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Innovative approaches in high-end photo retouching and color grading techniques for enhanced marketing and visual storytelling, including for SMEs

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Abstract

This paper explores innovative high-end photo retouching and color grading approaches, emphasizing their significance in marketing and visual storytelling. It traces the evolution from traditional to digital techniques, highlighting technological advancements and the integration of artificial intelligence (AI) and machine learning (ML). These advancements have democratized access to professional-grade tools, enabling more efficient and precise editing. The paper details critical techniques such as skin retouching, background enhancement, and compositing, which are crucial for creating aesthetically pleasing and realistic images. It also delves into the principles of color theory and its application in achieving various moods and styles, influenced significantly by cinematic color grading. Furthermore, the paper examines the benefits and challenges small and medium-sized enterprises (SMEs) face in leveraging these techniques to compete with larger companies. Despite budget constraints and limited expertise, SMEs can utilize affordable tools, invest in training, and adopt efficient workflows to enhance their visual content. This paper underscores the transformative power of high-end photo retouching and color grading in modern marketing, offering insights into practical applications and strategic advantages for businesses of all sizes.

Keywords: High-end photo retouching; Color grading; Visual storytelling; Artificial intelligence

1. Introduction

In the dynamic world of marketing and visual storytelling, photo retouching and color grading have emerged as a cornerstone for creating compelling and memorable imagery. The importance of these techniques cannot be overstated, as they play a crucial role in shaping perceptions, conveying emotions, and enhancing the aesthetic appeal of visual content. High-end photo retouching and color grading are pivotal in differentiating brands in a saturated market, making them indispensable tools for marketers and visual artists (Lalramchuani, 2023).

Photo retouching involves the meticulous process of altering and enhancing images to achieve a desired level of perfection. This can range from simple adjustments like removing blemishes and correcting colors to more complex manipulations like changing backgrounds and creating composites (McDonald, Williams, & Mayes, 2021; Silbey, Subotnik, & DiCola, 2019). The goal is to produce an image that looks flawless and resonates with the intended audience. In marketing, retouched images highlight product features, convey brand messages, and evoke emotional responses from viewers. The impact of a well-retouched image can be profound, often making the difference between a successful campaign and one that falls flat (Freeman, 2018).

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Color grading, on the other hand, involves the stylistic enhancement of an image's colors to create a specific mood or tone. This technique is widely used in photography and videography to ensure visual consistency and elicit particular emotions. For instance, warm colors evoke comfort and happiness, while cooler tones convey professionalism or tranquility. In marketing, color grading helps to align visual content with the brand's identity and the emotional narrative they wish to project. The strategic use of color can influence consumer behavior, making it a powerful tool in visual storytelling.

Small and Medium-sized Enterprises (SMEs) face unique challenges in visual content creation. Unlike more giant corporations, SMEs often operate with limited budgets and resources, making it imperative to maximize their marketing efforts' impact. High-end photo retouching and color grading can give SMEs the competitive edge they need to stand out. However, these techniques are often perceived as expensive and complex, which can be daunting for smaller businesses. SMEs need solutions that are not only effective but also cost-efficient and accessible (Kelby, 2020; McDonald et al., 2021).

The specific needs of SMEs in visual content creation revolve around the ability to produce high-quality, professional-looking images without the extensive resources that larger companies might have. This includes access to affordable tools and software and the knowledge and skills to utilize them effectively. SMEs also benefit from streamlined processes and techniques that can deliver results quickly and efficiently, allowing them to keep pace with larger competitors. Moreover, the flexibility to adapt to various marketing strategies and platforms is crucial, as SMEs often need to be agile and responsive to market changes (Sunarso & Mustafa, 2023; Tiep Le, Ngo, & Aureliano-Silva, 2023).

This paper aims to explore innovative approaches in high-end photo retouching and color grading that can enhance marketing and visual storytelling, particularly for SMEs. By examining the latest trends and technologies, this paper aims to provide insights into how SMEs can leverage these techniques to create impactful visual content. The paper will cover the evolution of these techniques, key methods used in high-end retouching and color grading, and the benefits and challenges SMEs face in adopting these practices.

This paper will begin with a historical overview of photo retouching and color grading, tracing their development from traditional methods to cutting-edge digital techniques. It will then delve into the specifics of high-end photo retouching, highlighting fundamental techniques and the role of emerging technologies such as artificial intelligence. Following this, the paper will explore innovative approaches to color grading, discussing how different styles and moods can be achieved and their impact on visual storytelling. Finally, the paper will address the unique needs of SMEs, offering practical advice on how they can effectively incorporate these techniques into their marketing strategies.

In conclusion, high-end photo retouching and color grading are essential to modern marketing and visual storytelling. For SMEs, mastering these techniques can unlock new potential, allowing them to compete more effectively and tell their brand stories more compellingly. This paper aims to shed light on the innovative approaches that can make these advanced techniques accessible and beneficial to smaller businesses, ultimately enhancing their visual presence and marketing effectiveness.

2. The Evolution of Photo Retouching and Color Grading Techniques

2.1 History and Transition from Traditional to Digital Techniques

The journey of photo retouching and color grading has evolved significantly over the past century, transforming from labor-intensive manual processes to sophisticated digital methods. Traditionally, photo retouching was a meticulous task by skilled artists using brushes, airbrushes, and other manual tools to enhance images on physical prints. This process required a deep understanding of art and anatomy, precision, and patience. Color grading in the early days of photography and film was equally complex, involving chemical processes and manipulating physical film strips. These traditional methods were time-consuming, expensive, and required a high level of expertise (Bagale et al., 2021; Chaffey & Smith, 2022).

The advent of digital technology in the late 20th century marked a pivotal shift in photo retouching and color grading. The introduction of digital cameras, scanners, and computers revolutionized the way images were captured, processed, and edited. Software like Adobe Photoshop, first released in 1988, provided powerful tools that allowed artists to manipulate images with unprecedented ease and precision. Digital retouching eliminated many of the limitations of traditional methods, enabling artists to achieve more consistent and refined results in a fraction of the time (Johnston & Elyan, 2019). Similarly, digital color grading transformed the film and photography industries. Early digital color grading systems, such as the DaVinci color corrector introduced in the 1980s, allowed colorists to manipulate colors

digitally, offering greater flexibility and control. This transition from analog to digital opened up new creative possibilities, making experimenting with different looks and styles easier (Paul, 2023).

2.2 Advances in Technology and Software Tools

The evolution of technology and software tools has been instrumental in advancing the fields of photo retouching and color grading. Over the past few decades, significant developments have enhanced the capabilities and accessibility of these techniques. One of the most significant advancements has been the development of powerful image editing software. Programs like Adobe Photoshop, Lightroom, and Capture One have become industry standards, offering a wide range of tools and features for photo retouching. These software packages include advanced algorithms for tasks such as skin retouching, background removal, and object manipulation, making it easier for artists to achieve professional-quality results. Additionally, the introduction of non-destructive editing workflows has allowed for greater flexibility, enabling artists to make changes without permanently altering the original image (Markovic, 2018).

In color grading, software like DaVinci Resolve, Adobe Premiere Pro, and Final Cut Pro have revolutionized how colorists work. These programs provide a comprehensive set of color correction and grading tools, including color wheels, curves, and LUTs (Look-Up Tables). The integration of AI and machine learning technologies has further enhanced these tools, enabling automated color matching, shot matching, and even style transfer, where the color grading style of one image can be applied to another (Yang, 2023). Hardware advancements have also played a crucial role in the evolution of photo retouching and color grading. High-resolution monitors, graphics tablets, and pen displays have improved the precision and accuracy of digital editing. Moreover, the increasing processing power of computers has allowed for real-time rendering and previewing, significantly speeding up the workflow (Belkacem et al., 2022).

2.3 Current Trends and Innovations in the Industry

The fields of photo retouching and color grading are continually evolving, with new trends and innovations emerging as technology advances. One of the most notable trends in recent years is the increasing use of artificial intelligence (AI) and machine learning in image editing. AI-powered tools can automate many retouching and color-grading aspects, making these techniques more accessible to a broader audience. For instance, AI can identify and correct skin imperfections, enhance facial features, and adjust colors automatically, saving time and effort for artists (Alzahrani, 2022).

Another significant trend is the growing popularity of mobile editing apps. As smartphone cameras have improved in quality, so too have the capabilities of mobile editing software. Apps like Adobe Lightroom Mobile, Snapseed, and VSCO offer powerful editing tools that allow users to perform high-quality retouching and color grading directly on their mobile devices. This democratization of editing tools has empowered amateur photographers and small business owners to create professional-looking images without expensive equipment or software (Roivainen, 2024).

The rise of social media and the demand for visually engaging content has also influenced trends in photo retouching and color grading. Platforms like Instagram and TikTok have popularized specific aesthetics, such as vibrant colors, film-inspired looks, and minimalist edits. These trends have driven the development of preset filters and LUTs that can be easily applied to achieve specific styles (Cai, Ma, Wang, & Li, 2023). Additionally, the demand for consistency across visual content has led to the adopting of batch processing and synchronization tools, enabling artists to apply uniform edits to multiple images or videos quickly. Virtual and augmented reality (VR and AR) are also beginning to impact the industry. These technologies offer new creative possibilities for photo retouching and color grading, allowing artists to work in immersive 3D environments. For example, VR can simulate different lighting conditions and view retouched images from various angles, providing a more comprehensive editing experience (Helzle, 2023; Xu & Zhu, 2021).

In conclusion, the evolution of photo retouching and color grading techniques has been marked by significant advancements in technology and software tools. From the transition from traditional to digital methods to the latest trends and innovations, these techniques have become more powerful, accessible, and versatile. As the industry continues to evolve, it will be exciting to see how new technologies and creative approaches shape the future of photo retouching and color grading, further enhancing the art of visual storytelling.

3. High-End Photo Retouching Techniques

High-end photo retouching is an intricate art that transforms ordinary images into visually stunning masterpieces. This process is essential in various industries, including fashion, advertising, and portrait photography, where flawless and captivating visuals are paramount. High-end retouching involves a range of sophisticated techniques to enhance the aesthetic appeal of images while maintaining a natural and realistic look. Essential techniques in high-end photo

retouching include skin retouching, background enhancement, and compositing, each requiring a meticulous approach and a keen eye for detail.

3.1 Key Techniques in High-End Photo Retouching

One of the most critical aspects of high-end photo retouching is skin retouching. The goal is to achieve smooth, flawless skin without losing its natural texture. Techniques such as frequency separation and dodge and burn are commonly used. Frequency separation divides an image into high and low-frequency layers, allowing the retoucher to work on texture and color separately. This method helps remove blemishes, wrinkles, and other imperfections while preserving the skin's natural texture. Dodge and burn involve selectively lightening and darkening areas of the image to enhance facial contours and add depth, resulting in a more polished yet realistic look (Pring, 2022).

Background enhancement is another crucial technique in high-end retouching. It involves altering or completely changing the background of an image to suit the subject or the intended message better. This can include removing distracting elements, adjusting colors and lighting to match the overall tone of the image, or replacing the background with a more suitable one. Techniques like masking and compositing are often employed. Masking allows precise selection and isolation of the subject, making it easier to manipulate the background without affecting the subject. Compositing involves blending multiple images to create a seamless final image, often used in advertising and creative photography (Lukac & Plataniotis, 2018; Nichols, 2020).

Compositing is a powerful technique combining elements from different images to create a cohesive image. This method is widely used in fashion photography, advertising, and digital art. It requires a high skill level to ensure the combined elements appear natural and harmonious. Factors such as lighting, perspective, and color matching are critical in achieving a realistic composite. Advanced software tools like Adobe Photoshop provide various features that facilitate the compositing process, such as layer masks, blending modes, and adjustment layers (Tabatabaian, Beyabanaki, Alirezaei, & Epakchi, 2021).

3.2 The Role of Artificial Intelligence and Machine Learning in Retouching

The integration of artificial intelligence and machine learning has revolutionized the field of photo retouching, making it more efficient and accessible. Al-powered tools can automate many aspects of retouching, allowing artists to focus on the creative aspects rather than the technical details. These tools utilize complex algorithms to analyze and enhance images, offering features like automatic skin smoothing, background removal, and color correction.

AI in skin retouching can detect and remove blemishes, wrinkles, and other imperfections with remarkable accuracy. Machine learning algorithms can learn from large datasets of retouched images, improving their performance over time. This capability allows for quick and consistent results, which is especially beneficial for professionals dealing with high volumes of images (Alzahrani, 2022).

In background enhancement, AI tools can automatically identify and remove unwanted elements or replace the background entirely. For instance, Adobe's Sensei AI technology can intelligently select subjects and separate them from the background, streamlining the compositing process. AI-driven color grading tools can adjust colors to match a specific style or mood, enhancing the overall aesthetic of the image. While AI and ML offer significant advantages, they are not without limitations. These technologies can handle routine tasks efficiently but may struggle with complex retouching that requires a nuanced understanding of artistic principles. Therefore, human intervention remains crucial to achieving high-end results. Combining AI-driven automation and human expertise can lead to a more efficient workflow and superior outcomes (Alzahrani, 2022; Alzahrani, Al-Bander, & Al-Nuaimy, 2021).

3.3 Balancing Realism and Perfection in Retouching

One of the most significant challenges in high-end photo retouching is finding the right balance between realism and perfection. The objective is to enhance the image while maintaining a natural and believable appearance. Over-retouching can lead to images that look artificial and unappealing, detracting from the intended message and impact.

To achieve this balance, retouchers must deeply understand anatomy, light, and shadow. Techniques like dodge and burn help subtly enhance facial features and contours without erasing natural characteristics. Maintaining skin texture is also essential; techniques like frequency separation allow for removing imperfections while preserving the skin's natural look (Mohiuddin, 2019).

Attention to detail is crucial in ensuring that retouched images appear realistic. This includes paying close attention to elements like hair, eyes, and clothing, which should be enhanced without looking over-processed. Consistency across the image is vital, as uneven retouching can create a disjointed appearance. Moreover, ethical considerations play a significant role in the retouching process. There is a growing awareness of the impact of overly retouched images on self-esteem and body image, particularly in fashion and advertising. Retouchers must navigate the fine line between enhancing beauty and promoting unrealistic standards. This involves making conscious choices about which imperfections to remove and which to leave untouched, aiming for a portrayal of aspirational and authentic beauty (Fajoye, 2021; Semaan, Kocher, & Gould, 2018).

4. Innovative Color Grading Approaches

4.1 Importance of Color Theory and Its Impact on Visual Perception

Color theory is a fundamental aspect of visual arts, influencing how viewers perceive and emotionally respond to imagery. Understanding the principles of color theory is crucial for effective color grading, as it allows artists to manipulate colors to achieve specific effects and convey intended messages. Color theory encompasses the relationships between colors, the emotional and psychological responses they evoke, and their cultural significance.

At the core of color theory are the color wheel and the concepts of primary, secondary, and tertiary colors. The relationships between these colors, such as complementary, analogous, and triadic schemes, provide a framework for creating harmonious and visually appealing color combinations. For example, complementary colors opposite each other on the color wheel can create a striking contrast that draws attention, while analogous colors adjacent to the wheel can produce a more harmonious and soothing effect (Perryman, 2021).

Various factors influence color perception, including context, lighting, and individual differences. For instance, warm colors like red, orange, and yellow are often associated with energy, warmth, and excitement, whereas cool colors like blue, green, and purple can evoke calmness, tranquility, and professionalism. These associations can vary across different cultures and contexts, making it essential for colorists to consider the target audience when selecting color schemes.

In visual storytelling, color grading leverages color theory to enhance images' narrative and emotional impact. By carefully selecting and manipulating colors, artists can guide viewers' attention, evoke specific emotions, and reinforce the overall message of the content. Whether aiming to create a sense of nostalgia, drama, or sophistication, understanding the impact of color on visual perception is key to effective color grading (Hibit, 2022).

4.2 Techniques for Achieving Different Moods and Styles Through Color Grading

Color grading is a powerful tool that can dramatically alter the mood and style of an image. Various techniques are employed to achieve different effects, each tailored to the project's specific goals.

The first step in color grading is often basic color correction, which involves adjusting the image's white balance, exposure, and contrast to achieve a neutral baseline. This ensures the colors are accurate and consistent, providing a solid foundation for further stylistic adjustments. Curves and level adjustments are essential in color grading, allowing precise control over an image's tonal range and color balance. By manipulating the curves, colorists can enhance contrast, adjust shadows and highlights, and fine-tune color channels to achieve the desired look. Level adjustments help set the black, white, and midpoints, ensuring the image has a full dynamic range (Fildes, 2022).

Color wheels and HSL (Hue, Saturation, Lightness) sliders are commonly used to adjust an image's overall color balance and saturation. Color wheels allow intuitive control over the shadows, mid-tones, and highlights, enabling colorists to create a cohesive color palette. HSL sliders provide granular control over individual colors, making it possible to enhance or mute specific hues to achieve the desired effect (Bavitha, 2021).

LUTs are pre-defined color grading presets that can be applied to an image to achieve a specific look or style. They are widely used in photography and videography to streamline grading and maintain consistency across multiple images or scenes (Leirpoll et al., 2017). LUTs can range from subtle adjustments that enhance natural colors to dramatic transformations that create a stylized, cinematic look. Selective color adjustments involve isolating and manipulating specific colors within an image. This technique can highlight particular elements, create color contrasts, or achieve a monochromatic look. For instance, desaturating all colors except for one can create a striking effect, drawing attention to the highlighted color. Split toning is a technique that involves adding different colors to the shadows and highlights

of an image. This can create a unique and atmospheric look, often used to evoke specific moods or stylistic effects. For example, adding blue tones to the shadows and warm tones to the highlights can create a vintage or cinematic feel (Misek, 2010).

4.3 The Influence of Cinematic Color Grading on Marketing Visuals

Cinematic color grading has profoundly influenced marketing visuals, borrowing techniques from the film industry to create compelling and emotionally engaging imagery. Cinematic color grading aims to enhance the narrative quality of visuals, often employing dramatic contrasts, stylized color palettes, and mood-specific adjustments to tell a story.

High Contrast and Dramatic Lighting: Cinematic color grading often features high contrast and dramatic lighting, creating a sense of depth and intensity. This technique can be used in marketing visuals to draw attention to the subject and evoke strong emotions. High contrast can also enhance the perception of luxury and sophistication, making it a popular choice for high-end products and brands (Brown, 2016).

Desaturation and Color Isolation: Desaturation, or reducing the overall saturation of an image, is a shared cinematic technique that can create a more severe and subdued tone. This effect can be used in marketing to convey professionalism, elegance, or introspection. Color isolation, where specific colors are highlighted while others are desaturated, can focus the viewer's attention on critical elements, reinforcing the marketing message (Jean-Pierre, 2021).

Warm and Cool Color Schemes: Warm and cool color schemes are a hallmark of cinematic color grading, often employed to evoke specific emotions or set the tone of a scene. Warm colors can create a sense of warmth, happiness, and nostalgia, while cool colors can convey calmness, detachment, or modernity. In marketing, these color schemes can align visuals with brand identity and evoke the desired emotional response from the audience.

Vintage and Retro Looks: Vintage and retro color grading styles have become increasingly popular in marketing, tapping into nostalgia and the appeal of bygone eras. Techniques such as faded colors, film grain, and sepia tones can create a vintage look, adding character and charm to marketing visuals. This approach is efficient for brands that want to evoke a sense of heritage, tradition, or authenticity (Bramesco, 2023).

Teal and Orange Look: The teal and orange look, characterized by complementary blue-green and orange hues, is a popular cinematic color grading style that has made its way into marketing visuals. This color scheme enhances skin tones and creates a visually striking contrast, making it ideal for lifestyle and fashion imagery. The teal and orange look can make images appear more dynamic and vibrant, capturing the viewer's attention and making a lasting impression (Bramesco, 2023).

5. Benefits and Challenges for SMEs

5.1 Leveraging High-End Photo Retouching and Color Grading

Small and medium-sized enterprises (SMEs) operate in a competitive market where visual content is crucial to branding and marketing. High-end photo retouching and color grading can level the playing field, allowing SMEs to produce professional-quality images that rival larger companies. By enhancing product photos, marketing materials, and social media content, SMEs can create a strong visual presence that attracts and retains customers. High-end retouching can eliminate imperfections and emphasize product features, while sophisticated color grading can evoke specific emotions and align visuals with the brand's identity. This attention to detail can significantly enhance brand perception and customer engagement.

5.2 Cost-Effective Tools and Resources for SMEs

Despite the perception that high-end photo retouching and color grading require substantial investment, there are numerous cost-effective tools and resources available that SMEs can leverage. Software like Adobe Photoshop and Lightroom offer comprehensive features at relatively low subscription costs. Platforms like Canva and Fotor also provide affordable and user-friendly options for basic editing and color correction. Open-source software such as GIMP also offers robust capabilities without any cost (Kinoli et al.).

Online tutorials, webinars, and courses can equip SME owners and employees with the necessary in-house skills to perform high-quality retouching and color grading. Websites like YouTube, Udemy, and LinkedIn Learning offer educational content tailored to different skill levels. By investing time in learning these skills, SMEs can reduce reliance

on expensive external services and maintain control over their visual content. Moreover, there are numerous online communities and forums where professionals share tips, tricks, and resources. Engaging with these communities can provide SMEs with valuable insights and support, further enhancing their ability to produce high-quality visual content (Ijomah, Idemudia, Eyo-Udo, & Anjorin, 2024).

5.3 Challenges Faced by SMEs and Potential Solutions

While the benefits of high-end photo retouching and color grading are clear, SMEs face several challenges in adopting these techniques. One of the primary obstacles is the limited budget. Investing in professional software, hardware, and training can be costly. To address this, SMEs should explore affordable alternatives and prioritize essential tools that offer the most value. Subscription-based models and freeware can provide high functionality without significant upfront costs. Another challenge is the lack of expertise. High-end retouching and color grading require specialized skills that may not be readily available within small teams. SMEs can overcome this by investing in employee training or outsourcing specific tasks to freelancers or agencies. Building relationships with freelance professionals can provide flexible access to high-quality services, allowing SMEs to scale their efforts according to their needs and budgets (Halilovic, 2020).

Time constraints also pose a significant challenge. SMEs often operate with lean teams where employees juggle multiple roles. The time-intensive nature of high-end photo editing can be daunting. Streamlining the workflow with efficient tools and processes can mitigate this issue. Utilizing presets, templates and automation features in software can significantly reduce the time required for routine tasks, allowing employees to focus on more strategic aspects of visual content creation. Finally, staying updated with the latest trends and technologies in photo retouching and color grading is crucial but can be overwhelming. To stay informed, SMEs should regularly engage with industry publications, online courses, and professional networks. This ongoing education will help them adapt to changing trends and maintain a competitive edge (Ijomah et al., 2024).

6. Conclusion

The exploration of innovative approaches in high-end photo retouching and color grading underscores these techniques' transformative impact on marketing and visual storytelling. For both large corporations and small and medium-sized enterprises (SMEs), the ability to produce compelling and visually striking content is crucial in a competitive market. This paper has delved into the historical evolution of photo retouching and color grading, the advanced technologies driving these fields today, and the practical applications that enhance visual content's aesthetic and emotional appeal.

Photo retouching and color grading have come a long way from their traditional roots, evolving through significant technological advancements. The transition from manual methods to sophisticated digital tools has democratized these techniques, making them more accessible and efficient. Software advancements and the integration of artificial intelligence and machine learning have further revolutionized the field, automating routine tasks and enabling more precise and creative editing. These developments have expanded the possibilities for artists and marketers, allowing them to achieve high-quality results with greater ease and speed.

High-end photo retouching techniques, such as skin retouching, background enhancement, and compositing, are critical in creating flawless and captivating images. These techniques require artistic skill and technical expertise to balance realism and perfection, ensuring that the final product is aesthetically pleasing and believable. The use of AI and ML in retouching has streamlined many processes, making professional-level editing more accessible even to those with limited experience.

Color grading, grounded in the principles of color theory, is another powerful tool for shaping images' visual and emotional impact. By manipulating colors, artists can evoke specific moods, enhance the narrative quality of visuals, and align content with brand identity. The influence of cinematic color grading has permeated marketing visuals, bringing dramatic contrasts, stylized palettes, and mood-specific adjustments that elevate the storytelling potential of images. This cinematic approach helps create a cohesive and memorable visual experience, making it a valuable asset in the marketer's toolkit.

For SMEs, leveraging high-end photo retouching and color grading presents opportunities and challenges. These techniques can help SMEs compete with larger companies by producing professional-quality content that attracts and retains customers. While budget constraints, lack of expertise, and time limitations pose significant challenges, there are numerous affordable tools, resources, and strategies SMEs can adopt to overcome these obstacles. Investing in

employee training, utilizing cost-effective software, and engaging with online communities can empower SMEs to enhance their visual content and strengthen their market presence.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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