Gelar: Jurnal Seni Budaya
Vol 22, No. 2, December 2024 pp. 182-192
https://jurnal.isi-ska.ac.id/index.php/gelar/index
E-ISSN 2655-9153

The potential of onomatopoeia from Javanese culture as assets for visual work creation

Sayid Mataram [a,1 *], Arif Ranu Wicaksono [a,2], Anugrah Irfan Ismail [a,3], Peter Ardhianto [b,3]

[a] Universitas Sebelas Maret, Jl. Ir. Sutami 36 A Kentingan, Surakarta 57126, Indonesia
[b] Universitas Katolik Soegijapranata, Jl. Pawiyatan Luhur Sel. IV No.1 Bendan Duwur, Semarang 50234, Indonesia
[1] sayidmataram@staff.uns.ac.id*; [2] arifranu@staff.uns.ac.id; [3] a_irfan_ismail@staff.uns.ac.id; [4] peter.ardhianto@unika.ac.id
* Corresponding Author

ABSTRACT

Onomatopoeia is one of the visual elements in graphic design works. Cultural diversity in Indonesia has the potential to produce domestic onomatopoeia. *Antawacana* is one of the speech cultural activities of natural sound mimesis in Javanese society. It is the speech and sounds performed by *Dalang* of *Wayang Purwa* (puppeteers of shadow puppet performance). This research examines the potential of Indonesian domestic onomatopoeia, especially Javanese, which comes from the speech of puppeteers as an asset to support the increase in potential and productivity in the field of graphic design. This research converts audio into visual items to develop Indonesian domestic onomatopoeia based on the domestic cultural asset of *Antawacana*. This research interprets sound into visuals by using *Antawacana* as the basis for visualization. The variety of sounds in *Antawacana* itself results from *Dalang's* interpretation. This research contributes to the Indonesian creative industry by providing visual assets based on *Antawacana*. These assets can assist the communication process in other creative works. In addition, along with technological developments, the potential of onomatopoeia as a domestic cultural asset can be developed into an artificial intelligence asset in online graphic design creation platforms.

OPEN ACCESS

Article History
Received 2024-07-10
Revised 2024-08-21
Accepted 2024-11-13

Keywords
Onomatopoeia
Javanese culture
Visual assets
Creation of art
Visual work creation

1. Introduction

Onomatopoeia is part of a phonogram or sound visualization and is one of the visual elements in graphic design works. The function of onomatopoeia is to create nuances and emotional involvement of the audience through visualization of events and sound expressions [1]. Onomatopoeia gives a particular impression of visual exposure in visual works, where the impression can visually emphasize the audio elements that should be in the real world. Audio or sound classified as onomatopoeia is the result of human interpretation, so the audio interpretation is influenced by physical, environmental, and cultural entities, which then creates a variety of different onomatopoeia descriptions for the same sound. Onomatopoeia is often used in comics, graphic novels, animation, multimedia, and other works that use graphics [2], [3], especially typographic elements. Onomatopoeia is a writing element that is part of a phonogram, so the main element is writing that is arranged in such a way as to adjust the visual elements of shape and color to give an impression to the reader or audience [4]–[6]. Most of the onomatopoeia used today around the world are adopted from events and sound expressions of Western culture [7]–[9]. The use of popular and habitual Western onomatopoeia items seems to create a generalization in sound visualization activities in the creative industry, including in Indonesia. In fact, Indonesia has cultural diversity with the potential to produce domestic onomatopoeia items. For this reason, the domestic creative potential that comes from Indonesian culture, especially the speech culture, needs to be mapped and developed into a form of sound visualization to produce Indonesian onomatopoeia [10]–[12]. Indonesia has diverse cultures, and each culture has a variety of languages. Each language derives a variety of sub-

 ISSN 2655-9153

languages influenced by various determining factors in the form of physical entities, living environment, geographical conditions, and certain habits in the community. This means that Indonesia has a vast wealth of speech varieties, which, unfortunately, are not thoughtfully developed by the community, especially as visual material in design. Most people take the culture of speech for granted as their daily language. Another cause of this lack of development is the presence of more popular speech in society, such as those from Western culture. In Javanese society, a speech can be considered valuable because of its speakers, and one of those speakers is *dalang wayang purwa*, a puppeteer of *wayang* (shadow puppet) performance. *Dalang* is one of the professions in the Javanese entertainment world where one of the elements of performance's requirements is how they produce the art of speech in the context of *wayang* performances.

One form of speech culture is the activities performed by *Dalang* of *Wayang Purwa* performances, *Antawacana*. In shadow puppet performances, in addition to performing the movements of shadow puppet figures, *dalang* is also required to create a dramatization nuance using *Antawacana* [13]–[15]. The *Antawacana* has various intonations of character dialog, sound expressions, and sound events, which are the primary capital for creating onomatopoeia originating from Indonesian domestic culture. *Antawacana* has potential and is a capital that can be developed into visual forms of onomatopoeia to increase the potential and productivity of the design and fine arts field in Indonesia's creative industry. From this description, the problem of this research is formulated into, 'How to design Indonesian domestic onomatopoeia from Javanese speech assets, especially those said by *Dalang*, as a supporting asset to increase the potential and productivity of the graphic design field?' To answer this question, this research was conducted to study the steps to develop domestic onomatopoeia by creating audio conversion to visual forms, and designing a variety of Indonesian domestic onomatopoeia based on the cultural assets of *Antawacana*. This research contributes to the provision and improvement of visual assets based on *Antawacana*. Further, these assets can help the communication process in other art work creations.

2. Method

This research created an onomatopoeia model from Indonesian culture, namely *Antawacana*. The modeling was done by converting *Antawacana* audio recording data into a visualization. *Antawacana* is a product of Indonesian tradition that has the potential to be broken down into onomatopoeia classifications in the forms of sound shapes, sound tones, and sound associations. The concept of sound symbolization refers to objects or characters that produce sound. The concept of sound tone refers to the level of loudness and weakness of the sound produced. Meanwhile, sound association refers to the form of sound produced from perception and imagination. Visual semiotics and aesthetic perception were used to analyze sound form and sound association. Meanwhile on the sound tone, the resonance level of sound was analyzed. Indonesian onomatopoeia, as the product of this research, is an essential graphic design element in increasing the potential of Indonesia's creative industry through the addition of culture-based visual assets because domestic onomatopoeia can be used to translate foreign onomatopoeia and show national identity through visualized domestic speech content.

2.1. Sound Interpretation

In art and design, onomatopoeia is a visual interpretation of sound (phonogram) to create a visual mimesis of sound that affects the reader's interaction with the medium. This sound mimesis comes from human voices, non-human voices, noise, and sounds produced by inanimate objects (Fig. 1). Mimesis is an act of imitation; in this context, the imitation is done on audio or sound objects [16]–[19]. As mentioned, the sound object is naturally produced by several objects and conditions. Human objects can produce sounds through vocal cords or other organs, such as conversations, farts, breaths, burps, sneezes, hiccups, screams, and snoring. Non-human objects are sounds produced by creatures other than humans, such as animal sounds, the scraping of twigs, and the voices of mythical creatures such as ghosts, fairies, and spirits. These non-human living creatures sometimes produce sounds similar to those produced by humans. Inanimate objects produce sounds that are the result of an event (*e.g.,* the sound of

 ISSN 2655-9153

knocking, rifle blasts, and the gurgling of water), sounds that are based on specific materials (*e.g*., the clinking of glass, the clatter of drums, and the explosion of gunpowder), and sounds from the particular shape of an object (*e.g.* the bulging shape of gamelan, the flat shape of metal, the thin shape of paper). Object noise is produced by inanimate objects but with a tight intensity of repetition, such as the swish of the wind, the crash of waves, the thunder, and the roar of lightning. There are also imaginary sounds, such as heart sounds, dreams, visualizations of thoughts, and the throbbing of a headache.

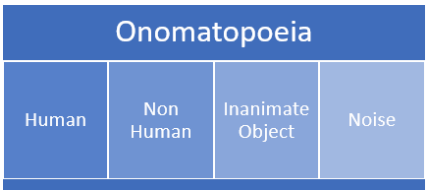

Fig 1. Objects of sound mimesis

According to Scott McCloud [20], the form of onomatopoeia displayed in comics, as one of the media that often uses it as part of visual content, is grouped into four categories, namely based on (1) the level of loudness - which can be indicated using the large sizes, oblique shapes, as well as exclamation marks; (2) tone colors or timbre - based on the quality of the sound indicated by the roughness of the shape, wavy, sharp, shrill, faint and so on; (3) association-styles and shapes of letters based on interpretations that represent or resemble specific sound sources; and (4) graphic integration – letters mixed with images as a single sound effect in a visual exposure (Fig. 2). The sound shape of the loudness of the sound affects the thickness and thinness of the typeface used. The shape of the timbre will produce sounds that require decorative visuals, such as the repetition of resonant waves. The sound association is an attempt to translate sound in the minds of viewers, where sometimes one sound produces the same sound with another but from different types of objects (for example, the thunder of lightning with the thunder of a bomb). Meanwhile, graphic integration is often used to visualize imaginary sound effects (*e.g*., the throbbing of a headache). Loudness and timbre can be measured using specific media, while sound association and graphic integration are derived from perspective or interpretation, so measurement is impossible.

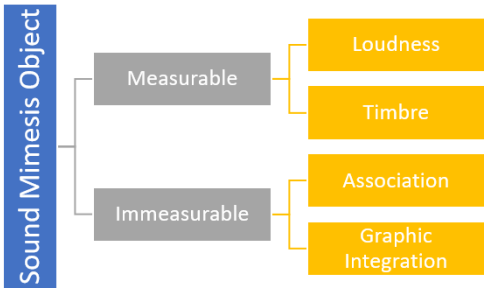

Fig 2. Divisions of onomatopoeia forms

2.2. Visual Conversion

The conversion from sound to visual elements is done through several steps: recording the sound, interpreting and measuring the sound, and visualizing the sound. The first step, sound recording, was carried out on the selected sample, which in this case was the recording of the *Dalang*'s voice. *Dalang* profession was selected for this study because they professionally interpret the sounds in shadow puppet performances, ranging from monologue, dialogue, and narration, to onomatopoeia sounds needed to add nuances to the dramatization of the play or story. To be noted, *Dalang* interprets the sounds based on their insights and perceptions, which are strongly influenced by their culture and living environment. Thus, the result of the sound interpretation is still subjective but can also be considered a common thing in their community space. In the second step, sound samples were selected by interpreting natural sounds into sounds spoken by the *Dalang*. *Dalang* produce highly subjective sounds based on their interpretation as the basis for mimesis or sound imitation. The *Dalang* then speaks the imitation of the sound to dramatize their performance (Fig. 3). This certainly complicates the generalization process; however, when the *Dalang* performs and the audience accepts the

 ISSN 2655-9153

results of the sound mimesis, generalization of the sound form conversion slowly takes place. This generalization becomes even more concrete when the audience then brings the conversion to their society or community.

Fig 3. Conversion process of sound by *dalang*

Since many sounds can potentially be visualized, this research used a random sampling method to select the sounds to be visualized [21], [22]. Only one sample was randomly selected for each sound object. This was done to test the sound measuring software and the visual form of onomatopoeia sounds. The sound samples are the sound of thunder (*gludug-gludug-gludug*), the sound of waves hitting a rock (*byur-byur*), the sound of knocking on wood using a hard object (*tok-tok-tok*), the sound of a brass blade instrument of gamelan (*thing-thing*), the sound of a *gamelan* instrument with a bulging tip that is hit hard so that it produces a reverberating sound (*gongggg*), and the sound of farts (*duuutt*). The third step was taking measurements using the Decibel X mobile application. The Decibel X measuring instrument was chosen because of its ability to record professionally and is calibrated for reliable accuracy. From these measurements, details were obtained as shown in Table 1.

Tabel 1. Sound measurement

Sound	Sound Level Meter	Decimeter
Gluduk - Gluduk – Gluduk (Sound of thunder)	Frequency weighting: A Response time: Fast (0.2s) Calibration: +0.0dB Avg/Leq: 73.4dB Min: 34.8dB Max: 80.3dB Peak: 85.0dB	Standard: NIOSH Treshold: 85dB Exchange Rate: 3dB TWA: 0.0dB Dose: 0.0% Projected Dose: 0.0%
Byur – byur (sound of wave hitting rocks)	Frequency weighting: A Response time: Fast (0.2s) Calibration: +0.0dB Avg/Leq: 80.1dB Min: 30.4dB Max: 88.1dB Peak: 88.8dB	Standard: NIOSH Treshold: 85dB Exchange Rate: 3dB TWA: 40.0dB Dose: 0.0% Projected Dose: 18.3%
Tok – tok – tok (sound of wood knocking hard object)	Frequency weighting: A Response time: Fast (0.2s) Calibration: +0.0dB Avg/Leq: 78.5dB Min: 32.2dB Max: 88.2dB Peak: 93.2dB	Standard: NIOSH Treshold: 85dB Exchange Rate: 3dB TWA: 38.3dB Dose: 0.0% Projected Dose: 10.4%
Thing -thing (sound of brass blade instrument of gamelan)	Frequency weighting: A Response time: Fast (0.2s) Calibration: +0.0dB Avg/Leq: 78.0dB Min: 30.8dB Max: 86.1dB Peak: 88.1dB	Standard: NIOSH Treshold: 85dB Exchange Rate: 3dB TWA: 37.3dB Dose: 0.0% Projected Dose: 9.8%
Gonggg (sound of a gamelan instrument with a bulging tip that is hit hard)	Frequency weighting: A Response time: Fast (0.2s) Calibration: +0.0dB Avg/Leq: 84.0dB Min: 34.4dB Max: 93.4dB Peak: 96.4dB	Standard: NIOSH Treshold: 85dB Exchange Rate: 3dB TWA: 47.4dB Dose: 0.0% Projected Dose: 72.9%
Duuutt (sound of fart)	Frequency weighting: A Response time: Fast (0.2s)	Standard: NIOSH Treshold: 85dB

 ISSN 2655-9153

Sound	Sound Level Meter	Decimeter
	Calibration: +0.0 dB Avg/Leq: 94.6 dB Min: 44.9 dB Max: 102.8 dB Peak: 105.9 dB	Exchange Rate: 3dB TWA: 56.5 dB Dose: 0.1% Projected Dose: 928.3%

The fourth step was interpreting the sound, which has been converted into speech and measured, into a visual form. The visual conversion began by looking for visual references and comparing to the results of the measurements made. The visual references are onomatopoeia and onomatopoeia designs used in comics, animation, movies, and several other visual works. The visual reference can be seen in Table 2.

Tabel 2. Visual references

Sound	Visual References
Gluduk - Gluduk – Gluduk (Sound of thunder)	
Byur – byur (sound of wave hitting rocks)	
Tok – tok – tok (sound of wood knocking hard object)	
Thing -thing (sound of brass blade instrument of *gamelan*)	
Gonggg (sound of a gamelan instrument with a bulging tip that is hit hard, an echoing sound)	
Duuutt (sound of fart)	

The visual composition of onomatopoeia design [23], [24] is based on the loudness of the sound, the repetition of the sound, the timbre, and the visuals surrounding it as a form of association with the sound source (Fig.4). The loudness of the sound and its repetition results in the design of writing using thick or thin letters and the number of repetitions. Timbre produces curves or repetition of acute angles in onomatopoeia letter designs. The visuals surrounding the sound, such as the sound of lightning, involve visuals of light branching out, thus associating with its shape during graphic processing. In addition, the speech uttered by *Dalang* in the context of an *Antawacana* is also considered.

Fig 4. Visual composition of onomatopoeia design creation

 ISSN 2655-9153

The visual reference was then processed into an onomatopoeia designs using graphic software. The design processing includes elements of letters and writing, colors, and ambiance graphics that will become visual effects to dramatize the onomatopoeia forms. Graphic processing was done using SAI Paint Tool software and Adobe Photoshop. The visual design process sequentially started with sketching (Fig. 3), shape affirmation using line art (Fig. 4), coloring process in the final stage, and finishing (Fig. 5).

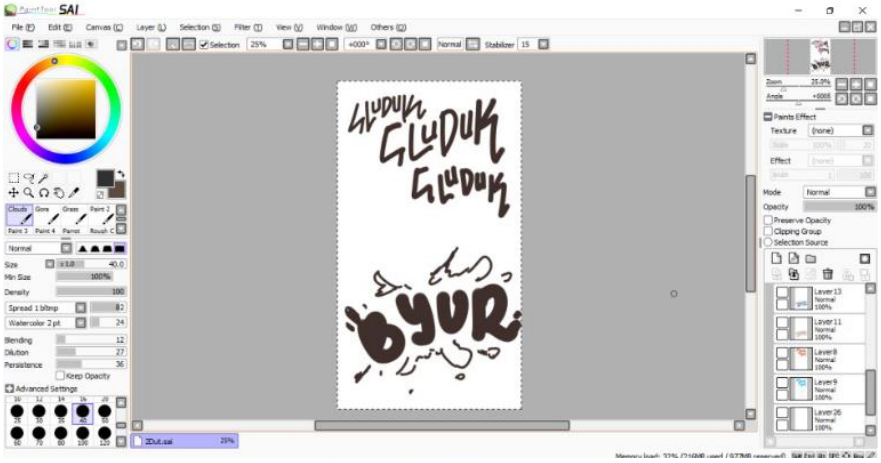

Fig 5. Digital sketching

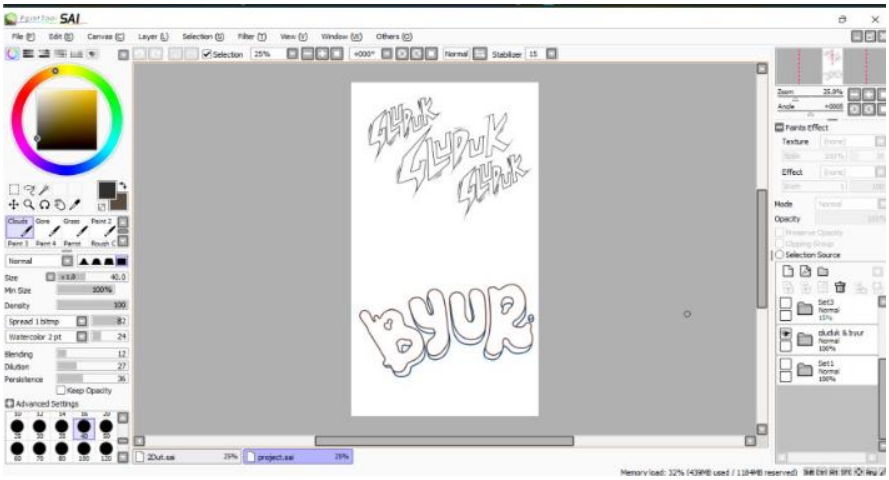

Fig 6. Process of line art creation

Fig 7. Coloring and Finishing using Adobe Photoshop software

 ISSN 2655-9153

3. Results and Discussion

3.1. Seeing Sounds

Sound is a natural phenomenon captured by the sense of hearing [25]–[27]. The sound is a wave with a particular resonance, and the human ear hears frequencies between 20 hertz and 20,000 hertz. Frequencies below 20 Hertz are called infrasound. Meanwhile, frequencies above 20,000 hertz are called ultrasonic. Long sound waves have a low frequency. In comparison, short sound waves have a high frequency. The loudness or volume level of a sound is determined by its amplitude. The height of sound waves is measured using relative loudness units or decibels. Large sound waves are considered louder. The sound of human conversation is about 60 decibels. The sound that the human ear is comfortable hearing reaches 80 decibels. If it exceeds that, it can cause hearing loss. Sound will sound painful if it goes 130 decibels, which will result in ringing in the ears [28]–[30]. The ability of humans who cannot see sounds but can feel or measure them can be used to translate these sounds, either natural or artificial. Natural sounds are sounds that automatically appear without the role of other entities, such as the sound of thunder and fart sounds. Meanwhile, artificial sounds are those that involve other entities, such as the sound of wood being struck, the sound of a gamelan, or the sound of waves hitting a rock. The results of converting sound into visual form from the selected samples are as Table 3.

Tabel 3. Visual Conversion Results

Sound	Visual Conversion Results
Gluduk - Gluduk – Gluduk (Sound of thunder)	
Byur – byur (sound of wave hitting rocks)	
Tok – tok – tok (sound of wood knocking hard object)	
Thing -thing (sound of brass blade instrument *gamelan*)	
Gonggg (sound of a gamelan instrument with a bulging tip that is hit hard, an echoing sound)	
Duuutt (sound of fart)	

 ISSN 2655-9153

3.2. The potential of domestic onomatopoeia in the creative industry

The creative industry in Indonesia is currently experiencing technological developments, especially in visual communication design, which uses visual elements as a medium to convey messages. The development of the current technological era requires distinguished assets that characterize the superiority of each nation in global competition. Thus, domestic onomatopoeia becomes one of the options in answering this challenge. The development of the times is accompanied by technological developments, especially in the visual industry of popular culture, where globally, every person has almost the same visual references. Visual references will be controlled globally by countries that are masters of art and design, such as America and Japan so that the results of their visual products are present in the minds of the global community. This condition also occurs in phonograms and onomatopoeia; the variety, form, and speech refer to their references when these elements are revealed in a visual work. Indeed, this will slowly cover the diversity of domestic culture, which has the potential to be developed globally as visual assets in the form of phonograms and onomatopoeia. Onomatopoeia is part of sound visualization or phonogram, a form of sound activity or event [31]. Onomatopoeia is the visual form conversion of sound pronunciation and tone intonation [32]. Onomatopoeia creates dramatization, expresses emotion, and provides sound imagination in visual works without audio. Compared to the role of images and narrative words, onomatopoeia can be less dominant, but if these elements are not present, dramatization or visual message delivery is not optimal. Onomatopoeia is often seen in design and artworks such as comics, animation, graphic design products, and stickers on social media applications.

The visualization of onomatopoeia comes with the popularity of visual icons that are also part of popular culture. Popular culture that spreads in various countries gives rise to multiple activities, including translation. Translation is the activity of finding the equivalent of a foreign language in the mother tongue or official language of a country and vice versa. Intentionally or not, the translators then come up with domestic words or phrases. However, these equivalents are often taken for granted because domestic listeners still pronounce or hear them frequently. The phonogram shapes are interpretations and conversions of sound pronunciation into letter form, while the colors of letters used in the phonogram are interpretations of their meaning nuance. In Indonesia, especially Java, there is a profession in the arts that demands the ability to produce various sounds, namely *Dalang of Wayang Purwa* or a puppeteer of shadow puppet performance. To bring scene after scene to life in a shadow puppet show, puppeteers need the skills to capture, interpret, and produce sounds, including *Antawacana*, various sounds of different characters, and other non-speech sound elements. *Antawacana* in *Wayang Purwa* shows is an attempt to present the characters of the puppet figures, their emotions, and the sound produced from certain events in the story, building dramatization and creating certain emotions from the audience [33]–[35]. Such a function is similar to onomatopoeia. Thus, it is essential to pursue the development of *Antawacana* into onomatopoeia in the Indonesian creative industry.

The most significant potential of onomatopoeia lies in the plurality of domestic assets that can enrich local language and culture. Furthermore, the development of domestic asset use in creative industries shows a positive trend [36]. Creative industries, such as film, animation, and games, often utilize onomatopoeia to create sound effects that are authentic and close to their users [2], [37]. Using onomatopoeia in these mediums improves the quality of creative creations and helps strengthen local branding and preserve and promote local culture. In addition, AI capabilities can be leveraged to document, detect, analyse, and disseminate local onomatopoeia more effectively [38], [39]. For example, speech recognition and natural language processing technologies can help identify and categorize onomatopoeia from different regions [40]. AI integration can also be used to create educational applications that teach onomatopoeia to the younger generation, thus helping to preserve this domestic asset [41]. However, AI integration also faces challenges, such as the need for high-quality data and the ethical use of technology.

 ISSN 2655-9153

4. Conclusion

Onomatopoeia is a result of human culture that is often overlooked because it is considered a trivial matter in everyday life. However, onomatopoeia has a vital role in building nuance and dramatization in visual works such as comics, animations, and films. Onomatopoeia is a form of speech culture. In Javanese culture and society, various activities use onomatopoeia to realize dramatization in art performances, such as the one done by *Dalang* in shadow puppet shows. *Dalang* performs a *wayang* show using *Antawacana* as a form of speech activity, and in the *Antawacana*, there is onomatopoeia. *Dalang* creates spoken onomatopoeia speech in the *Antawacana* based on his mimetic efforts from various natural sounds. This research reinterprets the mimesis efforts made by *Dalang* in visual form. The result of the *Antawacana* onomatopoeia visualization becomes part of the phonogram that can be used in various visual works. Thus, *Antawacana* onomatopoeia can become a domestic visual asset with aesthetic and functional value. The aesthetic value of visual onomatopoeia comes from graphic aesthetic elements such as color, shape, and typography. Meanwhile, the functional value comes from its function, which gives the impression and emphasis or dramatization in visual works. The influence of technological advances then brings more significant opportunities from onomatopoeia as a domestic visual asset, for example, as part of artificial intelligence assets and online digital design creation platforms.

Acknowledgment

The authors would like to thank the Universitas Sebelas Maret, Surakarta, Indonesia, and Universitas Katolik Soegijapranata, Semarang, Indonesia, for granted support.

Declarations

Author contribution	:	SM: research idea, collecting data, analyzing the data, and writing the article; ARW, AII, PA: analyzing the data, and writing the article.
Funding statement	:	This research was funded by the Research Group Grant (HGR) scheme of Universitas Sebelas Maret with contract number 194.2/UN27.22/PT.01.03/2024.
Conflict of interest	:	The authors declare no conflict of interest.
Additional information	:	No additional information is available for this paper.

References

[1] M. Sakamoto, "System to quantify the impression of sounds expressed by onomatopoeias," *Acoust. Sci. Technol.*, vol. 41, no. 1, pp. 229–232, Jan. 2020, doi: 10.1250/ast.41.229.

[2] L. Ye, "Onomatopoeia, Sound Effects and Humour in Japanese Anime and US Animation Films and Television," *Animation*, vol. 18, no. 3, pp. 273–291, Nov. 2023, doi: 10.1177/17468477231206681.

[3] P. Ardhianto, "Makna Tipografi Onomatopoeia Pada Komik 'Tigan Ngasak Batavia,'" *Gelar J. Seni dan Budaya*, vol. 12, no. 1, pp. 71–79, 2014.

[4] E. Vivoli, I. Campaioli, M. Nardoni, N. Biondi, M. Bertini, and D. Karatzas, "Comics Datasets Framework: Mix of Comics Datasets for Detection Benchmarking," in *International Conference on Document Analysis and Recognition*, 2024, pp. 154–167, doi: 10.1007/978-3-031-70645-5_11.

[5] T. Fukusato and S. Morishima, "Automatic depiction of onomatopoeia in animation considering physical phenomena," in *Proceedings of the Seventh International Conference on Motion in Games*, 2014, pp. 161–169, doi: 10.1145/2668064.2668096.

[6] V. Lukyanova and O. Koloskova, "Pragmatic potential of onomatopoeia in animated movies for children," *Glob. J. Foreign Lang. Teach.*, vol. 10, no. 1, pp. 58–64, Feb. 2020, doi: 10.18844/gjflt.v10i1.4482.

[7] D. T. Ardianto, D. Susanto, and S. Mataram, "Onomatopoea sebagai Pembuka Signifikasi Teks dalam Komik Tintin Petualangan Tintin Penerbangan 714 ke Sidney versi Terjemahan Bahasa Indonesia," *Mudra J. Seni Budaya*, vol. 33, no. 2, pp. 223–231, May 2018, doi: 10.31091/mudra.v33i2.349.

[8] I. Hadi, "A Comparison of Onomatopoeia in Foreign, Indonesian, and Local Languages," *Madah J. Bhs. dan Sastra*, vol. 4, no. 2, p. 184, Aug. 2017, doi: 10.31503/madah.v4i2.540.

[9] T. Eliza, D. R. Sari, and M. Irawati, "Using Onomatopoeia in Comic to Improve Vocabulary," *Enrich J. Pendidikan, Bahasa, Sastra dan Linguist.*, vol. 5, no. 1, pp. 12–24, Jun. 2024, doi: 10.36546/enrich.v5i1.1189.

[10] A. Najichah, "Analisis Struktur dan Makna Onomatope dalam Komik Baru Klinting Karya Sapriandy (The Analysis of Structure and Onomatope Meaning in the Baru Klinting Comics by Sapriandy)," *Jalabahasa*, vol. 14, no. 2, pp. 1–8, Jun. 2020, doi: 10.36567/jalabahasa.v14i2.187.

[11] M. N. Shofi and B. Denafri, "Onomatope dalam Komik Nusa Five Volume 1 karya Sweta Kartika," *J. Bhs. dan Sastra*, vol. 9, no. 2, p. 164, May 2021, doi: 10.24036/jbs.v9i2.111563.

[12] S. Sunarya, S. T. W, and S. Marmanto, "Development of Non-arbitrary to the Arbitrary Iconic Words in Javanese Language," *GEMA J. Lang. Stud.*, vol. 17, no. 3, pp. 137–151, Aug. 2017, doi: 10.17576/gema-2017-1703-09.

[13] T. Widagdo, D. Djatmika, and H. Yustanto, "Analysis Characteristics of *Antawacana* as Reflections on the Character of Werkudara in Wayang Purwa," in *Proceedings of the Proceedings of the Third International Seminar on Recent Language, Literature, and Local Culture Studies, BASA, 20-21 September 2019, Surakarta, Central Java, Indonesia*, 2020, pp. 1–6, doi: 10.4108/eai.20-9-2019.2296757.

[14] L. Budhi, S. Subiyantoro, A. Wahida, and S. Sularso, "The role of symbolism in moral education: a study of the ruwat murwakala ritual," *Gelar J. Seni Budaya*, vol. 21, no. 1, pp. 11–23, 2023, doi: 10.33153/glr.v21i1.5072.

[15] A. Mukti, Y. Hendrayani, and A. Irawati, "Strengthening Local Values in Shadow Puppet Messages at Padepokan Sehat Medika, Kebumen," *Mediat. J. Komun.*, vol. 17, no. 2, pp. 383–396, Dec. 2024, doi: 10.29313/mediator.v17i2.2754.

[16] Y. Sawamura, K. Osuka, T. Nakamura, M. Kanoh, and K. Yamada, "A Consideration on Initial Parameter Setting using Onomatopoeias for Interactive Design Tools," in *2019 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, 2019, pp. 1–5, doi: 10.1109/FUZZ-IEEE.2019.8858818.

[17] K. Osuka, T. Kaneiwa, T. Nakamura, M. Kanoh, and K. Yamada, "Interactive Design Support using Arbitrary Onomatopoeia," *Procedia Comput. Sci.*, vol. 192, pp. 1805–1812, 2021, doi: 10.1016/j.procs.2021.08.185.

[18] T. Nakamura, Y. Sawamura, M. Kanoh, and K. Yamada, "Initital Values Assignment of Parameters Using Onomatopoieas for Interactive Design Tool," *J. Japan Soc. Fuzzy Theory Intell. Informatics*, vol. 30, no. 5, pp. 766–772, Oct. 2018, doi: 10.3156/jsoft.30.5_766.

[19] A. Kijima and K. Choshi, "Quantitative and qualitative parameters of grasping movement constrained by phonological elements contained in onomatopoeia," *Taiikugaku kenkyu (Japan J. Phys. Educ. Heal. Sport Sci.*, vol. 51, no. 5, pp. 663–675, 2006, doi: 10.5432/jjpehss.51.663.

[20] S. McCloud and M. Martin, *Understanding comics: The invisible art*, vol. 106. Kitchen sink press Northampton, MA, 1993.

[21] A. Miyazaki and K. Tomimatsu, "Onomato planets: Physical computing of japanese onomatopoeia," in *Proceedings of the 3rd International Conference on Tangible and Embedded Interaction*, 2009, pp. 301–304, doi: 10.1145/1517664.1517726.

[22] R. Iranzad and X. Liu, "A review of random forest-based feature selection methods for data science education and applications," *International Journal of Data Science and Analytics*. pp. 1–15, 03-Feb-2024, doi: 10.1007/s41060-024-00509-w.

[23] M. Kuwahara, "Visualization of Japanese onomatopoeia," *J. Vis. Soc. Japan*, vol. 36, no. 140, pp. 29–32, 2016, doi: 10.3154/jvs.36.140_29.

[24] A. Syaputra, "Implementasi Metode Random Sampling Pada Animasi Motion Grapich Herbisida Dan Fungisida," *J. Sisfokom (Sistem Inf. dan Komputer)*, vol. 11, no. 2, pp. 142–147, Aug. 2022, doi: 10.32736/sisfokom.v11i2.1370.

 ISSN 2655-9153

[25] B. O. Lopes, M. S. Brízido, A. I. Reis, M. M. Miranda, and S. M. Pina, "Eales' Disease: When the Rare Sounds Frequent," *Case Rep. Ophthalmol. Med.*, vol. 2021, pp. 1–6, Aug. 2021, doi: 10.1155/2021/1056659.

[26] I. A. Dewi, M. Ichwan, and S. Silfiana, "Analisis Forman Frekuensi pada Suara Manusia dengan Menggunakan Linear Prediction," *MIND J.*, vol. 5, no. 1, pp. 39–53, May 2021, doi: 10.26760/mindjournal.v5i1.39-53.

[27] B. W. Prasetya, B. Susanto, and J. Purwadi, "Identifikasi Suara Pria dan Wanita Berdasarkan Frekuensi Suara," *J. Inform.*, vol. 4, no. 1, Feb. 2011, doi: 10.21460/inf.2008.41.13.

[28] J. C. Lin, "The Microwave Auditory Effect," in *Auditory Effects of Microwave Radiation*, Cham: Springer International Publishing, 2021, pp. 127–173.

[29] A. Bálint, Á. Szabó, A. Andics, and M. Gácsi, "Dog and human neural sensitivity to voicelikeness: A comparative fMRI study," *Neuroimage*, vol. 265, p. 119791, Jan. 2023, doi: 10.1016/j.neuroimage.2022.119791.

[30] M. Shishlenin, A. Kozelkov, and N. Novikov, "Nonlinear Medical Ultrasound Tomography: 3D Modeling of Sound Wave Propagation in Human Tissues," *Mathematics*, vol. 12, no. 2, p. 212, Jan. 2024, doi: 10.3390/math12020212.

[31] D. T. Ardianto, S. Mataram, A. I. Ismail, and A. R. Wicaksono, "Onomatopoeia: When Sound Is Seen," *Mudra J. Seni Budaya*, vol. 38, no. 1, pp. 1–8, Dec. 2022, doi: 10.31091/mudra.v38i1.2220.

[32] A. Khachatryan, "Sound Symbolism and Onomatopoeia," *Armen. Folia Anglistika*, vol. 11, no. 1, pp. 58–64, Apr. 2015, doi: 10.46991/AFA/2015.11.1.058.

[33] I. W. Budiarsa, "Pekatik in gambuh dramatic show," *Int. J. Linguist. Lit. Cult.*, vol. 7, no. 3, May 2021, doi: 10.21744/ijllc.v7n3.1589.

[34] I. P. Ardiyasa, "Wayang (Puppet) Character Transformation Model In Augmented Reality," *Lekesan Interdiscip. J. Asia Pacific Arts*, vol. 3, no. 2, pp. 54–63, Nov. 2020, doi: 10.31091/lekesan.v3i2.1141.

[35] Cahya, "Nilai, Makna, dan Simbol dalam Pertunjukan Wayang Golek sebagai Representasi Media Pendidikan Budi Pekerti," *Panggung*, vol. 26, no. 2, p. 298246, Mar. 2017, doi: 10.26742/panggung.v26i2.170.

[36] C.-L. Chen, "Cultural product innovation strategies adopted by the performing arts industry," *Rev. Manag. Sci.*, vol. 15, no. 5, pp. 1139–1171, Jul. 2021, doi: 10.1007/s11846-020-00393-1.

[37] Y. Motamedi *et al.*, "Linking language to sensory experience: Onomatopoeia in early language development," *Dev. Sci.*, vol. 24, no. 3, May 2021, doi: 10.1111/desc.13066.

[38] P. Ardhianto *et al.*, "Generative Deep Learning for Visual Animation in Landscapes Design," *Sci. Program.*, vol. 2023, pp. 1–12, Aug. 2023, doi: 10.1155/2023/9443704.

[39] P. Ardhianto, Y. Purbo Santosa, and Y. Pusparani, "A generative deep learning for exploring layout variation on visual poster design," *Int. J. Vis. Perform. Arts*, vol. 5, no. 1, pp. 10–17, Jun. 2023, doi: 10.31763/viperarts.v5i1.920.

[40] Y. Kojima and T. Fujimoto, "Development of an Image Processing Application that Represents Onomatopoeia," in *International Conference On Systems Engineering*, 2023, pp. 99–109, doi: 10.1007/978-3-031-27470-1_10.

[41] U. Świerczyńska-Kaczor, "Empirical insights into traditional and AI enhanced interactive narratives based on children's fables," *J. Econ. Manag.*, vol. 46, pp. 25–54, 2024, doi: 10.22367/jem.2024.46.02.