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K-Means Clustering Analysis of UI Color Palettes in Mobile Financial Applications for Motion Graphics Design to Enhance Gen Z Financial Literacy

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ABSTRACT

Financial literacy among Malaysian Gen Z is still a serious concern, especially in budgeting, saving, and long-term financial planning. Although many young users are familiar with digital financial platforms, they still face challenges in managing their money effectively. This study analyses the UI color palettes of 42 mobile financial applications using Itten's warm-cool-neutral tone classification framework, Color-in-Context Theory, and color-psychology associations. The study used qualitative descriptive visual content analysis with K-Means Clustering, supported by computational color palette extraction and descriptive frequency analysis. For each application, a multi-color palette was identified, including primary, secondary, accent, and neutral/background colors. These colors were then classified into four palette pattern categories: Cool-dominant palette, Natural/Growth palette, Neutral-based palette, and Warm-dominant palette. The results show that Cool-dominant palettes (n=17, 40.5%) and Natural/Growth palettes (n=11, 26.2%) make up 66.7% of all the applications analysed. This shows that these color patterns are commonly used in the industry and may help create a sense of trust, credibility, and positive financial perception. These findings provide an evidence-based color palette framework for motion graphics design that may support financial literacy communication among Gen Z in Malaysia.

Keywords: *UI color palette, mobile financial applications, motion graphics, Gen Z financial literacy, color psychology.*

1 INTRODUCTION

Financial literacy among Gen Z in Malaysia is still a serious concern, especially in budgeting, saving, and financial behavior (Muat et al., 2024). Although Gen Z users are highly exposed to digital financial platforms as digital natives, many still show clear gaps in managing their finances effectively and understanding long-term financial planning.

Mobile financial applications include banking, e-wallet, investment, and budgeting platforms. This study examines 42 Malaysian and global applications, including MAE Maybank2u, CIMB OCTO, GX Bank, Touch 'N Go eWallet, ShopeePay, Moomoo, TradingView, Money Coach, and Goodbudget. These applications represent financial service categories that are commonly used by Malaysian Gen Z.

In mobile financial applications, UI design plays an important role in shaping user experience, trust, and continuous engagement. Among the main visual elements, color palettes can influence user emotions, trust, and attention (Cyr et al., 2010). A UI color palette consists of several matching colors used in an application interface. These include the primary color, secondary color, accent color, and neutral or background color. Based on Itten's (1961) warm-cool-neutral tone classification, Elliot and Maier's (2012) Color-in-Context Theory, and Labrecque and Milne's (2012) color-psychology associations, this study suggests that color palette choices in financial applications are designed to create certain psychological associations. Cool-color palettes, for example, are often used to communicate trust and competence.

At the same time, motion graphics have become an effective medium for communication because they present information through animation, typography, and visual storytelling (Landa, 2018). Applying color palette conventions from familiar financial applications into motion graphics may help communicate financial literacy messages to Gen Z audiences. Therefore, this study analyses UI color palettes in 42 mobile financial applications and proposes how these palettes can be applied in motion graphics design to support Gen Z financial literacy engagement in Malaysia.

1.1 Research Objectives

The specific objectives of this study are:

- To analyse the UI color palettes using K-Means Analysis in mobile financial application interfaces and identify the common palette patterns.
- To propose a color palette framework from mobile financial app UI analysis for motion graphics design to support Gen Z financial literacy communication.

1.2 Problem Statement

Financial literacy among Malaysian Gen Z remains critically low, particularly in budgeting, saving, and financial management (Sabri et al., 2021). Although Gen Z users frequently interact with digital financial applications, most financial literacy content still fails to attract sustained attention due to inadequate visual design and low engagement.

UI color palettes are important because colors influence user emotions, trust, and attention (Cyr et al., 2010), with cool-palette financial apps potentially evoking security and stability (Labrecque & Milne, 2012). Motion graphics effectively deliver information through dynamic visuals (Landa, 2018). However, limited research exists on how the palette conventions of financial applications can be systematically analysed and applied in motion graphics to support Gen Z financial literacy engagement. This gap motivates the current study.

2 LITERATURE REVIEW

2.1 Theoretical Framework: Itten's Warm-Cool-Neutral Tone Classification

The main analytical framework of this study is Itten's (1961) warm-cool-neutral color tone classification, as presented in The Art of Color. Itten, a well-known Bauhaus color theorist, classified colors based on their psychological temperature. Warm tones, such as red, orange, and yellow, are often linked with energy, urgency, and warmth. Cool tones, such as blue, teal, and purple, are often linked with calmness, trust, and rational thinking. Neutral tones, such as black, white, and grey, are linked with balance, clarity, and professionalism. Itten's framework is one of the most commonly used color classification systems in visual design education and practice (Singh, 2006).

This study expands Itten's three-category framework by adding a fourth category, which is Natural/Growth Tone (green). This is because green has clear psychological links with financial growth, prosperity, and environmental positivity, especially in the context of financial services (Labrecque & Milne, 2012). This four-category tone framework is also supported by Elliot and Maier's (2012) Color-in-Context Theory. This theory suggests that color meaning becomes stronger when it is repeatedly used in the same context. Therefore, the consistent use of cool and natural tones in global financial platforms can be seen as a socially reinforced convention that may shape users' psychological expectations.

2.2 UI Color Palettes in Mobile Financial Applications

User Interface (UI) refers to the visual layout and interactive elements of digital applications that help users interact with a system. In UI design, a color palette is a set of colors used consistently throughout an interface. It usually includes a primary color that represents the overall identity, a secondary color that supports visual hierarchy, an accent color that highlights interactive elements, and a neutral or background color that improves readability and contrast (Itten, 1961; Labrecque & Milne, 2012).

In mobile financial applications, UI color palette design can strongly influence usability, user experience, and continued engagement (Cyr et al., 2010). Gen Z users are highly influenced by visually engaging interfaces because they have grown up with digital media (Djamasbi et al., 2010). Therefore, color palette choices are an important factor in attracting and maintaining their engagement. Previous research on fintech application design shows that UI visual elements, including color, may affect user satisfaction and perceived reliability (Teng et al., 2020). This suggests that careful color palette decisions are important not only for appearance, but also for the overall user experience.

2.3 Color Psychology and User Perception

Colors and their tone categories can influence how users perceive trust, authority, and emotional feeling (Singh, 2006). Financial applications often use cool-toned color palettes because blue, teal, and purple are strongly connected with trust, stability, professionalism, and competence (Labrecque & Milne, 2012). Cyr et al. (2010) found that suitable color choices can help improve user trust and satisfaction in digital interfaces. Based on the Color-in-Context Theory by Elliot and Maier (2012), these color meanings can be understood as socially learned ideas that are strengthened through repeated use in global financial branding.

Green, which is classified as Natural/Growth Tone in this study, has strong psychological links with financial growth, prosperity, and environmental positivity (Labrecque & Milne, 2012). Its common use in investment and budgeting platforms shows its ability to communicate ideas of financial health and sustainability. Neutral tones, such as black, white, and grey, help create a sense of professionalism and readability. Meanwhile, warm tones, such as red, orange, and yellow, are less commonly used as main palette colors in financial apps. However, they can work well as accent colors to highlight calls-to-action and important information (Labrecque & Milne, 2012).

2.4 Color in Context Theory

Elliot and Maier's (2012) Color-in-Context Theory explains that color meaning is not fixed. Instead, it is shaped through social learning and repeated use in certain contexts. In the context of financial applications, cool and natural color palettes are often used together with financial service interfaces across global platforms. This repeated use may create a socially reinforced convention. As a result, users may learn to connect cool-colored and green-colored interfaces with trust, reliability, and financial credibility. This theory supports the idea that color palette patterns found in financial applications can be applied in motion graphics to create visual familiarity and may help support perceived credibility among Gen Z audiences.

2.5 Motion Graphics and Visual Communication

Motion graphics combine animation, typography, and visual storytelling to present information in an engaging and memorable way (Landa, 2018). They are widely used in digital education because they can help simplify complex information, maintain audience attention, and improve understanding compared to static formats (Yaakob et al., 2021). Research in Malaysian contexts shows that motion graphic elements, including animation, typography, and visual effects, can improve viewer engagement for different communication purposes (Khairulah et al., 2023; Shahrulnizam et al., 2023; Nasir et al., 2024). Kim et al. (2020) also showed that motion graphics can influence emotional quality in digital user experiences. This supports their potential use in financial literacy communication for emotionally receptive audiences such as Gen Z.

Applying the color palette conventions of mobile financial applications in motion graphics design may help create content that feels visually familiar and credible to Gen Z users. These established color-trust associations may also help strengthen their response to financial literacy content. However, this assumption still needs to be tested through future user testing.

2.6 Gen Z Financial Literacy

Financial literacy refers to the ability to understand and manage financial matters, including budgeting, saving, and financial planning (Muat et al., 2024). Although Malaysian Gen Z users are highly engaged with digital financial platforms, many of them still show weaknesses in practical financial management skills (Sabri et al., 2021). Research on fintech application design has shown that UI elements, including visual layout and color, may directly influence users' financial literacy and satisfaction (Teng et al., 2020). This suggests that careful visual design choices in financial applications are important not only for appearance, but also for learning purposes. Therefore, new digital approaches to financial literacy education that match Gen Z's visual preferences are needed.

2.7 K-Means Clustering

K-Means Clustering is a data grouping method used to organise a large set of data points into smaller clusters based on similarity. The algorithm works by assigning each data point to the nearest cluster centre, also known as the centroid. It then updates the centroids repeatedly until the clusters become stable (MacQueen, 1967; Hartigan & Wong, 1979). Because it is simple and efficient, K-Means is widely used in many fields, including image processing and pattern recognition (Jain, 2010).

In digital images, K-Means Clustering is commonly used for color quantisation. This process reduces the number of colors in an image while keeping its main visual characteristics. By treating each pixel's color value as a data point, K-Means groups similar pixels together. It then identifies a small set of representative colors that best describe the overall image (Celebi, 2011). This makes it an effective tool for extracting dominant colors from an image in a structured and consistent way.

This study uses K-Means Clustering to extract the main color palette from UI screenshots of 42 mobile financial applications. By grouping similar pixels within each screenshot, the algorithm helps identify the primary, secondary, accent, and neutral/background colors that define each application's visual identity. This computational approach supports a more systematic and objective analysis of UI color palettes. It also complements the qualitative visual content analysis used in this study.

3 RESEARCH DESIGN

3.1 Research Design

This study uses a qualitative descriptive visual content analysis supported by computational color palette extraction and descriptive frequency analysis. Visual content analysis was used because this study examines UI screenshots as visual data. This allows recurring visual features, such as color

palettes, to be identified and categorised in a systematic way (Bell, 2004). This research design supports a structured analysis of UI color palettes across 42 applications without using experimental manipulation or human participants.

The analysis process was carried out in five stages: (1) purposive selection of 42 mobile financial applications; (2) collection of UI screenshots from official Apple App Store listings, Google Play Store listings, and official developer websites; (3) selection of one main interface screenshot for each application that best represents the app's visual identity; (4) identification and extraction of the main color palette from each screenshot, including the primary, secondary, accent, and neutral/background colors; and (5) classification of each application's overall palette into one of four palette pattern categories based on the dominant palette characteristics.

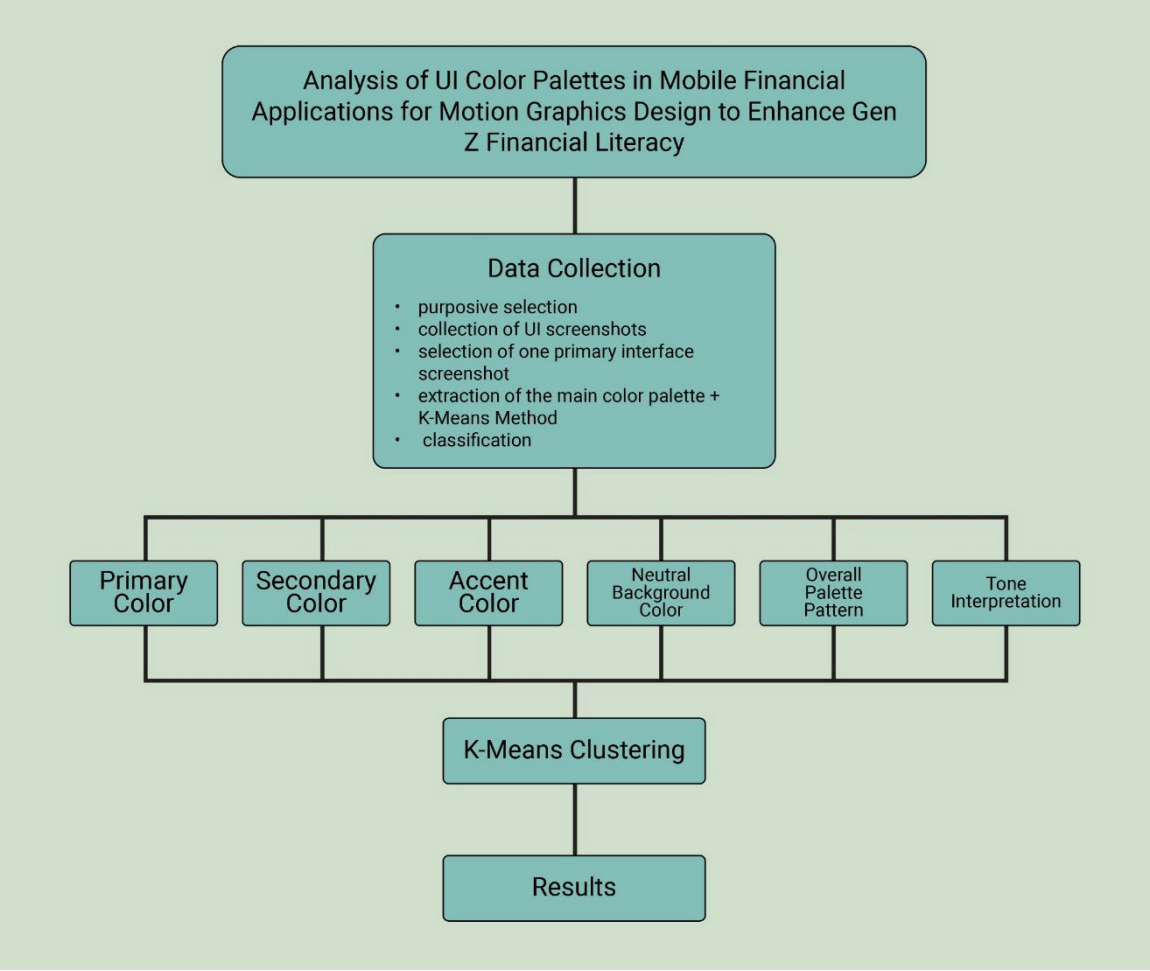

Figure 1 Framework of Study

3.2 Application Selection Criteria

The 42 applications were selected based on four criteria: (a) active availability on iOS and/or Android at the time of data collection; (b) relevance to financial service categories commonly used by Gen Z, such as banking, payments, investment, and personal financial management; (c) geographical diversity, including Malaysian domestic platforms and globally recognised platforms; and (d) enough publicly available UI screenshots from official Apple App Store pages, Google Play Store pages, or official developer websites to support reliable color palette identification.

Screenshots were collected from official Apple App Store listings, Google Play Store listings, and official developer websites. These sources were used because they provide official preview

materials that show the app's interface, features, functionality, and user experience (Apple Developer, n.d.; Google Play Help, n.d.). The applications were categorised into four service groups, as shown in Table 1.

Table 1 Application Categories and Distribution

Service Category	Applications	n	Major Palette Pattern
Banking & E-Wallet	MAE Maybank2u, Touch 'N Go eWallet, ShopeePay, GX Bank, CIMB OCTO, BigPay, Setel, Boost, Grab	9	Warm, Cool, Natural
Investment & Trading	TradingView, Wahed, StashAway, Versa, Webull, Robinhood, Binance, Luno, Coinbase, eToro, moomoo	11	Natural, Neutral, Cool
Global Payment	Wise, Monzo, N26, Venmo, PayPal, Apple Pay, Google Pay, Samsung Wallet, SoFi, Zelle, Kredivo, Stripe, Patreon, Payoneer	14	Cool, Natural, Neutral, Warm
Budgeting & PFM	Money Lover, Goodbudget, Money Coach, YNAB, Mint, Spendee, Finku, Toshl Finance	8	Cool, Natural, Neutral, Warm

Note. Major palette patterns are listed from the most to the least common pattern within each service group.

3.3 Color Palette Extraction and Classification Protocol

Figure 2 Sample

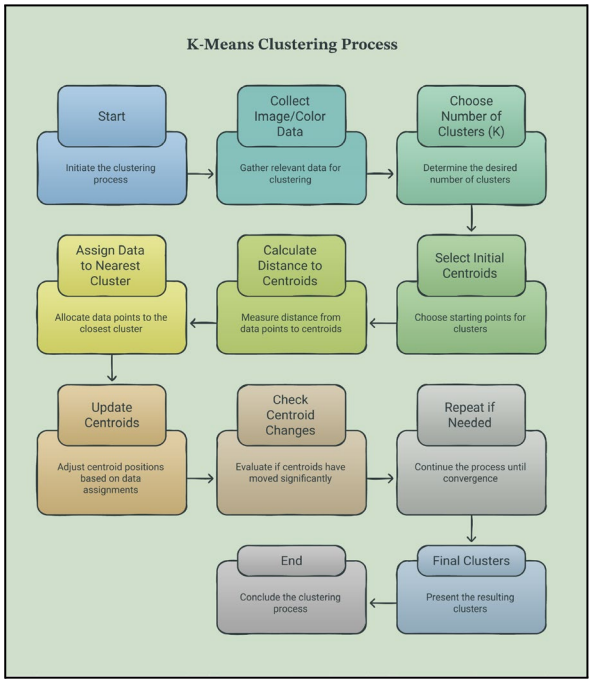

Figure 3 K-Means Clustering Process

For each application, the color palette was extracted using K-means clustering. This is a color quantisation method that groups similar pixels into a smaller number of color clusters. It allows the main colors of each interface to be identified (Celebi, 2011). The extracted palette for each application included up to five colors: the primary color, which covers the largest visual area; the secondary color, which covers the second largest visual area; the accent color, which is a highly noticeable color used

for interactive or call-to-action elements; the neutral/background color, which acts as the base background or structural color; and, where applicable, a supporting color.

In this study, K = 5 was used to extract up to five main color clusters from each UI screenshot. The extracted colors were then interpreted as primary, secondary, accent, neutral/background, and supporting colors. Visual verification was also used to make sure the extracted colors matched the visible interface design.

Color tone classification followed Itten's (1961) warm-cool-neutral framework, extended to four tone categories:

- Cool Tone - Blue, Teal, Purple: colors associated with calm, trust, rationality, and competence (Itten, 1961; Labrecque & Milne, 2012).
- Natural/Growth Tone - Green: colors associated with financial growth, prosperity, and environmental positivity (Labrecque & Milne, 2012).
- Neutral Tone - Black, White, Grey: colors associated with balance, clarity, authority, and precision (Itten, 1961; Singh, 2006).
- Warm Tone - Red, Orange, Yellow: colors associated with energy, urgency, excitement, and action (Itten, 1961; Labrecque & Milne, 2012).

Because this study analyses a multi-color palette rather than a single dominant color, classification was based on the overall pattern of the palette rather than any single color. The following palette pattern categories were established:

- Cool-dominant palette: Blue, teal, and/or purple as primary interface colors, supported by white or grey neutral base, with possible warm accent.
- Natural/Growth palette: Green as the primary interface color, supported by white or grey neutral base.
- Neutral-based palette: Black, white, or grey as the primary interface framework, supported by secondary colors of any tone.
- Warm-dominant palette: Red, orange, or yellow as the primary interface color, supported by neutral base.

3.4 Limitation

Several limitations should be acknowledged. First, color palette extraction was conducted through visual inspection supplemented by computational analysis; subjectivity may remain for colors at tone boundaries. Second, the study does not account for dark mode variants. Third, only the primary interface screenshot per application was analysed, which may not capture the full range of palette use across multiple screens. Future research should employ validated computational color extraction tools and multi-screen UI palette analysis to address these limitations.

4 Data Collection

Data was systematically collected from 42 mobile financial applications representing banking, e-wallet, investment, trading, payment, and personal finance management categories. Screenshots were collected from official Apple App Store listings, Google Play Store listings, and official developer websites because these sources provide official preview materials that showcase the app's interface, features, functionality, and user experience (Apple Developer, n.d.; Google Play Help, n.d.). For each application, the primary interface screen was selected, and the color palette was extracted to identify the primary, secondary, accent, and neutral/background colors. Table 2 presents the complete color palette classification data for all 42 applications.

Table 2 UI Color Palette Classification of 42 Mobile Financial Applications

No.	Application Name	Service Category	Primary Color	Secondary Color	Accent Color	Neutral/ Background Color	Overall Palette Pattern	Tone Interpretation
1	MAE Maybank2 u	Banking & E-Wallet	Yellow	Pink	Red	White	Warm-dominant palette	Warm - Energy, Action
2	Touch 'N Go eWallet	Banking & E-Wallet	Blue	Blue	Yellow	White	Cool-dominant palette	Cool - Trust, Reliability
3	ShopeePay	Banking & E-Wallet	Orange	Red	White	White	Warm-dominant palette	Warm - Energy, Urgency
4	GX Bank	Banking & E-Wallet	Purple	Black	White	Black	Cool-dominant palette	Cool - Trust, Prestige
5	CIMB OCTO	Banking & E-Wallet	Red	White	Grey	White	Warm-dominant palette	Warm - Energy, Action
6	BigPay	Banking & E-Wallet	Teal	White	Yellow	White	Cool-dominant palette	Cool - Trust, Clarity
7	Setel	Banking & E-Wallet	Blue	Red	White	White	Cool-dominant palette	Cool - Trust, Reliability
8	Boost	Banking & E-Wallet	Red	Orange	White	White	Warm-dominant palette	Warm - Energy, Excitement
9	Grab	Banking & E-Wallet	Green	White	Black	White	Natural/Growth palette	Growth - Prosperity
10	Wise	Global Payment	Green	White	Grey	White	Natural/Growth palette	Growth - Prosperity
11	Trading View	Investment & Trading	Black	Red	Grey	Black	Neutral-based palette	Neutral - Precision, Authority
12	Wahed	Investment & Trading	Blue	Yellow	White	White	Cool-dominant palette	Cool - Trust, Credibility
13	StashAway	Investment & Trading	Teal	Green	White	White	Cool-dominant palette	Cool - Trust, Growth
14	Versa	Investment & Trading	Teal	Green	Orange	White	Cool-dominant palette	Cool - Trust, Growth
15	Webull	Investment & Trading	Blue	Black	Grey	Black	Neutral-based palette	Neutral - Precision
16	Robinhood	Investment & Trading	Green	White	Black	White	Natural/Growth palette	Growth - Positivity
17	Binance	Investment & Trading	Black	Green	Yellow	Black	Neutral-based palette	Neutral - Authority
18	Luno	Investment & Trading	Blue	White	Grey	White	Cool-dominant palette	Cool - Trust, Reliability

No.	Application Name	Service Category	Primary Color	Secondary Color	Accent Color	Neutral/ Background Color	Overall Palette Pattern	Tone Interpretation
19	Coinbase	Investment & Trading	Blue	White	Grey	White	Cool-dominant palette	Cool - Trust, Reliability
20	Monzo	Global Payment	Red	White	Grey	White	Warm-dominant palette	Warm - Energy, Action
21	N26	Global Payment	Green	White	Grey	White	Natural/Growth palette	Growth - Clarity
22	Venmo	Global Payment	Blue	Green	Teal	White	Cool-dominant palette	Cool - Trust Reliability
23	PayPal	Global Payment	Blue	White	Grey	White	Cool-dominant palette	Cool - Trust, Reliability
24	Apple Pay	Global Payment	Black	White	Grey	White	Neutral-based palette	Neutral - Premium, Precision
25	Google Pay	Global Payment	Green	White	Blue	White	Natural/Growth palette	Growth - Clarity
26	Samsung Wallet	Global Payment	Blue	Black	Grey	Black	Cool-dominant palette	Cool - Trust Reliability
27	Money Lover	Budgeting & PFM	Green	White	Grey	White	Natural/Growth palette	Growth - Financial Health
28	Goodbudget	Budgeting & PFM	Green	White	Grey	White	Natural/Growth palette	Growth - Clarity
29	Money Coach	Budgeting & PFM	Black	Green	White	Black	Neutral-based palette	Neutral, Authority
30	YNAB	Budgeting & PFM	Teal	Green	White	White	Cool-dominant palette	Cool - Trust, Clarity
31	Mint	Budgeting & PFM	Green	Teal	White	White	Natural/Growth palette	Growth - Financial Health
32	Spendee	Budgeting & PFM	Green	White	Grey	White	Natural/Growth palette	Growth - Clarity
33	Finku	Budgeting & PFM	Blue	White	Grey	White	Cool-dominant palette	Cool - Trust
34	Toshl Finance	Budgeting & PFM	Red	Black	Grey	White	Warm-dominant palette	Warm - Energy, Action
35	eToro	Investment & Trading	Green	Red	White	White	Natural/Growth palette	Growth - Positivity
36	SoFi	Global Payment	Blue	Black	Grey	White	Cool-dominant palette	Cool - Trust
37	Zelle	Global Payment	Purple	Teal	White	White	Cool-dominant palette	Cool - Trust
38	Kredivo	Global Payment	Blue	Orange	White	White	Cool-dominant palette	Cool - Trust

No.	Application Name	Service Category	Primary Color	Secondary Color	Accent Color	Neutral/ Background Color	Overall Palette Pattern	Tone Interpretation
39	Stripe	Global Payment	Black	Purple	White	White	Neutral-based palette	Neutral - Precision
40	Patreon	Global Payment	Green	White	Black	White	Natural/Growth palette	Growth - Community
41	Payoneer	Global Payment	Orange	Purple	White	White	Warm-dominant palette	Warm - Energy, Action
42	moomoo	Investment & Trading	Black	Blue	Grey	Black	Neutral-based palette	Neutral - Precision, Authority

Note. Color palette classification was supported by K-Means clustering and visual verification. Palette pattern classification was based on overall dominant palette characteristics following Itten (1961) and Labrecque and Milne (2012) tone frameworks.

5 Data Analysis

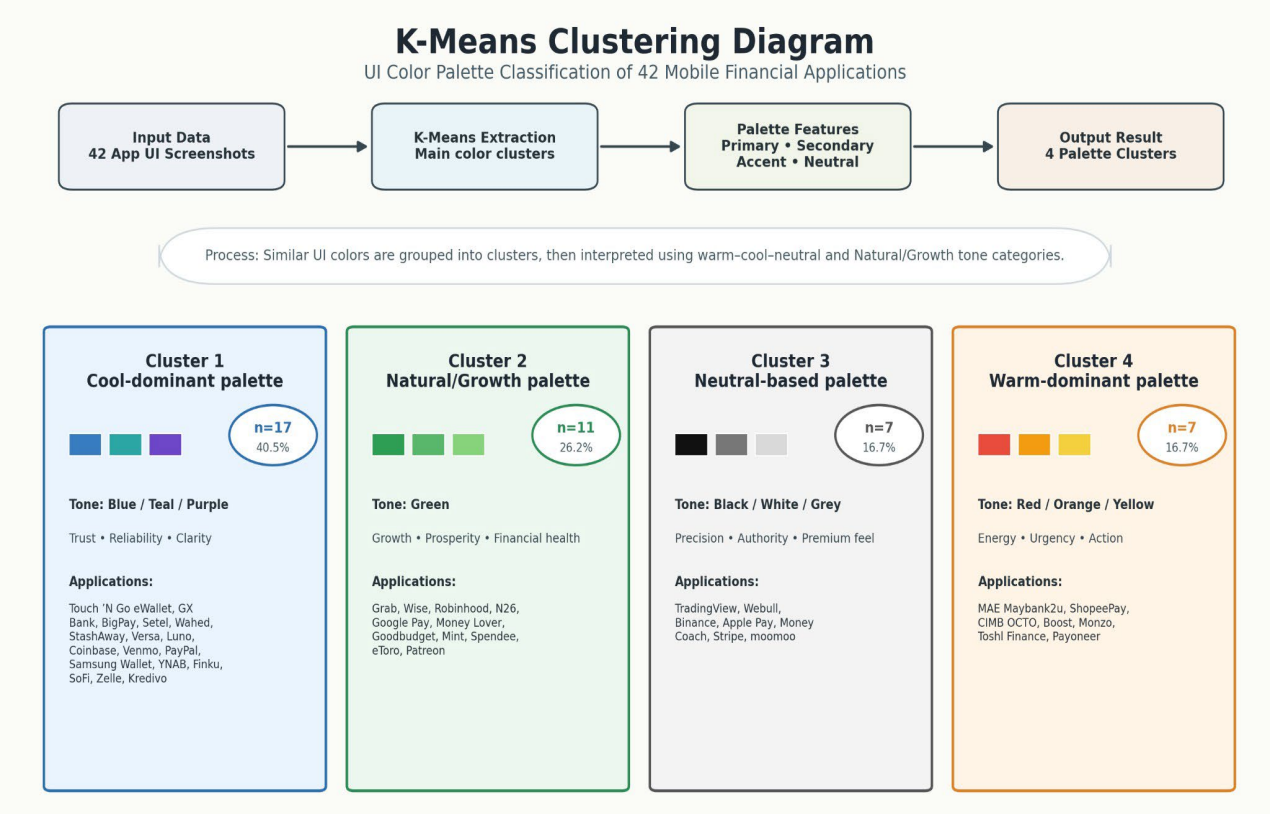

Figure 4 K-Means Clustering Diagram

Palette pattern frequencies and percentages were calculated by counting the number of applications in each palette pattern category. The classification was based on the overall palette characteristics identified for each application, with a total of 42 classification entries. Frequency refers to the actual number of applications in each palette pattern category, while percentage refers to the proportion of each pattern within the total sample. Percentages were included because they make the distribution easier to compare between the palette pattern categories. They also help provide clearer evidence for the proposed palette framework. However, the percentages are only used as descriptive values, not as inferential statistics. This is because the study does not test hypotheses or make statistical

generalisations beyond the selected sample. Table 3 presents the complete frequency distribution of the palette patterns.

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Table 3 Color Palette Pattern Frequency Distribution

Palette Pattern	Description	Frequency (n)	Percentage (%)
Cool-dominant palette	Blue, teal, and/or purple as the primary interface colors; white or grey as neutral base; may include warm accent	17	40.5%
Natural/Growth palette	Green as the primary interface color; white or grey as neutral base	11	26.2%
Neutral-based palette	Black, white, or grey as the primary interface framework; supported by secondary colors	7	16.7%
Warm-dominant palette	Red, orange, or yellow as the primary interface color; supported by neutral base	7	16.7%
Total		42	100.1%*

The frequency analysis shows a clear pattern across the palette pattern categories. Cool-dominant palettes are the most common pattern (n = 17, 40.5%), followed by Natural/Growth palettes (n = 11, 26.2%). Together, these two categories represent 66.7% of the 42 applications analysed. This shows a clear industry pattern of using calm, trust-related, and growth-related color palettes in financial application interfaces. Based on Color-in-Context Theory (Elliot & Maier, 2012), this pattern may show a socially reinforced connection between cool and natural palette choices and the psychological qualities valued by financial service users, such as trust, competence, stability, and growth. Neutral-based palettes (n = 7, 16.7%) are mostly found in investment and cryptocurrency platforms, where dark and neutral interfaces may suggest premium quality and technical precision. Warm-dominant palettes (n = 7, 16.7%) appear mainly in payment, e-wallet, and action-oriented financial services.

6 RESULTS AND FINDINGS

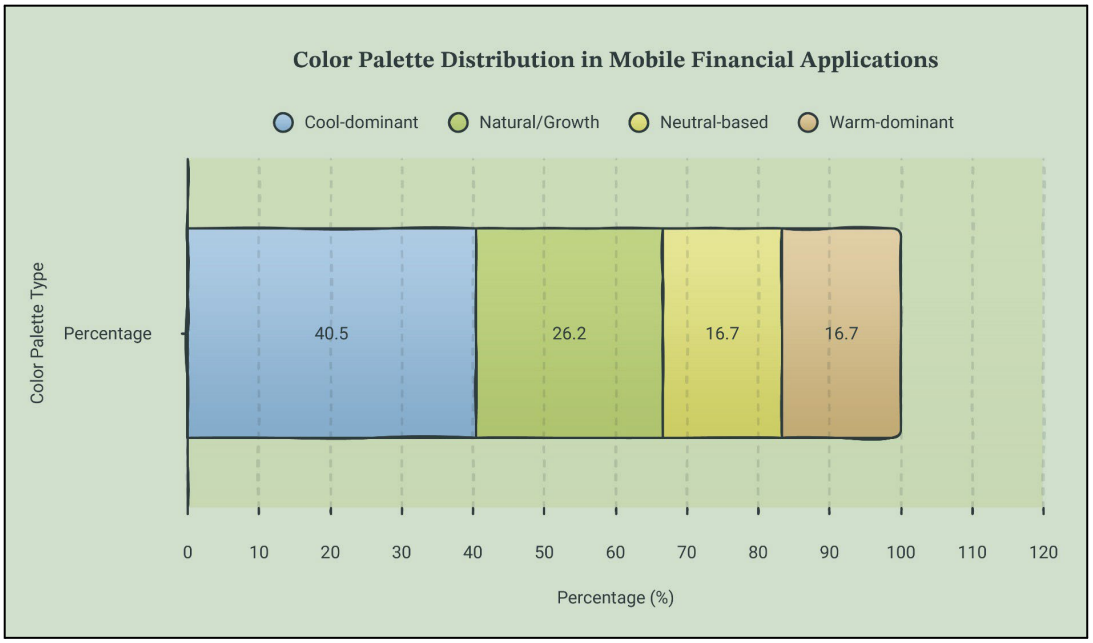

Figure 5 Color Palette Distribution in Mobile Financial Applications

The color palette analysis of 42 mobile financial applications identified four main palette patterns across all service categories. Cool-dominant palettes (n = 17, 40.5%) are the most common pattern. This category includes applications such as Touch 'N Go eWallet, GX Bank, BigPay, Setel, Wahed, StashAway, Versa, Luno, Coinbase, Venmo, PayPal, Samsung Wallet, YNAB, Finku, SoFi, Zelle, and Kredivo. These applications use blue, teal, or purple as their main interface color, supported by white, grey, or black neutral backgrounds. This palette combination is strongly linked to trust, reliability, and competence (Labrecque & Milne, 2012; Itten, 1961). Its common use across global financial platforms may also reflect a socially reinforced visual convention (Elliot & Maier, 2012).

Natural/Growth palettes (n = 11, 26.2%) are the second most common pattern. This category includes Grab, Wise, Robinhood, N26, Google Pay, Money Lover, Goodbudget, Mint, Spendee, eToro, and Patreon. Green as a main palette color has a clear role in financial application design because it communicates financial growth, prosperity, and financial health. The use of Natural/Growth palettes in both global and Malaysian financial applications shows that green is commonly understood as a sign of financial growth across different contexts.

Neutral-based palettes (n=7, 16.7%) are mostly found in investment and cryptocurrency platforms, including moomoo, TradingView, Binance, Webull, Money Coach, Apple Pay, and Stripe. In these applications, dark and neutral interfaces may communicate precision, authority, and premium quality. This is consistent with Itten's (1961) view that neutral tones can show balance and professionalism. In these contexts, the neutral base palette is often supported by secondary cool or warm accent colors. This helps create visual hierarchy while still keeping the overall neutral identity.

Warm-dominant palettes (n = 7, 16.7%) appear mainly in payment, e-wallet, and action-oriented financial services, including MAE Maybank2u, ShopeePay, CIMB OCTO, Boost, Monzo, Toshl Finance, and Payoneer. These applications use red, orange, or yellow as their main palette colors to communicate energy, urgency, and action. This is consistent with Labrecque and Milne's (2012) finding that warm tones communicate excitement and dynamism. Warm colors also appear as accent elements in many Cool-dominant and Natural/Growth palette applications. In these cases, they function as call-to-action highlights without defining the overall palette identity.

The palette pattern distribution across service categories shows that palette choices appear to reflect the financial service function of each application. Global payment applications are most strongly linked with Cool-dominant palettes, which may support the perception of trust and reliability in payment interactions. Banking and e-wallet applications show a mixed Warm-Cool-Natural pattern, reflecting both trust-oriented banking interfaces and action-oriented payment services. Investment and trading applications show a stronger Natural-Neutral pattern, which may reflect financial growth positioning and premium interface conventions. Budgeting and personal finance management applications show a balanced Cool-Natural pattern, which may reflect trust, clarity, and financial health themes. This service-specific palette distribution suggests that palette choices in financial applications may not be random. Instead, they may reflect a planned connection between color psychology and the specific financial value offered by each service type.

6.1 Proposed Color Palette Framework for Motion Graphics Design to Enhance Genz Financial Literacy

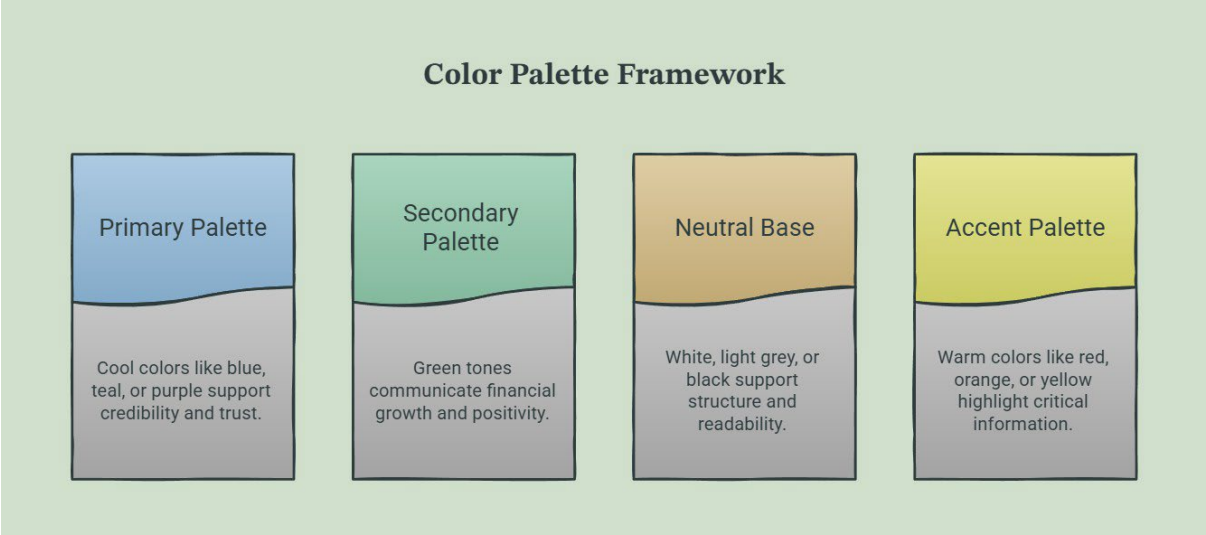

Figure 6 Color Palette Framework

Based on the analysis findings, this study proposes an evidence-based color palette framework for motion graphics that target Gen Z financial literacy. This framework is developed from the palette patterns found across 42 mobile financial applications. It is also supported by established color psychology literature. The framework is recommended as a design guideline. However, its effectiveness in improving Gen Z financial literacy engagement should be tested through future user studies.

- Primary palette - Cool Colors (Blue, Teal, or Purple): As the dominant palette pattern in financial app UI (40.5% of applications), cool colors are recommended as the primary visual palette of financial literacy motion graphics. These colors may support perceived credibility, trust, and visual familiarity with established financial interface conventions (Labrecque & Milne, 2012; Elliot & Maier, 2012).
- Secondary palette - Natural/Growth Colors (Green): As the second most prevalent palette pattern (26.2%), green tones may be applied as a secondary palette element to communicate financial growth, savings, and financial positivity, particularly in content addressing investment, savings, and budgeting topics.
- Neutral base - White, Light Grey, or Black: Neutral tones can support structure, readability, and contrast across motion graphics compositions. A white or light grey base supports clarity and reduces cognitive load, while a dark base may enhance premium positioning for investment-oriented content.
- Accent palette - Warm Colors (Red, Orange, or Yellow): Warm colors may be applied sparingly (recommended maximum 10–15% of visual space) to highlight critical information, key

statistics, calls-to-action, and financial warnings. This use is consistent with the established role of warm tones as attention-directing accents in financial UI design (Labrecque & Milne, 2012).

This framework is developed from the palette patterns found across 42 mobile financial applications. It is also supported by established color psychology literature. The framework is recommended as a design guideline. However, its effectiveness in improving Gen Z financial literacy engagement should be tested through future user testing.

7 CONCLUSION

The findings show that Cool-dominant palettes (n = 17, 40.5%) and Natural/Growth palettes (n = 11, 26.2%) are the two most common palette patterns. Together, these two categories make up 66.7% of the 42 mobile financial applications analysed. This reflects a clear industry pattern of using calm and trust-related color palettes in financial application interfaces. Neutral-based palettes (16.7%) are mostly found in investment and cryptocurrency platforms, while Warm-dominant palettes (16.7%) appear mainly in payment and e-commerce-related services. These palette patterns may show a planned connection between color psychology and the specific financial value offered by each service type.

Based on these findings, this study proposes a four-tier color palette framework for motion graphics targeting Gen Z financial literacy. The framework consists of Cool primary, Natural/Growth secondary, Neutral base, and Warm accent colors. It is recommended as a design guideline that may help create visual familiarity and support perceived credibility among Gen Z audiences in Malaysia. However, the effectiveness of this framework in improving financial literacy engagement was not tested in this study. Therefore, future user testing is needed to confirm its effectiveness.

Future studies should conduct user perception testing with Malaysian Gen Z participants to validate the proposed motion graphics color palette framework. They should also use validated computational color extraction tools to support quantitative palette analysis and expand the dataset. Future research may also include dark mode and multi-screen UI palette analysis, analyse palette changes across onboarding, home, transaction, and data visualisation screens, and evaluate the effectiveness of motion graphics produced using this framework in experimental financial literacy educational settings.

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CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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