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The Application and Analysis of Digital Coloring in Illustrations of Kostum Barat dari Masa ke Masa *by Moh. Alim Zaman for Karuta Design*

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ABSTRACT

The design of fashion products based on trends is inseparable from the study of dress history, which is largely supported by Kostum Barat dari Masa ke Masa by Moh. Alim Zaman—a cornerstone of dress history education in Indonesia. Despite being an older publication, the book remains a primary reference for learning fashion products. This study therefore develops a karuta-based learning medium to create interactive and engaging learning from the book. A qualitative case study with a coloring-book approach was employed to apply digital coloring to the book's illustrations. The book's eras were categorized to determine an appropriate color mapping for each era, which then served as the basis for applying digital coloring to the illustrations and will be continued in the design of karuta as a learning medium.

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INTRODUCTION

Studying history provides factual knowledge that is not merely an understanding of the sequence of events, but also the causal relationships between concepts as a coherent whole, thereby fostering sound intellectual knowledge (Murti et al., 2025). Accordingly, books for studying history are essential, even though understanding history is not always easy. One such book is *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman, which presents knowledge of dress from era to era, from prehistoric times to the 2000s. This literature has consistently served as a reference for learning the history of fashion products among design students. In fact, by studying history at the undergraduate level, history can be used as a foundation for product design (Widyastuti, 2020). Unfortunately, *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman falls into the category of older books, as it was published in 2001 and is no longer in print; moreover, its author has passed away. Yet this book is one of the first foundational literatures used in learning the history of fashion products in Indonesia at several well-known institutes. This condition is compounded by the absence of comparable recent books published in Indonesia as learning media. From this situation, the need to transform the historical content of this book into an interactive and visually engaging medium—without diminishing its historical value—is well justified. This need constitutes the urgency of the research in support of Asta Cita, which focuses on implementing an educational curriculum to cultivate character development, national awareness, and civic competence through strategic solutions that creatively utilize and develop digital technology in learning (Nursalim et al., 2025). This digital technology aims to advance education in the field of product design, particularly fashion. The solution to this need requires a new medium that is educational and demands rapid visual recognition, such as karuta. A digital coloring technique was selected to bridge the karuta design process in order to revive the illustrations in *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman, so that they align with the need for interactive and efficient learning in the absorption of learning materials.



Figure 1. Appearance of the Book *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman
(Source: Publisher Meutia Cipta Sarana, 2001)

To delimit this research, the primary data source serving as the research sample focuses on the illustrations contained in *Kostum Barat dari Masa ke Masa* by Moh. Alim

Zaman. These data form the basis for applying the digital coloring technique, which is relevant to karuta media design because karuta relies on visual readability; digital coloring serves to enhance the clarity and appeal of the illustrations so that they function optimally as an educational game medium. The final output takes the form of sample karuta card designs (torifuda and yomifuda) as digital prototypes. Subsequently, the research question is formulated as follows: how can the digital coloring technique be applied in karuta design based on the historical data of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman? The aim of this research is focused on producing digital coloring results that are accurate and well-targeted, grounded in historical sources, so as to yield aesthetic value in the illustrations of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. The benefit is that these digital coloring results can ultimately be used in karuta design based on *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman in a well-targeted manner, so that this learning medium may potentially be tested on the target users of this learning product.

METHODOLOGY

This qualitative case study employs a color mapping approach and a coloring-book approach. To obtain the research data, this study conducted an interview with the owner of the publisher of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. In addition, because the study relates to karuta design, the OKAKURA community (Ogura Karuta Club) at Universitas Dharma Persada was selected. Meanwhile, other informants were students of the Product Design program at Universitas Esa Unggul, who were involved in testing the karuta product as part of the karuta design process. This research underwent the stages of observation, interviews, and a literature review related to the study.

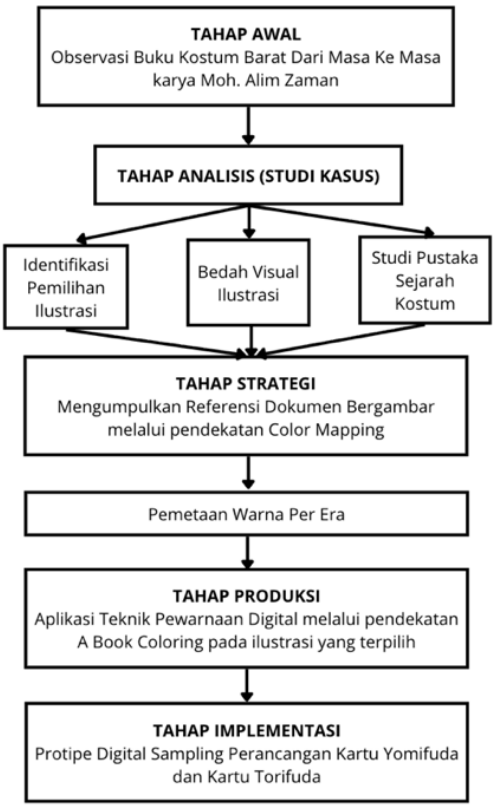


Figure 2. Research Method Flow
(Source: Author's documentation, 2026)

The research procedure consists of several stages, as follows:

1. Preliminary Stage. Observation of the book Kostum Barat dari Masa ke Masa by Moh. Alim Zaman.
2. Analysis Stage (case study). Data were obtained from interviews with informants, while also analyzing the identification of illustration selection, visual dissection of illustrations, and a literature study of costume history (seeking similar reference illustrations for each era).
3. Strategy Stage. The analysis was derived from the collection of illustrated document references through a color mapping approach.
4. Production Stage. Application of the digital coloring technique through a coloring-book approach, using colors obtained from the color mapping of a collection of illustrated document references according to the categorization of each costume era.
5. Implementation Stage. The output is a digital prototype sampling of karuta design based on Kostum Barat dari Masa ke Masa by Moh. Alim Zaman, without removing the original illustrations from the digital coloring technique results.

Instrumen Pengumpulan Data

During data collection, interviews were conducted with three informants: Mrs. Hera Meutia Desilina, the head of Meutia Cipta Sarana, the publisher of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman; the OKAKURA community; and students of the Product Design program, Faculty of Design and Creative Industries, Universitas Esa Unggul. In addition to interviews, observations and a literature review related to this research were also carried out.



Figure 3. Interview with Mrs. Hera Meutia Desilina, Head of Meutia Cipta Sarana (Source: Author's documentation, 2025)

Besides showing books by Moh. Alim Zaman, such as *Gaun Pengantin Barat* and *Desain Mode Tingkat Dasar*, in addition to *Kostum Barat dari Masa ke Masa*, Mrs. Hera Meutia Desilina recounted the struggle she and her mother endured in publishing books to support fashion design education in Indonesia. Before meeting Mrs. Hera, the team presented an overview of a learning concept in the form of karuta media so that *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman could be used again. Mrs. Hera approved this concept and permitted the research team to create a new medium so that today's students could read books by Moh. Alim Zaman even though the covers and contents appear old and outdated. She reminded the team that in the process of creating the new medium, there should be no changes to the style of illustration drawings made by the late Mr. Moh. Alim Zaman in the book. She also hoped that other books could be used in the new medium as well, so as to support fashion design education and similar fields.

The team then proceeded to Universitas Dharma Persada to interview OKAKURA, whose members consist of students from the Japanese Language and Culture study program. They are provided with a tatami area for playing karuta and engaging in traditional Japanese cultural activities. The interviewees were the community leader, Nazir, and his deputy, Zilva, who explained that this karuta community has existed for a long time and is trusted to participate in international competitions held in Japan. Unfortunately, the pandemic temporarily halted offline activities, although karuta can be played online. Nazir and Zilva explained that karuta games use two types: *hyakunin isshu* (*uta karuta*) and *iroha karuta*, which differ in purpose or manner of play. *Uta karuta* is played by adults or in competitions, as it consists of 100 classical poems by 100 famous poets. *Iroha karuta* is played by children as a medium for learning hiragana characters, containing Japanese proverbs; this type of karuta is also played by families during the New Year.



Figure 4. Karuta Game by OKAKURA, Universitas Darma Persada
(Source: Author's documentation, 2025)

OKAKURA demonstrated how to play using two types of karuta. Sharp hearing is required to catch the voice of the game moderator when reading the information card (*yomifuda* card). Players promptly take the *torifuda* card that pairs with the *yomifuda* card. The winner is determined by the number of correctly taken cards during play. Karuta can be played in groups or one-on-one. *Uta karuta* and *iroha karuta* generally consist of *torifuda* (poem information) and *yomifuda* cards (containing illustrations and the continuation of the poem).



Figure 5. Yomifuda Card (left) and Torifuda Card (right)
(Source: https://lansingkarutaclub.blogspot.com/p/how-to-play.html)

OKAKURA tried the karuta product provided by the team. This product, which is an *iroha karuta*, is Sushi Bar, sold at Okuna Karuta, Tokyo, Japan. This karuta product uses alphabet letters and English. This type of karuta product employs a memory game. Players must find matching motifs found on the tail and body/head of the sushi fish, which feature the Japanese and English names of the fish. On the *yomifuda* card, there is information

about the fish in English. The visual motifs used on this karuta card are detailed Japanese motifs on cards made of cardboard.



Figure 6. Karuta "Card Game Sushi Bar"
(Source: Author's documentation, 2025)



Figure 7. Trial of Playing Karuta "Card Game Sushi Bar" by the OKAKURA Community (left) and Product Design Students of Universitas Esa Unggul (right)
(Source: Author's documentation, 2025)

The consideration for using "Card Game Sushi Bar" for the trial was that the target of the karuta game based on *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman is players who are generally design students. The trial of this karuta product was conducted with OKAKURA, whose members consist of students from the Japanese Language and Culture study program at Universitas Dharma Persada, and students from the Product Design program at Universitas Esa Unggul. Initially, the team hypothesized that OKAKURA members would be better able to play "Card Game Sushi Bar" because they are accustomed to karuta games using *uta karuta* or *iroha karuta*, compared to Product Design students at Universitas Esa Unggul. However, this hypothesis proved incorrect; instead, design students were able to complete the game faster because they are accustomed to "reading" visuals rather than text. Meanwhile, OKAKURA members are not accustomed to reading visuals, but rather to reading kanji / hiragana / katakana characters on karuta. In this trial, a flip card system was also implemented, an interactive medium involving flipping cards to match them and remember positions (a memory game). Its purpose is to train memory, concentration, visual speed, and focus as a good educational medium. This type of flip card game is also found in *iroha karuta* cards, which rely on memory play rather than *uta karuta*.

The next stage was data reduction by observing *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. The team transcribed several core materials from this book to be used in the karuta design process, which would later be synchronized between the materials and the illustrations in the book. The results of the data reduction were also examined from the table of contents of this book, which includes the following chapters:

1. The Development of Ancient World Costumes
2. The Development of Classical World Costumes
3. The Development of European Costumes up to the Enlightenment
4. The Development of Western Costumes from the 19th Century to the Present

This categorization stage was carried out to group the visual illustrations in the book, synchronized with the findings from the data reduction stage. From this, it was found that in the data materials on the Mesopotamia Valley of Phoenicia and the Mesopotamia Valley of Persia, there are no illustrations in *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. The results of this visual categorization were also used to delimit the illustration data in the karuta design

Table 1. Data Reduction Results on the Book *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman
(Source: Data Processed by the Author, 2025)

Kartu **PERKEMBANGAN KOSTUM DUNIA KUNO**	Kartu **PERKEMBANGAN KOSTUM DUNIA KLASIK**	Kartu **PERKEMBANGAN KOSTUM EROPA HINGGA MASA PENCERAHANNYA**	Kartu **PERKEMBANGAN KOSTUM BARAT BAB XIX HINGGA MASA KINI**
A. Mesir Kuno : 1. Latar Belakang Peradaban Mesir Kuno 2. Tata Kostum Mesir Kuno B. Mesopotamia : 1. Latar Belakang Peradaban Mesopotamia 2. Tata Kostum Mesopotamia a. Babilonia b. Asiria C. Daerah Di Luar Lembah Mesopotamia : 1. Latar Belakang Peradaban Daerah Di Luar Lembah Mesopotamia 2. Tata Kostum Daerah Di Luar Lembah Mesopotamia : a. Funisia b. Yahudi c. Persia	A. Kawasan Laut Egeia 1. Latar Belakang Peradaban Kawasan Laut Egeia 2. Tata Kostum Kawasan Laut Egeia a. Kreta b. Hellas B. Jazirah Apenina 1. Latar Belakang Peradaban Jazirah Apenina 2. Tata Kostum Jazirah Apenina a. Etruria b. Romawi	A. Bizantium 1. Latar Belakang Peradaban Bizantium 2. Tata Kostum Bizantium B. Abad-abad Pertengahan 1. Latar Belakang Peradaban Abad-abad Pertengahan 2. Tata Kostum Abad-abad Pertengahan a. Roman b. Gotik C. Renaisan 1. Latar Belakang Peradaban Renaisan 2. Tata Kostum Renaisan : a. Renaisan Italia b. Renaisan Jerman c. Renaisan Spanyol D. Abad XVII dan XVIII 1. Latar Belakang Peradaban Bizantium 2. Tata Kostum Bizantium : a. Barok b. Regence c. Rokoko d. Louis XVI	A. Neoklasik 1. Latar Belakang Peradaban Neoklasik 2. Tata Kostum Neoklasik : a. Directoire b. Empire B. Romantisme 1. Latar Belakang Peradaban Romantisme 2. Tata Kostum Romantisme : a. Biedermeyer b. Crinoline c. Bustle C. Dekade Terakhir Abad XIX 1. Latar Belakang Peradaban Dekade Terakhir Abad XIX 2. Tata Kostum Dekade Terakhir Abad XIX : a. Fin de Siecle D. Abad XX 1. Latar Belakang Perabadan Abad XX 2. Tata Kostum Abad XX : a. Edwardian b. Pra Perang Dunia I c. Periode Diantara Dua Perang Dunia d. Periode Penemuan Jati Diri

Table 2. Visual Categorization of Illustrations in the Book *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman
(Source: Data Processed by the Author, 2025)

Kartu **PERKEMBANGAN KOSTUM DUNIA KUNO**	Kartu **PERKEMBANGAN KOSTUM DUNIA KLASIK**	Kartu **PERKEMBANGAN KOSTUM EROPA HINGGA MASA PENCERAHANNYA**	Kartu **PERKEMBANGAN KOSTUM BARAT BAB XIX HINGGA MASA KINI**
List Kartu: 1. Mesir - Kuno 2. Mesopotamia - Babilonia 3. Mesopotamia - Asiria 4. Di Luar Lembah Mesopotamia - Funisia 5. Di Luar Lembah Mesopotamia - Yahudi 6. Di Luar Lembah Mesopotamia - Persia Catt: di blok merah karena di bukunya tidak terdapat ilustrasi karya Alm. Bapak M. Alim Zaman	List Kartu: 1. Laut Egeia - Kreta 2. Laut Egeia - Hellas 3. Jazirah Apenina - Etruria 4. Jazirah Apenina - Romawi	List Kartu: 1. Bizantium 2. Abad Pertengahan - Roman 3. Abad Pertengahan - Gotik 4. Renaisan - Renaisan Italia 5. Renaisan - Renaisan Jerman 6. Renaisan - Renaisan Spanyol 7. Abad XVII dan XVIII - Barok 8. Abad XVII dan XVIII - Regence 9. Abad XVII dan XVIII - Rokoko 10. Abad XVII dan XVIII - Louis XVI	List Kartu: 1. Neoklasik - Directoire 2. Neoklasik - Empire 3. Romantisme - Biedermeyer 4. Romantisme - Crinoline 5. Romantisme - Bustle 6. Dekade Terakhir Abad XIX - Fin de Siecle 7. Abad XX - Edwardian 8. Abad XX - Pra Perang Dunia I 9. Abad XX - Periode Diantara Dua Perang Dunia 10. Abad XX - Periode Penemuan Jati Diri

Table 3. Data Display on the Book *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman
(Source: Data Processed by the Author, 2025)

No	Kategorisasi Era	Referensi Dokumentasi Gambar Berwarna	Pemetaan Warna
1	Perkembangan Kostum Dunia Kuno		
2	Perkembangan Kostum Dunia Klasik		
3	Perkembangan Kostum Eropa Hingga Masa Pencerahannya		

4	Perkembangan Kostum Barat Abad XIX Hingga Masa Kini		



Figure 8. Color Mapping in the Categorization Based on the Book *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman as an Application of the Illustrated-Book Method in the Digital Coloring Technique
(Source: Author's documentation, 2025)

Based on the results of this trial, the material was used for analyzing the karuta design process based on *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. The method to be used in this karuta design is the illustrated-book method. This method is employed to map appropriate colors in the karuta design process based on *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. The purpose of this color mapping is to ensure that the selected colors represent the visual character of each costume era. To this end, an era mapping was carried out in *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman to determine which illustrations would be selected from the book. From the categorization of eras—namely the Development of Ancient World Costumes, the Development of Classical World Costumes, the Development of European Costumes up to the Enlightenment, and the Development of Western Costumes from the 19th Century to the Present—the total content of the karuta design comprises 70 cards, consisting of *yomifuda* and *torifuda* cards.

Table 2 shows the visual categorization carried out by mapping the illustrations in *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. Of the four categorized eras, only the categorization of the ancient world costume era—specifically the cultures outside the Mesopotamia Valley of Phoenicia and Persia—has no illustration images in the book. It was therefore decided that these two cultures would not be included in the karuta design process based on this book. After conducting the visual categorization, the next stage was data display, which involved arranging a collection of documentation—whether illustration drawings, photographs, sketches, or images—that could represent the illustrations from *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman, which had gone through the visual categorization stage for each era. This was done as a basis for applying the color mapping approach in order to obtain base colors that could be used in the karuta design process. This is because karuta products generally have different colored edges for each product, such as the karuta product World of History (World History karuta), which has different colors for each historical categorization (Widyastuti et al., 2025). For this reason, color mapping is also used as a basis for applying the digital coloring technique with the coloring-book method, considering that approximately 80–90% of the illustrations in *Kostum Barat dari*

Masa ke Masa by Moh. Alim Zaman are black and white. This condition constitutes the potential for applying the digital coloring technique in the karuta design process.

DISCUSSION

The application of the coloring-book approach within the digital coloring technique has also been carried out by Sanda Miller in adapting Erwin Panofsky's theory of iconography to analyze fashion imagery (Miller, 2021). The application of digital coloring to the illustrations of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman is not merely a technical process of introducing color, but an effort of visual preservation that is interpretive in nature. In each color selection that refers to colored image documentation references, the process not only reproduces historical appearances but also constructs a visual narrative that enables design students to read the cultural codes of the era. Within Panofsky's iconographic framework, coloring lies at the level of iconological analysis—namely, revealing the symbolic meaning of color and dress as representations of the social, economic, and political values of their time. In other words, digital coloring is not an aesthetic complement, but an instrument of visual analysis that enriches design students' historical understanding.

The application of Panofsky's iconographic theory in this study was carried out through three stages. First, at the pre-iconographic level, the team identified the basic visual elements in the illustrations—such as dress silhouettes, accessories, and textile details—without relating them to cultural meaning. Second, at the iconographic level, these illustrations were compared with colored image documentation references from the same era to determine a historically accurate color palette. Third, at the iconological level, the color choices were interpreted as markers of social status, the influence of the spice trade, or the development of dyeing technology of their time. For example, the color purple in ancient Roman dress was not chosen merely for aesthetic reasons, but represented access to the purple dye from the Murex mollusk, which was extremely expensive—thus the color became a marker of power and elitism.

The role of computer technology in applying this digital coloring technique is integrated with color optimization through clustering analysis that refers to color harmonization, thereby producing a stylistically coherent and efficient color scheme (Yang & Liu, 2022). An immersive visual experience is created when artistic innovation develops, verified and integrated by technology, owing to the role of digital technology in enhancing visual communication design products (Cai & Su, 2022). One such visual communication design product is the card game, as it is frequently used as an object of study and design; this product platform has characteristics whose elements include: flat, uniform, ordinal, spatial, and textural properties (Altice, 2026). These card element characteristics have remained consistent for centuries in the history of card games and have determined the formal contours of the playing card platform. Playing cards originating from Europe were carried by traders and missionaries in the 16th century; this dissemination indirectly gave rise to karuta products, or European-style cards, derived from the Portuguese word carta (playing card) (Misra, 2025). Karuta products are still used by modern society today, owing to the influence of nishiki-e woodblock printing in the Edo period (1603–1868) (Hunter, 2024). This differs from the ukiyo-e woodblock printing technique, which places greater emphasis on the use of color. Ukiyo-e woodblock printing uses a single color (black ink as line) with other colors added manually, whereas nishiki-e uses the same technique but with more varied, richer, and more colorful use of color (Takahashi, 2025). It is no wonder that

karuta products in the Edo period attracted the attention of their users, who at that time appeared to use them only among the nobility and their families.

The coloring process in karuta products has developed over time; indeed, the karuta products sold at Okuna Karuta, Tokyo, Japan, are already diverse. Karuta products became popular in modern Japanese society owing to their adaptation to visual pop-culture products favored by all groups, from young children to adults. One example is the karuta product Choudenji Machine Voltes V, a famous anime broadcast in Japan in the 1970s. This product is intended not only for children but also for adults who wish to feel nostalgic about older anime. In this product, the application of the digital coloring technique in the card printing process is evident, resulting in colors that are more vibrant and varied compared to karuta from the Edo period. Digital coloring technology also applies to tokusatsu karuta such as Godzilla karuta, which displays screen captures in the form of photographs from one of the special-effects (tokusatsu) Godzilla films, as seen on television.



Figure 9. Karuta Products from the 1970s – the anime Choudenji Machine Voltes V (left and center) and Karuta Products from the 1980s – Godzilla Karuta (right) (Source: https://shop.okunokaruta.com/?pid=176737694 and https://arihant.bank.in/products/detail/49868345/)

Both products above demonstrate the growing existence of karuta in modern society owing to the digital coloring technique, which is related to the karuta product printing process. The sample karuta card designs (torifuda and yomifuda) are the final output of the utilization of the digital coloring technique on the illustrations of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman. Therefore, after obtaining the color mapping for each era categorization, these colors were applied to the back side of the karuta design as a representation of each era, using the digital coloring blocking technique on both the yomifuda and torifuda cards. The blocking technique is also applied to the front edges of the yomifuda and torifuda cards. A white blocking technique was applied to the back of both cards because it will serve as white space for placing information as well as illustrations from *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman that have been colored using the coloring-book method with the digital coloring technique, based on the arrangement of image documentation as a reference for evoking the atmosphere of dress in each era.

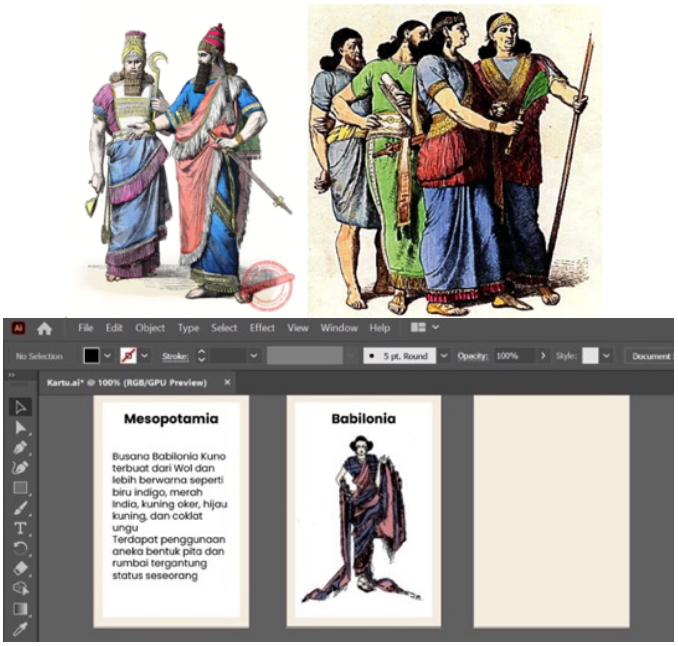


Figure 10. Process of Applying Digital Coloring to the Design of Yomifuda and Torifuda Cards Based on Image References
(Source: Author's documentation, 2025)

The digital coloring technique cannot be separated from the development of digital technology, which has given rise to various media as tools of message persuasion to build product image (Irianto Manik, 2021). Even in designing card game products such as the Kosataka Nolja card game, one must consider aspects such as layout, typography type, and card color as product identity (Maharani, 2020). Furthermore, appropriate educational value is needed in designing card games (Gunawan, 2021). When designing a card game, one should also consider game rules that are not overly bound to traditional games (Mahatmi & Widjono, 2026). Even in redesigning a game product, an evaluation and mapping of the essence of those changes is needed for each game component that adjusts to design needs (Audiah & Hananto, 2019). This is similar to karuta, which can be played in two ways: one-on-one or in groups. Technically, to apply the coloring-book method in this digital technique, ProCreate software was used based on the colors from the collection of document references for each era. Afterward, using Adobe Illustrator, information from *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman that had been summarized was incorporated into the karuta design. The same applied to the illustrations representing the era categorizations that had been colored.

There were obstacles in applying digital coloring to the illustrations of Kostum Barat dari Masa ke Masa by Moh. Alim Zaman in this karuta design, among them ensuring that the color composition matched the image documentation references in the data display in order to find the right color harmony according to its culture. To overcome this, a solution in the form of repeated revisions was required in order to find a color composition harmony that could depict the dress costumes of each era. From the results of these revisions, the digital coloring technique on the illustrations of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman contributes a technique for evoking the atmosphere of dress through an appropriate color composition using the color mapping method as well as the coloring-book method.

An identification of differences in color characteristics emerged for each era based on the color mapping. In the Development of Ancient World Costumes era, earthy colors such as brown, cream, and brick red dominated, reflecting the use of natural dyes from clay and plants. These colors provide a 'warm' and 'organic' visual effect, helping students associate dress with the agrarian and pre-industrial context of society. The Classical World era reflected advances in dyeing technology and high social status among the ancient Romans and Greeks through the colors white, purple, and gold. Dark colors such as navy blue and maroon, with compositions of gold accents, dominated the colors of the Medieval European era, influenced by religious ornaments and the power of the church. Finally, visual differentiation occurred as a marker of the shift in cultural values and technology from era to era through the differing color palettes between these eras.

The trial results showed differences in visual reading ability between design students and members of the OKAKURA community. It is indicated that karuta designs based on illustrations require more adjustment to the rules of play, for example by providing additional time or prior visual introduction—especially since they are intended for players without a design background. In the future, trials with a more varied number of respondents are needed to validate these findings statistically.

From this research, a systematic work procedure is offered for processing old black-and-white illustrations into more attractive learning media through a digital coloring method based on color mapping and the coloring-book approach. Visual intuition, historical data, and visual references are the mainstays in both methods as the basis for every color choice. Thus, the results of digital coloring do not lose their historical roots and are able to bridge design students' need for an interactive and visually rich learning experience. This approach can serve as a reference for developing visual-based learning media in product design history courses or similar courses at the higher education level.

CONCLUSION

Through the reduction of historical data from *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman, this study found that the application of digital coloring is relevant to supporting visual readability in karuta media design. Subsequently, a visual categorization stage was carried out to identify which illustrations are contained in the book, and to synchronize which eras or periods lack illustrations by Moh. Alim Zaman in the book. At this stage, the number of cards to be produced was determined. The next stage involved arranging a collection of colored image documentation data while mapping the color composition of each era. From this, the color mapping was further selected in order to obtain colors representing the categorization of each era, so that they could be applied to the back view of the karuta design. Meanwhile, on the front view, this digital coloring technique is applied to the yomifuda and torifuda cards.

To ensure that the digital coloring technique can be properly applied, both the color mapping method and the digital coloring-book method were employed. This is because most of the illustrations in the book consist only of black-and-white outlines, so readers have no color reference for the models wearing costumes from a particular era. The application of this digital coloring technique to the illustrations of *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman in karuta design provides benefits for karuta users—who are design students—enabling them to easily read the manual. It is hoped that this research can continue and develop so that the karuta design product based on *Kostum Barat dari Masa ke Masa* by Moh. Alim Zaman can be revived through better learning media, thereby contributing to improved design education.

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