physical pop-up or not, because the pop-up can be moved through the animation program.
- Pop-up can be added with digital visual effects from video editing or combined with certain animations to create greater visual effects that are hard/impossible to make in a physical pop-up book.
- There can be direct audio/music in the pop-up, because the format is in video.
- Good for storytelling through audio and visual, because the people don't need to be tired of reading long texts to understand the story or message.
- Created using an application/software on a computer (which could be easier for some creators)
- Digital pop-up is durable, because the files can be stored digitally, can be copied easily, and not damaged even if it is used many times. This greatly solves the challenges of physical pop-up.
- There is no need for a printing company, because it is done digitally. So it really saves the cost of printing, assembly, time, distribution, etc.
- Can be used for various digital media such as: movies, animations, advertisements, games, music videos. Whether it is as a digital book, props, decorations, place settings, and many more.

The Weakness of Digital Pop-up
- It cannot be physically touched (lack of tactile aspect), but can only be viewed on a 2D digital screen with a 3D visual impression.
- Most of the digital pop-ups are enjoyed in a passive way (the audience just watching). It is different from a physical pop-up book that requires interaction from the user. So far, interactive digital pop-up can only be found in video games.
- Generally it is not meant to be read, as there is usually no text, because the story is told from the audio.
- Not only paper engineers/pop-up artists, making digital pop-up also requires an animator/video editor.
- It is made using an application/software on a computer (could be tricky/complicated for some creator).
- To play the videos, the audience needs a digital screen and electrical power.
- The audience's eyes can be more tired seeing a pop-up on a digital screen rather than seeing it physically.
- The pop-up can be enjoyed only from the angle being videoed/animated.
- Time or duration to watch is limited to the length of the video, although it can be played back or paused. Except for the pop-up in video games, which is more flexible.

The Potential of Digital Pop-up.
Aside from many advantages and disadvantages of digital pop-up, it can be found that there are various potentials that can be developed. Because the pop-up format is digital, it can maximize the use of audio or music and visual effects that might be difficult to do in physical books. This will certainly increase the unique storytelling experience, because the audience is surprised, focused, can understand the storyline, and even be impressed. Digital pop-ups have the potential to be combined with other digital technologies such as augmented reality and virtual reality (like pop-up in the Peronio game) and other technologies to produce an even more advanced visual experience. Digital pop-up will be more interesting if it can interact with users like in the Tengami game, so the people don't just watch passively, but can also move the pop-up. Digital pop-up can also be combined with other paper arts such as: origami, paper cut, paper sculpture, paper automata, etc. Even digital pop-up has the potential to be combined with physical pop-up, to overcome each other's weakness. Or the digital pop-up could be made into physical versions to increase public interest after watching the movie. On some occasions, we can see videos as a good promotional media to promote physical pop-up books/cards. Although people have seen the content of the book from the video, it did not diminish people's expectations, but instead increased the desire to have the physical pop-up. Therefore, physical and digital pop-up are not meant to be separated but can be used to support each other to produce great visual sensations that amaze the audience.

'Digital Pop-up' without Pop-up Mechanism
In some cases, there are 'digital pop-up' that do not use real pop-up/paper engineering mechanisms at all. For example, the image below, taken from JP Morgan Chase Ad. The 3D visual effect in this ad is really cool, but actually this only shows 3D objects on the top of the book page, but it doesn't use any pop-up mechanism. Is it wrong or bad? Maybe not. Because it depends on the concept created by the creator. But if what you want is a pop-up effect like in a physical pop-up book, then it's better if using basic pop-up mechanisms such as V-Fold and Parallel Fold. So the visual of the pop-up can be looked more real.

Figure 1. JP Morgan Chase Ad
Source: https://youtu.be/igUhkaaqo0w

Digital Pop-up Tutorials and Templates
Currently, looking at Youtube, there are lots of tutorials on making simple digital pop-up books using various applications. There are also templates provided for free, using programs such as PowerPoint, Adobe After Effects, and many more. Looking at some of the results, it can be seen that there are templates that are quite smooth, such as the image on the bottom left that uses After Effects, and there are also templates that display the split/broken pop-up mechanism, such as the image on the bottom right that uses PowerPoint. Digital pop-up templates can make it easier for people to make simple pop-up animations in a practical way. But of course there are limitations to the pop-up mechanism that can be made, and the results of the pop-up are also less unique when compared to creating a digital pop-up without a template.

Figure 2. Pop-up Template
Left image source: https://videohive.net/item/popup-book-template/27902497?WT
Right image source: https://youtu.be/7iwhITRnhLc

Things to Pay Attention to When Making Digital Pop-up
To make people believe and be amazed by digital pop-up artwork, it is better for the designer to understand the basic mechanism of pop-up. Like in a physical pop-up book, an object can stand, because there is a correct paper mechanism with proper angle and folds. Likewise in movable books, the object can move because there is a tab to pull, or something can rotate because there is a turning wheel. It is true that digital pop-up can be made with animation, so the angles, folds, tabs, and wheels do not seem to really matter, and it can be made in their original size or not. But at least make sure the whole thing looks realistic or makes sense as a pop-up artwork. After that, designers can add digital visual effects to make the pop-up even cooler and more alive. One good example is the pop-up in the Paddington 2 movie. David Hawcock makes the mechanism of the pop-up book really real by moving many scenes according to the actual pop-up mechanism. Before the animation was made, David designed mock-ups of the pages in the book to give an idea of scale and how the paper would fold in the real world (Failes, 2017). After that, animations for the movement of other objects were added, which made the pop-up book in this movie look very magical.

Figure 3. Pop-up Book in Paddington 2
Source: https://www.vfxvoice.com/inside-framestores-paddington-2-pop-up-book-sequence/

CONCLUSION

Nowadays, along with technology advances, pop-up artwork has more opportunities to be shown in digital media. Regarding the characteristics of digital media, of course digital pop-up have their own strengths and weaknesses when compared to physical pop-up, as described in the discussion above. Creators need to understand the characteristics of this digital pop-up in order to create great pop-up artworks and amaze the audience. This will also affect the creation process and the program/application used to create digital pop-up. But regardless of how it is made, in the end what really matters is whether the pop-up can communicate the ideas and messages from the creator to the target audience or not. Because the potential of digital pop-up is not only to show amazing visual effects, but also to be a unique and effective visual communication medium for the target audience.

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