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ARTICLE

Can Images with Isolated Looped Motion or "Cinemagraphs" Improve Science Communication Design?

FARHAT BASIR KHAN

Professor of Communication Design
Department of Design & Innovation
Jamia Millia Islamia, New Delhi-110025, India
E-mail: fbkhan@gmail.com

ABSTRACT

Science communication is not a new concept; scientists have been trying to communicate their scientific findings and theories to the general population for centuries. The communication meant for non-scientists is particularly complex, considering their limited understanding of the subject and weak grasp of certain concepts. Visual communication design has been used in the form of infographics, photographs and illustrations for the popularisation of science.

The use of cinemagraphs or images with isolated looped motion could present an interesting option to communicators to convey focused visual messages. A survey was conducted to see if a group of students (n=120) and teachers (n=28) of a science & technology university saw any value in the use of cinemagraphs. The cinemagraph was deemed to be 42% more informative than the still image by the students and 29% more informative by the teachers.

The participants also found the cinemagraphs to be more useful and attractive than the other formats. Different kinds of motions were defined in the cinemagraphs. participants preferred "small slow subtle motion", "large intermittent motion" and "dispersed localized motion" over the still images and the videos by a wider margin. While making cinemagraphs, picking the right subject to highlight and using the right kind of motion can be used to improve focus and convey messages in a more attractive and useful manner and this could be crucial in improving science communication, especially for the non-scientists.

Keywords Science Communication, Visual Communication, Cinemagraph, Motion Image, Communication Design, Popularisation of Science

Introduction

Science and technology are the basis of all innovation and development and thus the importance of science communication has risen globally in the last decade[1]. The innovations and advancements only benefit society when they find their way into our daily lives. That is possible when science and innovations are understandable to masses. The scientific literacy of the population needs to be improved and scientists, such as Michael Faraday and Humphrey Davy, have been known to engage in efforts to popularise science[1].

In the 21st century, with social media and other digital tools, effective communication is essential for scientists to be successful.[2] Scientific topics that are relevant to the public, from climate change research to discussion around medical advancements, need to be communicated to the public. Communicating complicated scientific ideas to people who are not scientists has been a key challenge[3].

Public Engagement in Science & Technology (PEST) is a priority for governments around the world as it is the driver of the knowledge economy.[3] This makes science communication crucial for democracy as the knowledge of science is important to make decisions that might affect the economy and welfare of the state[4]. New media is offering innovative opportunities to reach out & communicate with people that are exciting and interactive[3]. The use of visualization may help simplify complex scientific concepts where words failed to accomplish the task.

The use of visual imagery is not new to science, however, it has not been extensively studied. Until the 1970s, visual images were not given much importance in science communication, which is no longer the case[5]. Social media and access to affordable devices are rendering visual communication as the preferred medium for communication design for individuals, institutions and organisations. As of 2016, Facebook also allowed users to upload 7-seconds videos, animated gifs or cinemagraphs to replace their Facebook profile picture[6]. According to Constantine, this was done to make the platform more visually appealing and informative[7].

Not only is it relevant for media and communications professionals, but even governments and activists have to rely on their ability to create appealing graphics and iconic imagery[8]. There has been a noticeable shift in using images for mere visual appeal to crafting experiences that recognise cognitive and cultural influences on understanding[9]. Images have become central to the meaning-making process and are used to communicate in distinctive forms across varied contexts and different media formats, through various platforms[8].

Nowadays, there are a lot of efforts to break through the conventional approach of visual communication. Innovative and exciting ways of engaging the audiences are expected from communicators. Pictures, diagrams, infographics and other visuals have become an integral part of science communication[5].

With modern cameras, it has become easy to take short, high-resolution videos or image bursts to capture important and interesting moments. These small, dynamic snippets of time convey more richness than a still photo, without being as heavy as a longer video clip. This type of media has been increasingly used over the years and led to a number of different approaches to creating them. The most straightforward methods make it as easy to capture this imagery as it is to take a photo (e.g., Apple Live Photo). In order to make these formats more compelling and attractive, a number of techniques are used to loop the videos perfectly to create cinemagraphs. In this format, dynamic elements or elements with noticeable motion are placed with static elements, which helps focus the viewer's attention to a specific area of the image. Currently, cinemagraphs still need significant user input to create loops and provide motion to the right areas of the image[10].

Cinemagraph as a new digital media offers a fresh and peculiar approach to visual language. By putting together photography and videography in one dynamic visual harmony, a cinemagraph allows a photograph to be more vivid, as a subtle movement effect is added to certain parts of the image that creates paradox illusions. Cinemagraphs can be classified using their different characteristics such as their aesthetic and sensorial attributes[11].

A cinemagraph is able to capture a 'decisive moment' like a still photograph,[11] but it has a repetitive effect that does not seem to end due to its touch of videography. The effect will result in a memorable experience. The success of cinemagraphs in the world of photography might also be possible to be duplicated in illustrations. Applying cinemagraph to illustrations can bring up an innovative and engaging discourse.

For this study, we consider science communication design to be the communication of scientific study to non-experts. The role of science communication design would be to educate and inform in the simplest and engaging method.

This research aims to explore the potential of the cinemagraph technique in science communication design. How the cinemagraph technique can be used to fulfil the need of visual language as the medium of story-telling, information, identity and art expression, and able to bring uniqueness to the illustration world. The aim of the study is to explore the technique, effect and visual impact, resulting from combining cinemagraph to an illustration work to get the suitable and positive formulation for this technique.

This study will attempt to answer whether a cinemagraph can improve science communication by surveying students and teachers from a science & technology university and recording their responses to the effectiveness of the cinemagraph in comparison to still images and videos.

Background

The technique for creating cinemagraphs is credited to Kevin Burg and Jamie Beck who created them for Paris Fashion Week 2011[13]. The first cinemagraphs were posted on Jamie Beck's photography blog, *From Me to You* on February 13th, 2011[14]. Burg believed that cinemagraphs were made possible through the intersection of technology, bandwidth and modern equipment[13]. Although a similar technique had been used previously to create moving images, the pair got recognition for creating and popularising the new format as they received 38000 comments on their blog[15].

After being covered by some major international publications, Cinemagraph had widespread appeal and popularity. Cinemagraphs intensified the realism of photographs through a depiction of movement in certain parts of the image, making it look alive[16]. Framing a cinemagraph can help accentuate key messages that would otherwise go unnoticed by the viewer[17.] Details such as the blowing of the wind through the air at a beachside can be highlighted through a cinemagraph by muting (making still) all other obscure background activity. Framing of these subtle movements and their juxtaposition to a still environment creates a sense of wonderment and conveys a message repeatedly[18].

Shifting the focus on a visual or graphical representation is useful and a cinemagraph is able to draw attention to specific parts & messages in such communication. A well-made cinemagraph will create a focal point of movement in a visual frame to actively create awareness of that particular event for the observer[19]. This helps in drawing attention to certain information while using the rest of the photograph as context. The paradox that is created can help stimulate the brain of an observer to repeatedly translate the accepted visual signal[16]. Park, Bae and Cho emphasised that cinemagraph could not only increase focus or level of attention but also encourage the observers to make decisions based on what they could see[20].

The quality of cinemagraph to draw focus to pinpointed information has ensured its use in advertising. To exemplify the usage, where an image is said to convey 1000 words, a cinemagraph would help isolate the phrase that conveys the key message. This has led to many international brands using cinemagraphs for their brand communication to attract more eyeballs[21]. The impact of cinemagraphs on consumer choices has been studied by Park & Rhee, who found that such images were more effective in affecting choices and decision making[22].

A case study of the impact of cinemagraphs in social advertising also found the cinemagraphs used in social ads to increase engagement by 85% on Facebook and by 110% on Twitter[23]. This makes a strong case for the use of cinemagraphs in science communication as it is known to create focus and improve engagement. The efficacy of a cinemagraph can vary

depending on the quality of the image, the animation and several other factors. Advanced processing skills, the right paradox and the choice of motion can affect the outcome. To understand a video commercial or a still picture ad, the target groups must devote more time, attention, and intellect as compared to a Cinemagraph[24]. Beyond this, the rules of Graphics Interchange Format (GIF) apply, which means the quality of the individual frames, as well as the final animation, will determine the quality of the cinemagraph.

Methods & Materials

For this research, a survey method was implemented. A close-ended questionnaire was prepared and administered to a sample of students and teachers selected voluntarily at an educational institution of science and technology. A Likert Scale was used with 7 points to collect the responses. A total of 120 students (age group 18-25) and 28 teachers took part in the survey. Out of the total number of students, 75 were female while 17 female teachers participated.

The participants were shown a series of sets of still images and cinemagraphs containing the same information in a classroom setting (the details of the sets and the corresponding images are presented below). After the exercise, the participants were asked to fill in the questionnaires to understand the varying impact of the two on the participants in terms of information conveyed, appeal, attractiveness, perceived quality, favourability and effectiveness.

The data from the results were manually analysed to draw patterns and inferences to define the type of cinemagraphs, their impact on the audience, and their possible applications. The data from the Likert Scale was recorded and plotted using Microsoft Excel to derive insights and numeric data from the survey questionnaires.

The following sets of resources were administered to the participants for observation:

Set 1 – Still Image, Video & intermittent continuous motion Cinemagraph

The content of the three formats was the same: a girl blowing bubbles (figure 1). However, in the cinemagraph, only the bubbles were animated and played on a loop (using intermittent continuous motion), adding a special focus to the process of bubbles being made.

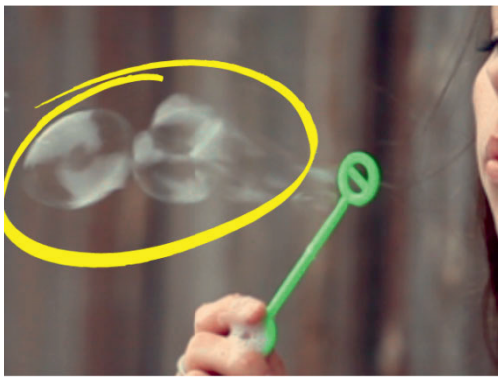

Figure 1: The bubbles highlighted with yellow colour in the image were in motion to create the cinemagraph

Set 2 – Still Image & obvious continuous motion Cinemagraph

A still picture depicting the entrance of a house where the porch and the walkway are visible. The cinemagraph focuses on the lamppost where the light is seen flickering in an "obvious continuous motion" (figure 2).

Figure 2: The light highlighted with yellow colour of the lamp in the image was in motion to create the cinemagraph

Set 3 – Still Image & small, slow and subtle motion Cinemagraph

A picture of a girl swinging on the swings by herself beside an empty swing was chosen for the still image. For the cinemagraph, the empty swing is moving as if someone had just vacated the swing, leaving it in a state of motion (figure 3). The motion chosen for this cinemagraph was "small with slow subtle motion".

Figure 3: The swing highlighted with red colour in the image was in motion to create the cinemagraph

Set 4 – Still Image & intermittent motion Cinemagraph

A picture of fresh-looking tomatoes was used for the still image. For the cinemagraph, the water was shown to be dripping from the tomatoes. The movement of the water is intended to increase the perceived freshness of the fruit through "intermittent motion".

Set 5 – Still Image & large intermittent motion Cinemagraph

A still image depicts a castle with grey skies and a heavy cloud cover. In the cinemagraph, lightning is depicted through "large intermittent motion".

Set 6 – Still Image & large background motion Cinemagraph

The still image depicts a can of a soft drink in front of a swimming pool. In the cinemagraph, the water in the pool is shown to be moving through "large background motion".

Set 7 – Still Image & dispersed localised motion Cinemagraph

A closeup, still image is used to depict bacon strips being cooked in a pan. For the cinemagraph, "dispersed localised motion" is used to show bubbles during the cooking of the strips.

Data Analysis

The respondents were asked to rate each format in each set on the following attributes:

Informative	Useful	Positive	Favourable	Good	Appealing	Attractive	Exciting	High quality

The data collected from the questionnaire was analysed in two different ways. First, all the cumulative scores from the responses on the Likert scale were added together to get an overall preference. Second, averages were derived for all the responses for comparison between the different formats used in each set.

Result

In Set 1, the majority of the participants saw the cinemagraph to be the most informative. The still images were perceived to be the least informative of the three. Figure 4 highlights the difference in points recorded for the three formats. It is noted that students, as well as teachers, had a similar response to the question, eliminating any dependency on the age group or educational qualification.

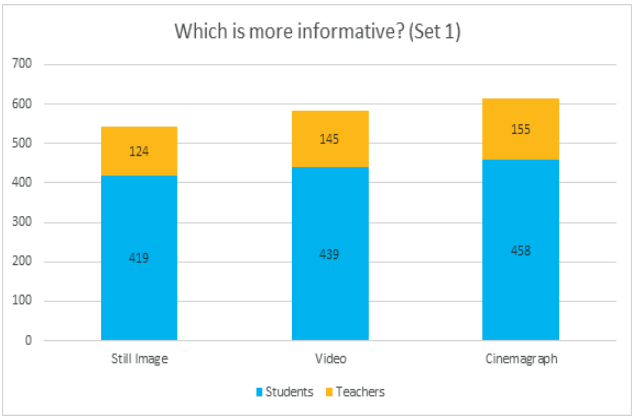

Figure 4: Which format conveys the most information? Cumulative scores from the responses for Set 1

For the other sets, the majority of the participants favoured cinemagraph for being the most informative. Table 1 depicts the cumulative scores from various responses from all the different sets. Cinemagraph scored the highest for being the most informative format in all 7 sets.

Table 1: Sum of responses from all sets for the question "Which is the most informative" format

	Students	Teachers	Total
Set 1			
Static Image	629	140	769
Video	630	148	778
Cinemagraph	621	165	786
Set 2			
Static Image	479	134	613
Cinemagraph	510	156	666
Set 3			
Static Image	473	112	585
Cinemagraph	486	151	637
Set 4			
Static Image	569	143	712
Cinemagraph	577	167	744
Set 5			
Static Image	507	143	650

Cinemagraph	565	174	739
Set 6			
Static Image	547	146	693
Cinemagraph	528	167	695
Set 7			
Static Image	516	125	641
Cinemagraph	546	157	703

In Set 1, cinemagraph was also the top choice for the most useful format in conveying a message. The video was the second most useful form. Both students and teachers ranked cinemagraph over video and static images. Table 1 shows the comparison between the cumulative scores for the three formats in Set 1.

For Set 2, the cinemagraph was found to be more informative as well. The cinemagraph scored 500 points (cumulative) for information conveyed as compared to 482 by the still image for the students. The teachers cumulatively scored the still image at 128 and the cinemagraph at 153. For Set 3, the participants found the cinemagraph to be significantly more informative than the still image (Figure 5). The cinemagraph was deemed to be 42% more informative than the still image by the students and 29% more informative by the teachers.

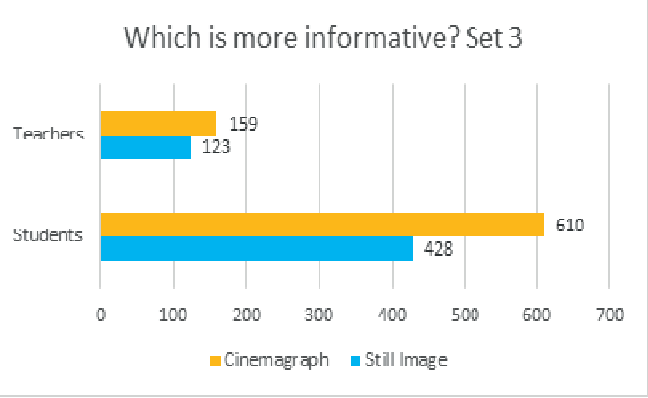

Figure 5: Which format conveys the most information? Cumulative scores from the responses for Set 3

Cinemagraph scored the most points in perceived usefulness in conveying a message. In Set 1, where three formats were used

to convey a single message, cinemagraph scored the highest, followed by the video format. Figure 6 depicts the differentiation in scoring for the three formats.

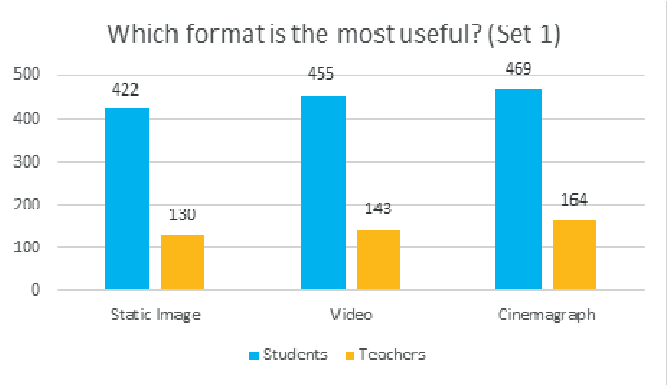

Figure 6: Comparative scores from Set 1 for what the participants think is the most useful

Static Image Vs Cinemagraph

Cinemagraphs scored higher than static images in every category other than 'positive', where static images were preferred. The categories where the cinemagraphs scored the most over the static images were "informative", "useful", "attractive", "exciting" and "high quality".

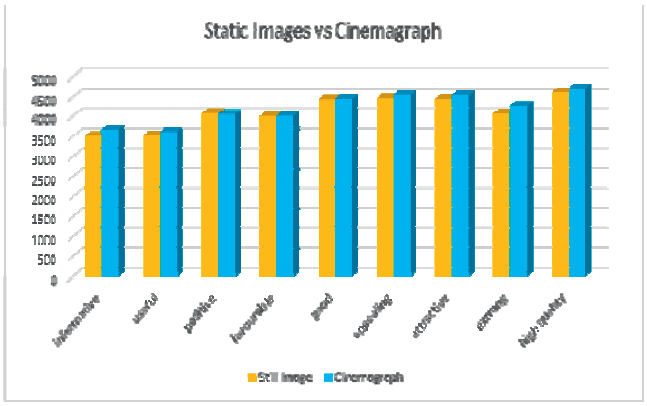

Figure 7: Cumulative scores for static images & cinemagraphs across 9 categories

Does the Type of Motion Impact the Result?

In differentiating between the effectiveness of static images and cinemagraphs, the kind of motion used for cinemagraphs also impacted the outcomes. Table 2 lists the average scores for various categories when different motions are used in a cinemagraph. The average scores represent the difference between average scores of the cinemagraphs and the average scores of static images (average cinemagraph score minus average static image score).

For the "informative" category, cinemagraphs scored 0.5 average score more when "large intermittent motion" was used as compared to when "large background motion" was used. Similarly, cinemagraphs with "small slow subtle motion" were deemed more useful than static images as compared to cinemagraphs with "large background motion" and "intermittent motion".

The three most effective motions for cinemagraphs were "small slow subtle motion", "large intermittent motion" and "dispersed localized motion".

Table 2: Average scores of the difference between cinemagraphs and static images (average cinemagraph score minus average static image score) for all sets

	Informative	Useful	Positive	Favourable	Good	Appealing	Attractive	Exciting	High quality
Intermittent continuous motion	0.7	0.8	0.35	0.5	0.5	0.45	0.45	0.6	0.55
Obvious continuous motion	0.55	0.55	0.1	0.2	0.3	0.6	0.6	0.65	0.75
Small slow subtle motion	0.75	0.9	0.45	0.7	0.65	0.75	0.9	0.6	0.9
Intermittent motion	0.5	0.4	0.45	0.45	0.7	0.85	0.85	0.9	0.65
Large intermittent motion	0.8	0.75	0.5	0.6	0.75	0.9	0.75	0.8	0.95
Large Background Motion	0.3	0.4	0.5	0.4	0.6	0.8	0.8	0.9	0.8
Dispersed localized motion	0.7	0.65	0.5	0.5	0.6	0.95	0.9	1.05	0.75

Does Gender Play a Role in Perception Towards a Visual Format?

A difference was noted in some instances between the male students and teachers' responses compared to their female counterparts. Table 3 lists the average values recorded for the responses provided by male and female students and teachers.

Table 3: Average response value recorded by male vs female (students and teachers) for Set 1

		Male		Female	
		Teacher	**Student**	**Teacher**	**Student**
Informative	*Image*	5.6	3.6	3.6	3.3
	Video	6.1	3.9	4.6	3.5
	Cinemagraph	6.3	3.9	5.0	3.7
Useful	*Image*	5.0	3.5	4.3	3.5
	Video	5.8	3.9	4.6	3.7
	Cinemagraph	6.3	3.9	5.6	3.9
Positive	*Image*	5.4	5.3	4.7	5.4
	Video	5.9	5.2	4.9	5.3
	Cinemagraph	6.3	5.3	5.6	4.9
Appealing	Image	4.4	5.4	5.3	5.5
	Video	6.1	5.1	4.9	5.4
	Cinemagraph	5.9	5.1	5.9	5.5
Exciting	*Image*	4.6	4.6	5.2	4.7
	Video	6.2	4.6	5.2	4.8
	Cinemagraph	6.0	5.0	5.7	4.5

Overall, in almost all the instances, the averages for male and female responses point towards a preference for the cinemagraph over still images and in the majority of the instances, a preference for cinemagraph over the video. The preference for certain formats doesn't have any clear correlation to the gender of the responders. There is a difference in how much more informative or useful the participants found the formats.

The data indicate that female participants find cinemagraphs more informative and useful than both still images and videos. The average response score for cinemagraph for perceived levels of information for the females was 4.3 while it was 3.4 for still images and 4.0 for the video. The women found the cinemagraph more informative than the video by 7% and more than the still

image by 20%. Men found the cinemagraph more informative than the video by 2% and more than the still image by 10%.

Discussion

There is a noticeable difference in how consumers interpret and perceive the various digital graphical formats. Each format elicits a unique reaction from the consumers, meaning that for the same content or information in different formats, there can be a different reaction from the same consumers. As depicted in this study, the consumers can prefer a certain format for certain attributes and favour yet another format for different attributes. There is evidence for using cinemagraphs in professional photography and media to evoke the right kind of emotions[25].

Cinemagraphs were the more informative and useful formats according to the respondents of the survey. This can be attributed to the possibility of highlighting any one part or perspective of an image or video through motion while other parts remain static. This directs the observer towards the highlighted portions and allows him or her to focus on this one part of the image. Sometimes, the content creators use the same photograph or a video to focus on different parts to create different cinemagraphs to evoke different emotions[25].

Cinemagraphs can take time and effort to create, however, a well-made cinemagraph can create more impact than a still image. Toet *et al.* studied the impact of cinemagraphs using food imagery against still photos to study for increased desirability of shown food items[25]. They found that cinemagraphs could increase the desirability for certain foods by emphasising their hedonic qualities, such as lusciousness & freshness. Eris *et al.* also studied the impact of cinemagraphs vis-à-vis static images and videos but did not find statistical differences between the three formats for information recognition[26]. This is an indication of dependability on the content and kind of information being presented. However, it presents cinemagraph as a suitable alternative for information dissemination through the visual format.

The participants of this study found the cinemagraph to be more compelling (exciting) and of higher quality as compared to the other formats across all three sets of visuals. This can be

partially attributed to the novelty of the cinemagraph. As a newer format, it appears to be visually striking and more engaging. Dawes (as cited in Khan, 2016) reported that ads that utilised cinemagraphs had 5.6 times the click-through rate than the conventional still image ads.

It was observed that while gender was not a significant determinant in the responses, age or occupational influence may not be discounted at this point. The teacher participants overwhelmingly preferred cinemagraphs over the other formats. This can be attributed to the limited exposure of the teachers to cinemagraphs as opposed to the students who come across the said format often through social media or the latest mobile phone devices that offer features to develop them. However, this can be an important study for the future to determine the effect of new-age digital visual formats across age groups.

Conclusion

Cinemagraphs are a relatively new medium that extends the functionality of animated GIF format. It was made popular due to social media and photo sharing communities that found it exciting and useful. Cinemagraphs combine photographic, animatic and cinematographic techniques to create a new, useful medium of visual communication design. By framing focal points and subtle movements, cinemagraphs can be used to convey messages that would otherwise easily be missed in a still photograph or lost in the background in a video. By framing the event as the focal point, cinemagraphs convey information quickly and effectively. For the use of motion, "small slow subtle motion", "large intermittent motion" and "dispersed localized motion" were the most effective.

This study finds significant statistical evidence in the cinemagraphs as the preferred visual format for information transmission, messaging effectiveness creating excitement, and conveying quality. These qualities are essential for science communication, where the idea is to transfer knowledge most simply and effectively. By using different techniques in the framing process, cinemagraphs will have application in marketing, advertising and even education. Cinemagraphs could also add value

to the game publishers trying to publish games using static images only. Using cinemagraphs will add excitement and information to such games without significantly adding megabytes to their download size. From a communication design research perspective, more research is warranted into the impact of partially moving images on the retention of information and recall.

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